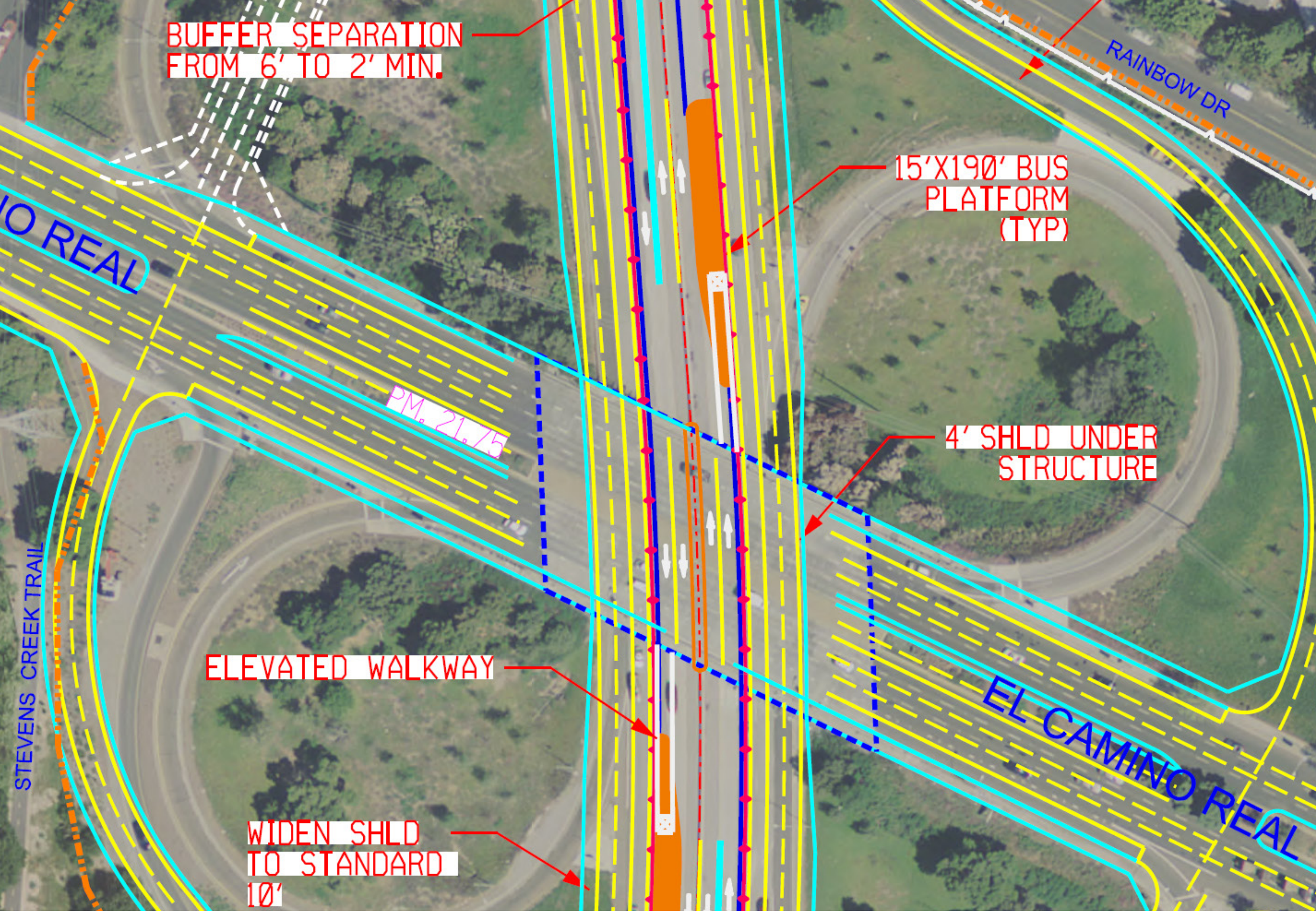

ALTERNATIVES ANALYSIS

STATE ROUTE 85 TRANSIT GUIDEWAY STUDY

2016 MEASURE B

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Chapter 1

Introduction

The purpose of this SR 85 Transit Guideway Study is to investigate alternative transit improvements to address the congestion and delay that now characterizes this major transportation facility. A collaborative process involving each of the cities along the corridor, the VTA, and Caltrans is being used to guide the study. The study is intended to address a broad range of transit options and alternatives including consideration of advanced transit technologies and operational strategies. A comprehensive and transparent process was used to identify, develop and evaluate a full range of transit technology and service alternatives.

This Final Report provides a description of SR 85 improvement alternatives as well as an analysis of alternatives. The information provided will be used by the VTA and the Policy Advisory Board to develop a recommendation for further analysis and development of a preferred alternative.

1.1 Alternatives Development Process

The process was designed to make sure that all merited ideas were considered. The SR 85 Corridor Policy Advisory Board (PAB) was established to ensure the stakeholder cities in the SR 85 corridor are involved in the development of existing and potential transportation capital projects along the corridor and have the opportunity to provide input and recommendations to the VTA Board of Directors. VTA staff brought updates and shared technical findings from the SR 85 Transit Guideway Study to the PAB on a periodic basis as the study progressed.

In addition, community meetings were held to inform the public and stakeholders about the study and to provide a forum for public discussion and feedback. Also, a project website was established to provide easy access to project information.

1.2 Fundamental Decisions

The process of defining and reviewing the alternatives was incremental in nature. Initially, a long list of technology and service options was considered. This list was gradually narrowed based on some fundamental decisions made during the process of working with the PAB and the public. These decisions were also informed by the assessment of existing conditions/transit market analysis and the engineering constraints analysis that was conducted as the first phase of this study. The fundamental decisions that were made were those on mode, service, stations, and right-of-way.

1.2.1 Mode

Initially the study considered light-rail and other rail-based technologies, as well as bus alternatives that would use the SR 85 corridor. The transit market analysis indicated that the corridor is characterized by low density land uses and patterns of travel which are focused in the peak commute periods and are highly directional. It became clear that these characteristics were not supportive of high investment and high capacity rail solutions. Further, an analysis of the cost structure of rail indicated that the high capital and operating costs made it a less suitable choice for a suburb-to-suburb transit connection. At its July 2, 2019 meeting the PAB passed a resolution to eliminate light rail as a considered mode for the SR 85 Transit Guideway Study. This was a major step, focusing the further engineering and planning work on bus-based alternatives.

1.2.2 Service

The approach was to develop transit alternatives with service characteristics that were tailored to the actual travel demands in the corridors. The PAB was provided with an analysis that showed the tradeoffs between maximizing service speed, person throughput, and access while managing costs. The PAB expressed their desire to emphasize speed, seeking to maximize the time competitiveness with traveling by automobile. Accordingly, the number of transit stops was limited and routing options attempted to keep the buses on the freeway as much as possible.

1.2.3 Stations

Consistent with the concept of maximizing transit speed, the PAB indicated that the number of transit stops in the corridor should be limited to 2-6 locations where there was potential for high levels of transit access activity. The concept of developing transit stops or stations that were located on the freeway, so that the buses would not have to exit the freeway to pick-up or drop-off passengers, was preferred by the PAB.

1.2.4 Right-of-Way

The engineering constraints analysis indicated that the transit alternatives could be constructed within the existing SR 85 right-of-way, although there were some “pinch points” where small property acquisitions might be necessary. The PAB indicated a desire to minimize project impacts by avoiding as much as possible the need to acquire additional right-of-way.

These fundamental decisions provided the basis for development of a refined set of bus transit alternatives in the corridor that would emphasize speed, serving a limited number of stops, and using the existing available right-of-way.

1.3 Project History/Background

To understand the rationale behind the identification of the bus alternatives it is important to understand some of the history of SR 85. SR 85 is a relatively young facility. The first portion between Stevens Creek Boulevard and US 101 in Mountain View was completed in 1965 and the full freeway extending all the way to its southern connection with US 101 was completed in 1994. During the development of the freeway, traffic noise was a concern and for this reason portions of the freeway were depressed below grade and large trucks are prohibited. Today the freeway, with its three travel lanes including an HOV lane in each direction, is a major conduit for commuters. It connects homes in South San Jose, Los Gatos, Saratoga, the Coyote Valley and points to the south, as well as Santa Cruz County, to jobs in Mountain View, Sunnyvale, Cupertino and other points along the US 101 and SR 237 corridors.

As part of VTA’s Silicon Valley Express Lanes Program it was proposed to convert the existing HOV lane in each direction to an express lane and then to use the wide median area which is available on SR 85 between SR 87 and I-280 to add an additional express lane. This was to address the fact the current HOV lanes fill to capacity during the peak commute periods in the peak direction. In April 2015, VTA issued the *Initial Study with Negative*

Declaration/Environmental Assessment with Finding of No Significant Impact State for the Route 85 Express Lanes Project. Some of the cities along the corridor objected with two primary concerns: 1) the additional lane would result in increased traffic related noise; and 2) there was an understanding that the available median area between SR 87 and I-280 would be reserved for a future light rail extension or some other transit improvement.

Discussions between the cities and VTA resulted in an agreement that the PAB would be formed to investigate measures to reduce traffic noise and to study alternative transit improvements in the corridor. In addition, it was agreed that a provision would be included in the Measure B transportation sales tax initiative to provide funding to the improvements that would be identified in the studies.

The express lane project has been paused pending the completion of the transit guideway study and the subsequent recommendation about how to proceed in the corridor that the PAB will provide to VTA's Board of Directors.

1.4 Alternatives Advanced

Having the fundamental decisions in place, the available information regarding the engineering and right-of-way constraints evaluated, and the transit market analyzed, a series of alternatives focusing on bus improvements were developed. These were alternative strategies for the construction of transit infrastructure. Three conceptual alternatives were advanced for additional consideration. These were express lanes, transit lanes, bus on shoulder as well as a no change alternative to be used to evaluate the build alternatives. At its meeting in September 2019 the PAB approved these alternatives for final consideration in the study. The following sections provide a much more detailed description of the alternatives that were studied.

1.4.1 No Change

This no-build alternative is the baseline against which the other "build" alternatives will be compared. It represents the existing conditions with no changes to the freeway configuration or other transit improvements.

1.4.2 Express Lanes

Two variations were considered: 1) conversion of the existing HOV lane in each direction to a single express lane; and 2) conversion of the existing HOV lane in each direction to an express lane and the addition of a second express lane in the median area of the freeway to provide dual express lanes (this alternative represents the project evaluated in the 2015 environmental document). Express lanes allow non-carpool vehicles to use the lanes for a fee, which would adjust based on express lane travel speeds to maintain consistent speeds. Carpools can use an express lane for free.

1.4.3 Transit Lanes

Exclusive lanes for transit vehicles designated as "Transit Only" would be created in the median of the freeway adjacent to the existing HOV lanes. A variety of configurations including provision of on-line freeway stations were considered. VTA transit service and private shuttles are envisioned as eligible users of transit lanes.

1.4.4 Bus on Shoulder

The shoulder area of the freeway, either left-side or right-side would be adapted for use by buses. When speeds in the general-purpose lanes drop below 35 miles per hour buses would be allowed to enter the shoulder area and bypass the traffic, but in a carefully controlled manner at speeds no greater than 10-15 miles per hours than that of the general traffic. VTA transit service and private shuttles are envisioned as eligible users of bus on shoulder lanes.

Chapter 2

Alternatives

2.1 SR 85 Corridor Context

The proposed corridor is SR 85 between US 101 in south San Jose and US 101 in Mountain View, California, approximately 24 miles long. For the purposes of this study, SR 85 was broken into three distinct sections based on roadway geometry and traffic volumes as outlined below and shown on **Figure 2-1**.

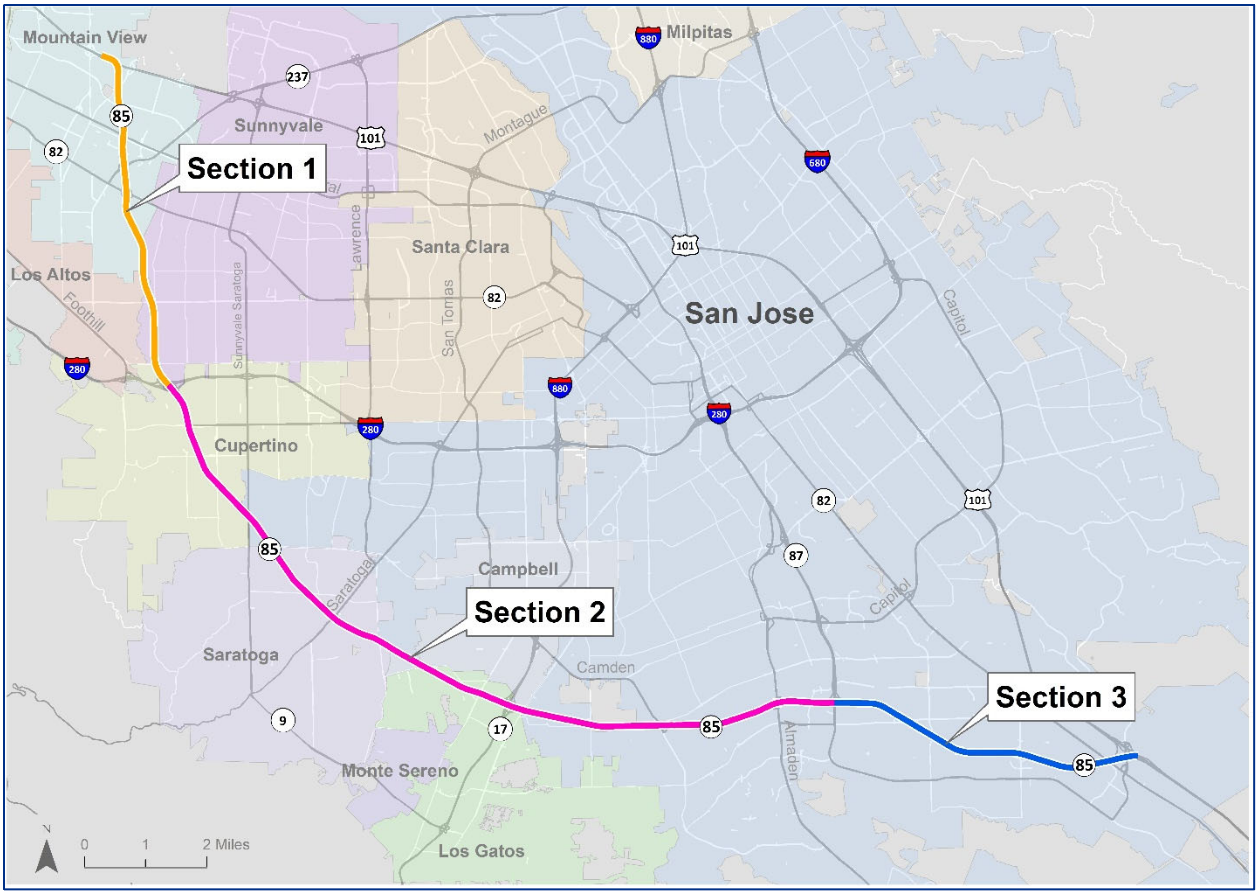


Figure 2-1: SR 85 Analysis Sections

- **Section 1** (approximately 5.5 miles) covers the northern end, beginning at the interchange of I 280 and continues north to the US 101 interchange. This section has a narrow median.
- **Section 2** (approximately 13.5 miles) begins at the SR 87 interchange and continues north to the I 280 interchange. Most of this section has a full shoulder and unpaved median.

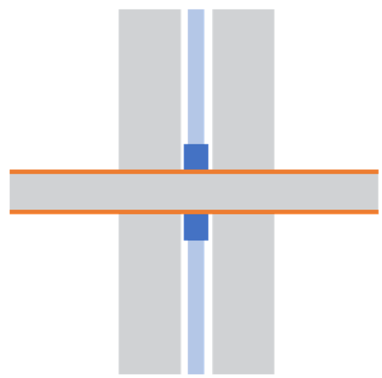
- **Section 3** (approximately 5 miles) covers the southern end of SR 85 where VTA LRT operates in the median. It starts at the interchange with SR 87 and continues to the interchange with US 101.

SR 85 has two general purpose lanes and one High Occupancy Vehicle (HOV) lane along all three sections. It currently experiences heavy congestion during peak periods in the general-purpose lanes as well as slow travel speeds in the HOV lane.

2.2 Stations

To complete the evaluation of alternatives it was necessary to identify locations for new transit stations. As noted, one of the fundamental questions answered by the PAB involved the number of new transit stations. The PAB preferred 2-6 stations in the SR 85 right of way to maximize transit. These new stations are only associated with the Transit Lanes and Bus on Shoulder Alternatives.

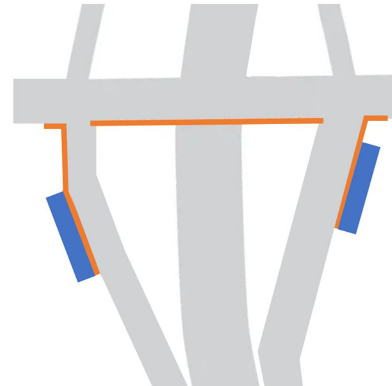
How customers access transit services or connect to local land uses must be established to differentiate and evaluate alternatives. There are several ways to create stations and provide local access to and from land uses.



- At-grade stations in either the SR 85 median or off the right shoulder. These stations would include, as appropriate, stairs, elevator and walkway connections to local streets and would provide access to:
    - Walkers, bikers and scooters
    - Park and ride lots directly adjacent to the station
    - Local bus stops on the cross street
    - Local land uses

- Median ramps where the transit lane either goes up or down to connect to the local street and has either a station on the ramp and/or provides the ability to connect to other bus stops/stations/hubs off SR 85

- Stations located on ramps that are used with the right-side transit lane or bus on shoulder alternatives.



Previous work identified up to six locations for potential stations and local street access (**Figure 2-2**). Each of these locations are discussed below.

- **Mountain View Transit Center** is located approximately 0.5 miles west of SR 85 along West Evelyn Avenue and has connections to LRT at the Mountain View Transit Center, a park and ride lot and connections to several local bus stops. While off the study corridor this could be considered a terminal station for service.

- **El Camino Real** could provide a direct connection to bus routes 22, 522.

- **Stevens Creek** could provide a direct connection to bus route 51 and De Anza College. McClellan Road could be considered for direct access ramps from the median or right for buses (and HOVs).

- **Saratoga Avenue** could provide a direct connection to bus route 26 and is close to West Valley College Transit Center. Direct access ramps from the median or right side for buses (and HOVs) at Quito Road to the south could be considered as well as using Allendale Avenue to access West Valley College Transit Center.

- **Bascom Avenue/Winchester Avenue** are two locations in close vicinity to each other. Bascom would provide a direct connection to Good Samaritan Hospital and several local bus routes including 61 and 27. The Winchester Avenue connection would allow a direct connection to bus route 27 and is immediately adjacent to a major employment complex. Additionally, the proposed extension of Winchester LRT would end at the proposed Vasona Station and park and ride lot. While both locations have merit, the development of only one location is appropriate given the short distance between them. A Bascom Avenue station will be considered for this analysis. Moving the station location to Winchester Avenue can be considered if plans for a Winchester LRT extension advance.

- **Ohlone/Chynoweth** is an existing multimodal center at the intersection of SR 85 and Santa Teresa Boulevard. It currently includes a park and ride lot (549 spaces), connection to the Guadalupe LRT, Almaden LRT Spur, and VTA bus routes 13 and 102. Direct northbound access to/from SR 85 is via ramps and a traffic signal at Santa Teresa Boulevard with access to the park and ride. The southbound direction access would be via ramps to Santa Teresa Boulevard then the signal at the access to the park and ride.

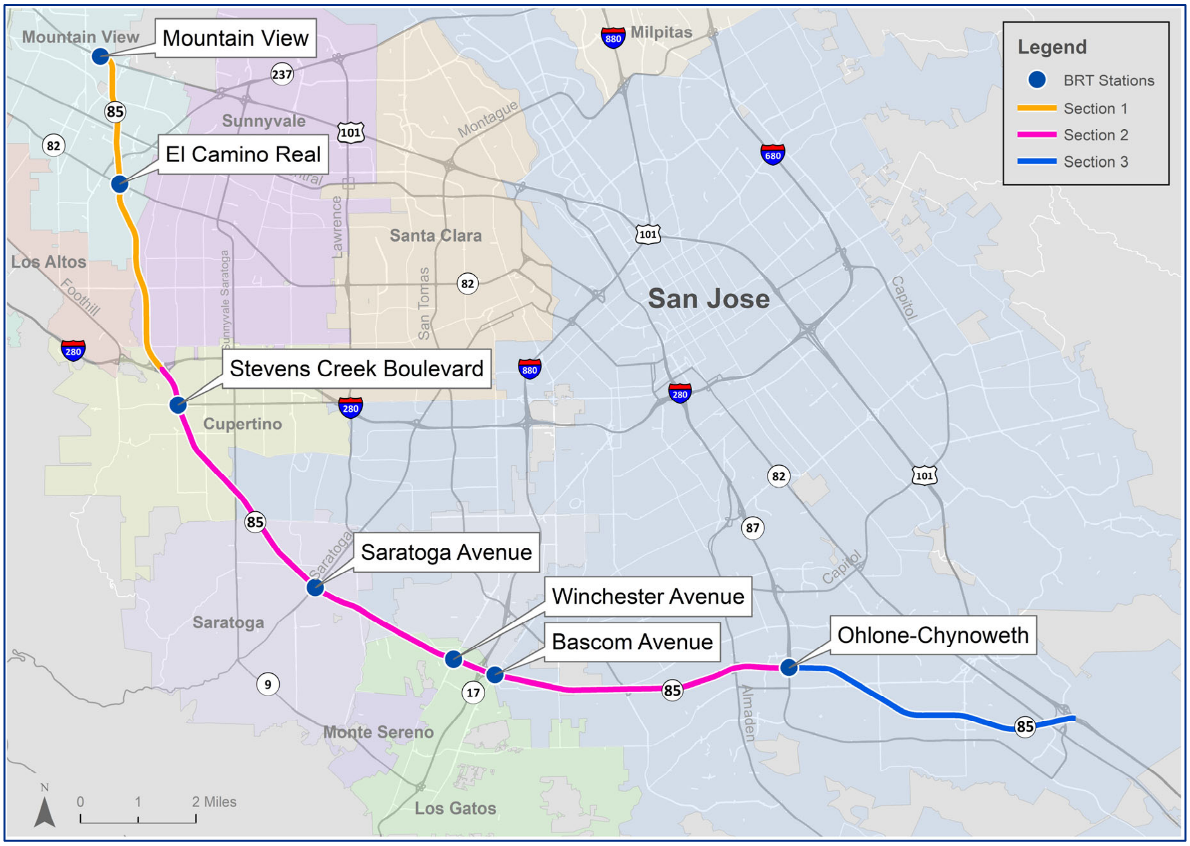


Figure 2-2: SR 85 Proposed BRT Stations

2.2 Alternatives Advanced

The following is a more detailed description of the four alternative categories advanced for analysis. These are construction alternatives. Under the No Change Alternative 1-1, and Express Lane Alternatives 2-1, 2-2 and 2-3, there is no new transit service that runs the length of the corridor. All other transit alternatives (transit lanes and bus on shoulder) will have a two routing options for the provision of a new transit route running the length of the corridor.

Each transit alternative includes three basic components: some form of exclusive transitway, a set of station/stop assumptions and a set of potential transit routings. The alternatives are grouped based on the type and location of the transitway. Following are brief descriptions of each component and the assumptions that will be used to evaluate the alternatives.

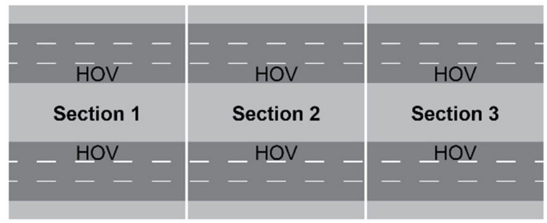
Since LRT currently operates in Section 3, the transit alternatives provide transit only lanes in Sections 1 and/or 2 by creating exclusive transitways in the median (inside) and/or outside or allow buses to use the shoulders when travel speeds in general purpose lanes fall below a set speed threshold (35 mph for example) using either the outside or inside shoulders.

2.2.1 No Change

Alternative 1-1 is the No Change. This alternative assumes no changes to how the existing HOV lane operates and no added travel lanes. Two options are included in this alterative.

- **Option 1** No physical changes to the corridor.

Alternative 1-1 No Change



- **Option 2** No improvements in the corridor associated with this project, but all projects included in the Metropolitan Transportation Commission (MTC) Plan Bay Area 2040 or those that have been submitted by VTA for inclusion in the upcoming MTC Plan Bay Area 2050 are assumed to be built as planned. A key project in the corridor is the conversion of the El Camino Boulevard interchange into a diamond interchange. Each of these projects are discussed in greater detail in the Proposed Engineering Features Report developed during this study.

2.2.2 Express Lanes

An express lane is defined as a managed lane that restricts access based on vehicle occupancy and associated user fees. By using express lanes instead of HOV lanes, these alternatives attempt to improve opportunities to maximize the use of the facility, provide greater modal opportunities and encourage people to shift their mode to transit or carpooling, increasing passenger throughput. The SR 85 express lanes align with VTA's Silicon Valley Express Lane Program.

The following assumptions are required to make the express lanes operational:

- Express lanes would continue to be separated from general purpose lanes with painted lines only and have continual access along the entire length of the corridor
- Tolling gantries would be added along the length of the project
- All on-road equipment would be connected to the existing control center
- Enforcement areas will be created as appropriate along the corridor

In addition to physical construction, policy decisions must be addressed. While final decisions on express lane policies would occur later in project development and align with current express lane policies, the following set of assumptions will be used during the evaluation of alternatives.

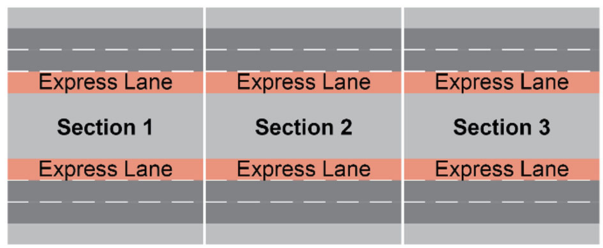
- The pricing of express lanes is assumed to be at a level high enough to ensure traffic would remain free flowing (45 mph).
- The following are assumptions are express lane tolling assumptions:
    - Single Occupancy Vehicles (SOV) – Tolled
    - High Occupancy Vehicles 2+ (HOV 2+) – Tolled at half the price of single occupancy

- High Occupancy Vehicles 3+ (HOV 3+) – Free
- Transit Vehicles – Free
- Private Shuttles – Free
- Electric Vehicles (EV) – Tolled as HOV 2+ unless they meet HOV 3+
- Trucks – Not permitted

▪ If the number of HOV 3+, transit vehicles and private shuttles combined exceeds express lane capacity, then all other vehicles would be prohibited from using the express lanes.

2.2.3 Alternative 2-1 HOV to Express Lane

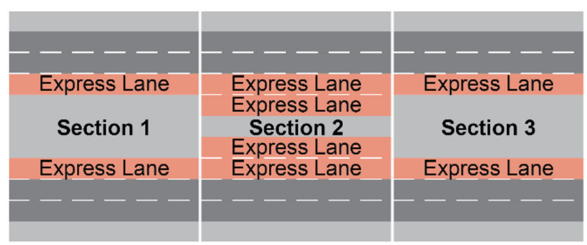
Alternative 2-1 HOV to Express Lane



Under this alternative the existing HOV lane is converted to an express lane. This alternative could be implemented without any physical changes to the roadway/shoulders except for median changes to construct gantries and enforcement areas in the median. Given the congestion along parts of the corridor in the existing HOV lane, to maintain free flow speeds, it is assumed that only HOV 3+ vehicles would be permitted in the express lanes during peak periods. This alternative assumes none of the future improvements noted in Scenario 2, No Change, as they are not required to implement express lanes and would only improve overall operations.

2.2.4 Alternative 2-2 Short Dual Express Lane

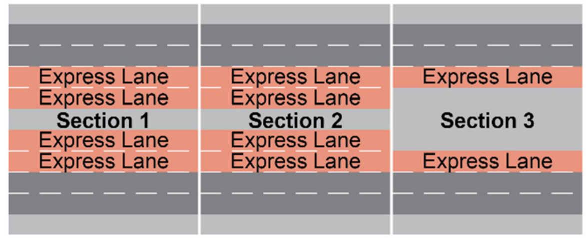
Alternative 2-2 Short Dual Express Lane



Both Alternatives 2-2 and 2-3 build on Alternative 2-1, a single express lane along the entire project. Alternative 2-2 includes a second express lane only in Section 2, as Section 2 is the easiest to implement and targets the area of greatest congestion. This alternative would be accomplished by reconstructing the existing median to accommodate the additional lane in each direction. Alternative 2-2 aligns with the SR 85 express lanes project that received environmental clearance in 2015 and was halted pending the outcome of this study and subsequent PAB recommendation.

2.2.5 Alternative 2-3 Long Dual Express Lane

Alternative 2-3 Long Dual Express Lane



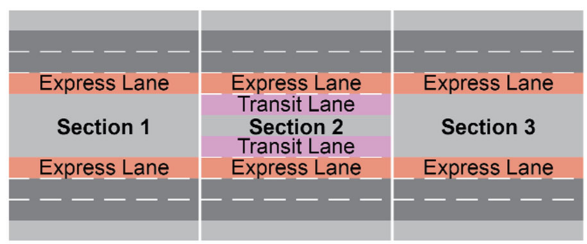
Alternative 2-3 builds on Alternative 2-2, adding a second express lane in Section 1, as well as Section 2. The second express lane in Section 1 would require replacement of the existing median, as well as some additional pavement widening on the outside. This alternative may require moving some sound walls. Additionally, for Alternative 2-3 the reconfiguration of the El Camino Real interchange will be required. This design was not included in VTA's Silicon Valley Express Lanes Program but is included as a point of comparison to transit alternatives that would add a new lane in Section 1 of the corridor.

2.3 Transit Lanes

Alternative 3-1 and 3-2, build on Alternative 2-1, HOV to Express Lane by adding an additional lane in the median for transit vehicles to exit the proposed express lane. Median stations would be included with these alternatives.

2.3.1 Alternatives 3-1 Short Median Transit Lane

Alternative 3-1 Short Median Transit Lane



Alternative 3-1 adds a median transit lane in Section 2, to the HOV to express lane conversion in Alternative 2-1.

Stations used or constructed would be:

- **Stevens Creek** This stop would be a median stop. With a reduced median in this area a split platform configuration could be required. It would require stairways and elevators on both sides of the overpass. Additionally, the bridge and adjacent roadways would need widening to accommodate pedestrian movements.

- **Saratoga Avenue** This stop would be a median crossover stop and would require separation of the bus station from the transit lane with a concrete barrier. Stairs and elevators would be needed on each side of the Saratoga bridge. The Saratoga Avenue overpass and adjacent intersections would need to be widened to accommodate pedestrian movements.

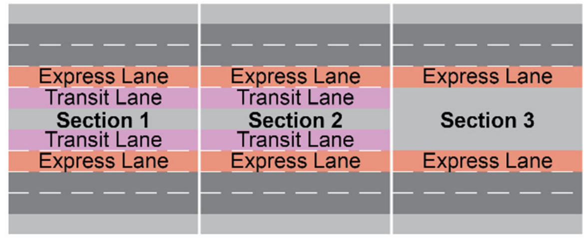
- **Bascom Avenue** This stop would be a median crossover stop and would require separation of the bus station from the transit lane with a concrete barrier. If a wider platform area is required, split platforms could be considered. Stairs and elevators would be needed on each side of the Bascom bridge. The Bascom overpass and adjacent intersections would need to be widened to accommodate pedestrian movements.

- **Ohlone/Chynoweth** This is an existing station and would not have any associated changes.

2.3.2 Alternative 3-2 Long Median Transit Lane

Alternative 3-2 builds on Alternative 3-1 and adds a median transit lane in Section 1 as well as Section 2.

Alternative 3-2 Long Median Transit Lane



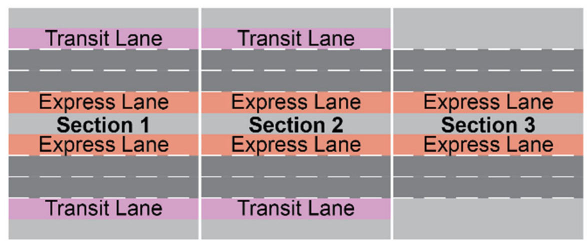
Stations used or constructed under this alterative would be:

- **Mountain View Transit Center** To more directly service this station, the median transit lanes use new median ramps to connect directly to Evelyn Avenue at a signalized intersection. The bus could then continue to the Mountain View Transit Center.

- **Alternative 3-1 Stations** Alternative 3-2 builds on Alternative 3-1. All alternative 3-1 stations would be constructed and included in Alternative 3-2.

2.3.3 Alternative 3-3 Right Side Transit Lane

Alternative 3-3 Right Side Median Transit Lane



This alternative would add a transit only lane on the right side of SR 85 in Sections 1 and 2. The existing three lanes would be moved toward the median with a reduced median shoulder so the expansion could fit within the existing right of way. Like Alternatives 3-1 and 3-2, stations/stops could be constructed on SR 85 but they would be on the right side. Another option would be for the buses to exit to the local street using the existing ramps. In this case, stations could be placed on the ramps or on the local streets depending on the proposed routing.

The following is a description of the stations that would be developed used under this alternative for a transit routing remaining on a right-side transit lane.

- **Mountain View Transit Center** Buses would use the existing ramps. Queue jumps or other appropriate bus treatments could be considered at the intersection with Evelyn Avenue.

- **El Camino Real** A right side bus stop along SR 85 would only be feasible with the proposed reconfiguration of the interchange. With reconfiguration, platforms could be constructed for both directions, separated from traffic by a concrete barrier, with stairs and elevators on each side of El Camino Real. As part of the reconfiguration, the El Camino Real bridge would need to include the appropriate pedestrian amenities.

- **Stevens Creek** Would require platforms for both directions, separated from traffic by a concrete barrier, with stairs and elevators on each side of Stevens Creek. The Stevens Creek overpass and adjacent intersections would need to be widened to accommodate pedestrian movements.

- **Saratoga Avenue** Would require platforms for both directions, separated from traffic by a concrete barrier, with stairs and elevators on each side of Saratoga Avenue. The SR 85 bridge would need to be widened to allow for the additional bus platforms. The Saratoga overpass and adjacent intersections would need to be widened to accommodate pedestrian movements.

- **Bascom Avenue** Would require platforms for both directions, separated from traffic by a concrete barrier, with stairs and elevators on each side of Bascom Avenue. The Bascom overpass and adjacent intersections would need to be widened to accommodate pedestrian movements.
- **Ohlone Chynoweth** Would not have any associated changes.

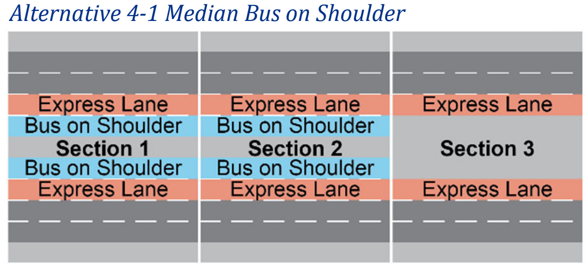
2.4 Bus on Shoulder

Alternatives 4-1 and 4-2 involve the use of shoulders. Operationally, these alternatives would allow buses to operate on the shoulder during periods of congestion. Rather than creating a separate transit only lane, this concept allows the buses to use the shoulders once traffic speeds fall below a certain threshold (35 mph). Buses could travel on the shoulder at up to 45 mph to the next stop. This concept allows buses to bypass the slow-moving traffic. Significant guidance on shoulder facilities operations is provided from the Transportation Cooperative Research Program (TCRP). Currently this type of operation is not permitted. In addition to any physical changes, regulatory changes would also be needed. Bus on shoulder operations could operate with no other improvements in some segments and provide travel time benefits for existing services. They could also be combined with the service improvements identified including adding stations within the right of way or on the ramps like Alternatives 3-1 through 3-3.

2.4.1 Alternative 4-1 Median Bus on Shoulder

This alternative would be a variation of Alternative 2-3. Instead of providing a second managed lane, the median shoulder would be upgraded so that buses could bypass any congestion within the express lane. This alternative could also include the median transit stations or access points as outlined in Alternative 3-2.

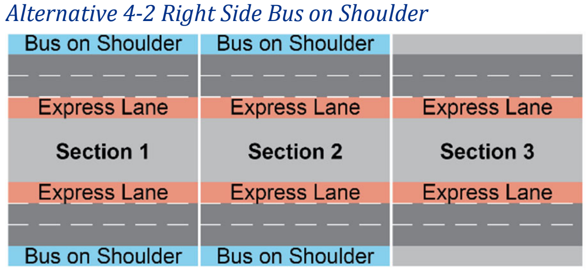
Alternative 4-1 Median Bus on Shoulder



2.4.2 Alternative 4-2 Right Side Bus on Shoulder

This alternative would operate like Alternative 3-3 but rather than a full-time transit lane, the right side would operate as a shoulder unless traffic congestion exists. Stations are not required but could be included and would align with Alternative 3-3.

Alternative 4-2 Right Side Bus on Shoulder



Chapter 3

Transit Operations

The demand for transportation facilities is highly dependent on regional and local land uses and demographics. It is difficult to predict where growth will occur and how dense or intensive it will be. Well planned transportation facilities are those that are flexible and can be adapted based on future conditions without the need for reconstruction. Often an incremental or phased approach is used that doesn't preclude future improvements.

As indicated previously, the No Change alternative and the HOV to Express Lane Conversion do not include any new transit services. The Transit Lane and Bus on Shoulder alternatives do include a new transit service running the length of the corridor. There are two routing options for this new service. One would include building an SR 85 transit facility complete with new in-corridor transit stations and the other option would make only the roadway improvements and use existing off-corridor bus stops.

Either of these transit routing options can be considered for various levels of operating days, service hours and frequencies.

3.1 Transit Routings

Two routing options were developed that explore the ridership tradeoffs between direct travel and increasing direct access to high demand off-corridor locations. These routing options apply to the transit lane (Alternatives 3-1, 3-2, 3-3) and bus on shoulder alternatives (Alternatives 4-1 and 4-2) only.

3.1.1 Option 1

This option assumes that the existing Mountain View Transit Center and the Ohlone/Chynoweth Station are used as the north and south terminus points and that new stations are built as part of the transit alternatives. The service could be expanded to provide greater access to the north by extending it beyond the Mountain View Transit Center in the north or beyond the Ohlone/Chynoweth Station in the south, though extending the route would increase the overall travel time of the route and decrease the average travel speed which would increase vehicle needs and operating cost.

Option 1 includes new stations at

- El Camino Real (except for Alternative 3-1)
- Stevens Creek
- Saratoga Avenue
- Bascom Avenue

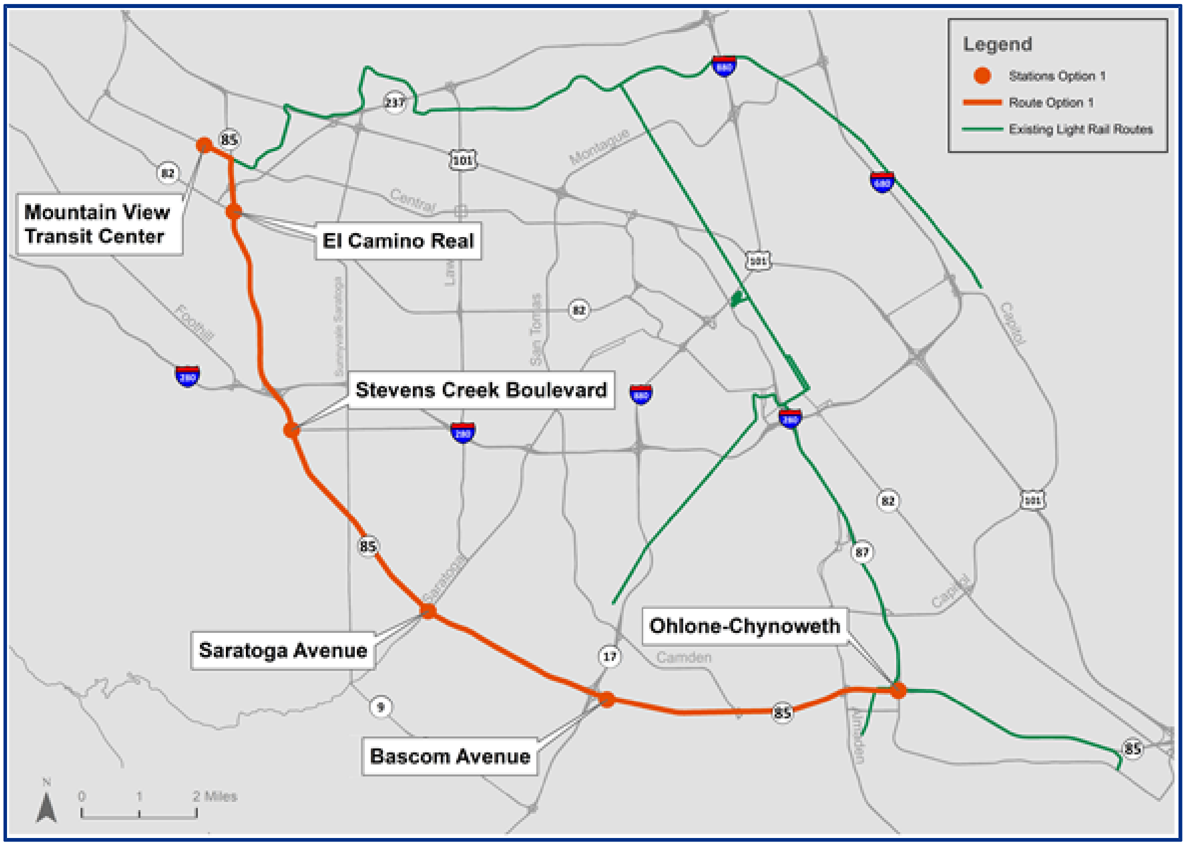


Figure 3-1: Routing Option 1

3.1.2 Option 2

The second service option would operate like the first, except the service would exit SR 85 at Stevens Creek, Saratoga and Bascom to circulate on local streets and connect to local transit centers at De Anza College, West Valley College and Good Samaritan Hospital. By exiting SR 85 to circulate locally, the length of the transit trip would increase, also increasing the transit operating cost. This alternative is shown on **Figure 3-2**.

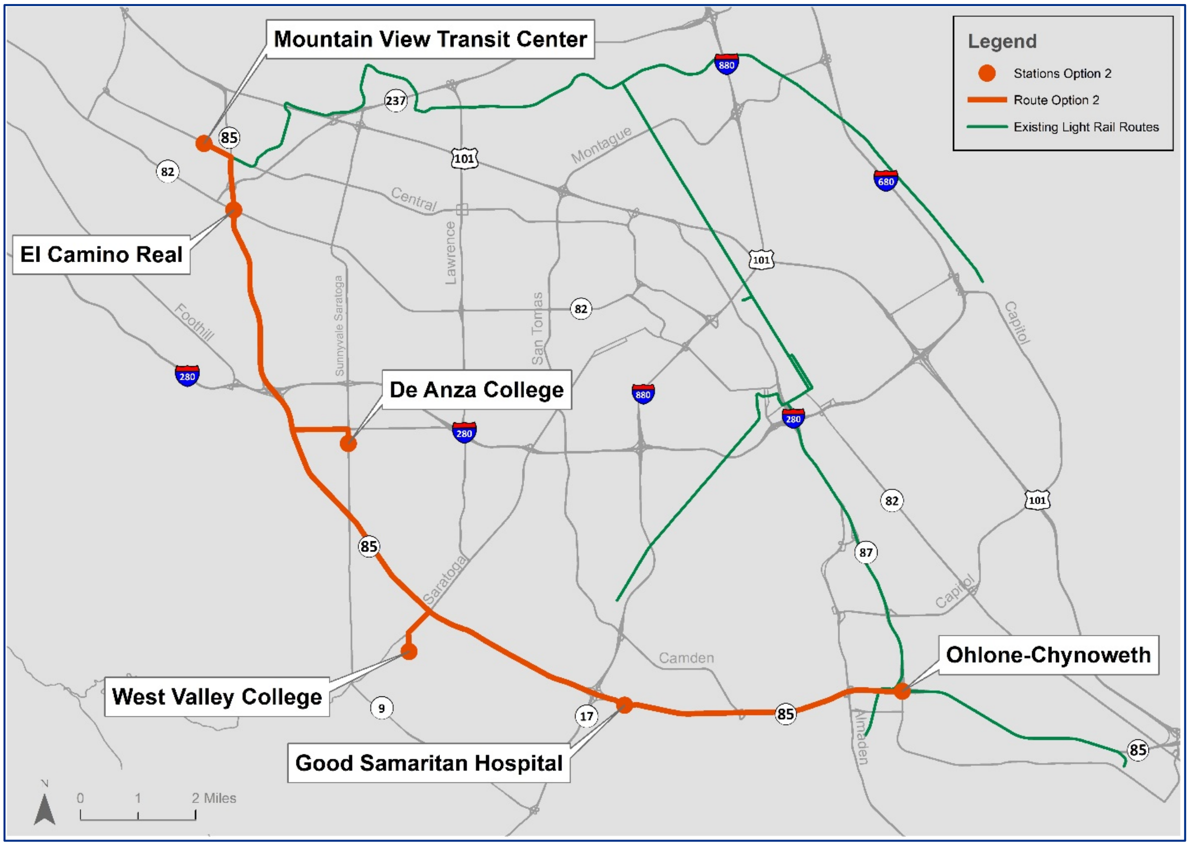


Figure 3-2: Routing Option 2

For transit routing exiting the transit lane to circulate on local streets, the following is a description of bus access for Alternatives 3-1, 3-2 and 4-1.

- **Mountain View Transit Center (Alternatives 3-2 and 4-1 only)** To more directly service this center, the median transit lanes are dropped down and cross under SR 85 to connect directly to Evelyn Avenue at a signalized intersection. The bus could then continue to the Mountain View Transit Center.

- **El Camino Real (Alternatives 3-2 and 4-1 only)** Given the current configuration, no opportunity exists to create a connection to the local street system directly from the median. With a new interchange configuration (cloverleaf to a diamond), a potential opportunity exists for providing direct ramps to the local street.

- **Stevens Creek** An alternative to direct ramps from the median would be to build direct ramps at McClellan Road.

- **Saratoga Avenue** Rather than provide access directly to Saratoga Avenue, direct ramps to Quito Road

- **Bascom Avenue** Assuming the access would be at Bascom Avenue (see above), median ramps would be built up to Bascom Avenue. This addition would require a signal on Bascom.
- **Ohlone/Chynoweth** Would use the existing ramps and then cross traffic to enter the median.

For transit routing that exits the transit lane to circulate on local streets, the following is a description of bus access to local streets for Alternative 3-3 and 4-2.

- **Mountain View Transit Center** Buses would use the existing ramps. Queue jumps or other appropriate bus treatments could be considered at the intersection with Evelyn Avenue.
- **El Camino Real** Without reconfiguration of the interchange, any form of right-side bus station would not be feasible. With the reconfigured interchange, bus stops on/off ramps would be possible. They could be coordinated with the reconfiguration and sidewalk and pedestrian amenities could be provided on the bridge.
- **Stevens Creek** In this area, a large number of riders are assumed to walk to their destination or have easy access to several nearby bus stops. Given this assumption, stations would be constructed on the off-ramps in each direction. Additionally, the bridge would need to be widened to provide appropriate sidewalk widths and the ramp intersections would need to be reconstructed to address bus movements and to provide appropriate pedestrian facilities.
- **Saratoga Avenue** Since the primary focus of this location would be connections to local bus routes providing last miles services there are two potential options for this location:
    - No stations are built in the vicinity of the interchange and buses circulate to West Valley College Transit Center, or
    - Stations would be constructed on the off-ramps in each direction. Additionally, the existing sidewalks would need to be widened and the ramp intersections would need to be reconstructed to address the bus movements and to provide appropriate pedestrian facilities. Bus stops for connecting bus services would be needed on Saratoga Ave.
- **Bascom Avenue** For this location a significant number of riders are assumed to walk to their destination or have easy access to several nearby bus stops. With this assumption, stations would be constructed on the off-ramps in each direction. Additionally, the Bascom bridge would need to be widened to provide appropriate sidewalk widths and ramp intersections would need to be reconstructed to address bus movements and provide appropriate pedestrian facilities.
- **Ohlone Chynoweth** No associated changes.

Table 3-1 summarizes station and stop access for both Routing Option 1 and 2.

Table 3-1: Station and Stop Access

Alternative	Option	New Direct Connection to Evelyn	Stations Locations: El Camino Real	Stations Locations: Stevens Creek	Stations Locations: Saratoga	Stations Locations: Bascom	Bus Routing	New El Camino Interchange	Bus Pathway
3-1 Short Median Transit Lane	**1**			In line at grade	In line at grade	In line at grade	In Line Route		Bus travels in median transit lane and uses the median at-grade stations. Passengers use stairs or elevator to get to cross-street
	2			NB off/SB on from McClellan Rd, *SB off/NB on at Stevens Creek*	NB off/SB on at Quito Rd, *SB off/NB on at Saratoga*	SB off/NB from Bascom, *NB off/SB on from Union*	Deviation Route		Bus travels in the median as in Option 1 except at Stevens Creek, Saratoga and Bascom where they would exit at nearby crossing with ramps and proceed to the nearby transit centers. There are no ramp stations since there are no generators at the end of the ramps.
3-2 Long Median Transit Lane	**1**	Direct Ramps to Evelyn Ave	In line at grade	In line at grade	In line at grade	In line at grade	In Line Route	Yes	Bus travels in median transit lane and uses the median at-grade stations. Passengers use stairs or elevator to get to cross-street
	2	Direct Ramps to Evelyn Ave	In line at grade	NB off/SB on from McClellan Rd, *SB off/NB on at Stevens Creek*	NB off/SB on at Quito Rd, *SB off/NB on at Saratoga*	SB off/NB from Bascom, *NB off/SB on from Union*	Deviation Route	Yes	Bus travels in the median as in Option 1 except at Stevens Creek, Saratoga and Bascom where they would exit at nearby crossing with ramps and proceed to the nearby transit centers. There are no ramp stations since there are no generators at the end of the ramps.

Alternative	Option	New Direct Connection to Evelyn	Stations Locations				Bus Routing	New El Camino Interchange	Bus Pathway
			El Camino Real	Stevens Creek	Saratoga	Bascom			
3-3 Right Side Transit Lane	**1**	No	In line at grade	In line at grade	In line at grade	In line at grade	In Line Route	Yes	Bus uses the transit lane and bypasses the ramps, the bus pulls off the mainline and across the shoulder into a protected area where the platform is located. Passengers must then use stairs or an elevator to get to the cross street.
	2	No	Ramp Station	No Ramp Station	No Ramp Station	SB off/NB from Bascom, *NB off/SB on from Union*	Deviation Route	Yes	Bus uses the right side transit lane, exits SR 85 and uses ramp stations then crosses the cross street and returns to SR 85
4-1 Median Bus On Shoulder	**1**	Direct Ramps to Evelyn Ave	In line at grade	In line at grade	In line at grade	In line at grade	In Route	Yes	Bus uses the Express Lane and when traffic drops below 35 mph they exit onto the shoulder to bypass the congestion. The station operations are the same as Alt 3-2 Option 1
	2	Direct Ramps to Evelyn Ave	In line at grade	NB off/SB on from McClellan Rd, *SB off/NB on at Stevens Creek*	NB off/SB on at Quito Rd, *SB off/NB on at Saratoga*	SB off/NB from Bascom, *NB off/SB on from Union*	Deviation Route	Yes	Bus uses the Express Lane and when traffic drops below 35 mph they exit onto the shoulder to bypass the congestion. The station operations are the same as Alt 3-2 Option 2

Alternative	Option	New Direct Connection to Evelyn	Stations Locations				Bus Routing	New El Camino Interchange	Bus Pathway
			El Camino Real	Stevens Creek	Saratoga	Bascom			
4-2 Right Side Bus On Shoulder	**1**	No	Ramp Station	Ramp Station	Ramp Station	Ramp Station	In Route	Yes	Bus travels in the right most <u>general purpose lane</u>. When traffic speeds drop below 35 mph the bus moves to the shoulder. The bus uses the ramps to access ramps stations. The bus crosses the cross street and returns to the right general purpose lane unless the speed is less than 35 mph
	2	No	Ramp Station	No Ramp Station	No Ramp Station	SB off/NB from Bascom, *NB off/SB on from Union*	Deviation Route	Yes	Bus travels in the right most <u>general purpose lane</u>. When traffic speeds drop below 35 mph the bus moves to the shoulder. The bus uses the ramps to travel to the transit center. There are no stations on the ramps where the bus goes to a transit center.

3.3 Service Level

All of the transit facility alternatives can operate under either Routing Option 1 or 2. Under either routing option, there can be varying transit service levels. The service levels to be analyzed include all-day, bi-directional weekday service at 15-minute headways.

Chapter 4

Evaluation Criteria and Results

The following is a review of the criteria used to evaluate the SR 85 alternatives.

4.1 Ridership

This section summarizes the data collection effort, methodology, and analysis results of the SR 85 service ridership development. Full analysis is shown in Appendix A.

4.1.1 Data Collection

The following three sources of data were collected:

- US Census LEHD Trips Data: The US Census Longitudinal Employer-Household Dynamics (LEHD) OnTheMap online portal was used to collect the daily work-related trips around station areas.
- American Community Survey: American Community Survey (ACS) 2017 means of transportation to work (ID: B08301) 5-year estimate data were used to calculate the potential transit mode share of trips that could use the SR 85 service once it is built.
- StreetLight Data: The O-D trips during the AM (6-11 am) and PM (2-8 pm) peak periods collected in the previous phase of this project were used to establish the O-D distribution of the potential SR 85 trips in the study area.

4.1.2 Methodology

Two routing options along with stations were evaluated.

- Option 1 - Mountain View Ohlone/Chynoweth with Freeway Stations: buses travel between the Mountain View and Ohlone/Chynoweth terminal stations and stops at freeway stations (BRT does not exit SR 85). The stations along SR 85 are as follows:
    1. Mountain View Light Rail Transit (LRT) Station Bus Stop
    2. El Camino Real
    3. Stevens Creek Blvd
    4. Saratoga Ave
    5. Bascom Ave
    6. Ohlone-Chynoweth LRT Station Bus Stop
- Option 2 - Mountain View Ohlone/Chynoweth with Freeway and Offline Stations: BRT buses travel between the Mountain View and Ohlone/Chynoweth terminal stations and stops at freeway and offline stations. The stations along SR 85 are as follows:

1. Mountain View Light Rail Transit (LRT) Station Bus Stop
2. El Camino Real
3. De Anza College Transit Center
4. West Valley College Transit Center
5. Good Samaritan Hospital
6. Ohlone-Chynoweth LRT Station Bus Stop

The analysis periods are the AM and PM peak periods that correspond to the VTA Regional Travel Demand Model's peak periods. The assumed peak period duration is four hours.

A station catchment area is defined as one third of a mile around each station. About 90 percent of VTA transit trips access transit stops by walking with the balance comprised by bicycling, scooting or being dropped off by automobile. There is no strict rule for walking tolerance, but analysis finds that a quarter mile is about the upper limit for walking to a local transit service. Walking distances are slightly higher for premium transit services, like Caltrain, which offer an appeal greater than local routes. The catchment area also applies to the destination end of the trip, where a transit rider is more likely to be traveling on foot.

For this analysis, catchment areas were defined as a radii around station areas rather than by walking path. This would have the effect of overestimating the number of people and jobs that fall within a reasonable walk, but that is estimated to be offset by those who make longer distance bicycle, scooter and driving trips to access stations.

A buffer was specified in the OnTheMap portal to collect 2017 daily inflow and outflow trips from the LEHD database. It is assumed that the Inflow trips are the "attraction" trips during the AM peak period and "production" trips during the PM peak period. The daily Outflow trips in an area are the "production" trips during the AM peak period and "attraction" trips during the PM peak period.

It was necessary to develop a mode share assumption given there is no existing transit service running the length of the corridor study area, The Santa Clara countywide Census tract data from the ACS Means of Transportation to Work dataset was collected and plotted. The average mode share of 5.1 percent from the top 300 Census was selected to represent the range of potential commuters in the station areas that would use SR 85 BRT service when it is implemented. The attraction and production trips estimated in the Trip Generation phase were multiplied by 5.1 percent to estimate the potential trips that would use the SR 85 BRT service when implemented.

The StreetLight O-D trips during the AM and PM peak periods were collected during the previous phase of this project. An O-D matrix documenting the assigned StreetLight zones and percentages based on origin was developed. Similarly, another O-D matrix documenting the assigned StreetLight zones and percentages based on destination was developed. These matrices were used to derive the SR 85 BRT production and attraction trips between stations.

An O-D Fratar balancing spreadsheet was developed to balance the SR 85 BRT production OD trips. A final set of O-D trips based on production was derived to minimize the relative difference of the OD trips developed to the target total in each row and column. As with the production O-D trips, the SR 85 BRT attraction O-D trips were plugged into the Fratar spreadsheet to derive the final set of O-D trips based on destination.

The O-D trips based on origin and O-D trips based on destination were averaged to derive the final O-D trips. The processes described were conducted for both AM and PM peak periods and for Options 1 and 2.

4.1.3 Results

The OD trips in Options 1 and 2 constitute the baseline ridership range that is used as the basis to further develop SR 85 BRT ridership for the alternatives. The baseline ridership range for the AM and PM peak periods in Options 1 and 2 for all the alternatives are shown in Tables A-7 through A-10 in Appendix A.

The bus OD travel time from the traffic analysis determines the bus travel time between two stations during the AM and PM peak periods and is the input used to derive ridership for the alternatives. The round-trip travel time based on origin (i.e., leaving for work during the AM period and coming home during the PM period) was calculated for each alternative. A base travel time OD pair was calculated based on the highest travel time among the alternatives in each OD pair.

If a travel time OD pair from an alternative is lower than the base travel time OD pair, it is considered more attractive to transit riders and therefore results in higher ridership. An elasticity of -0.6 was used to calculate the percent change in ridership as a result of percent change in travel time. The elasticity formula can be expressed as follows:

$$E = (\Delta Q/Q_0)/(\Delta TT/TT_0)$$

Where E: Elasticity, ΔQ: change in ridership, Q_0: baseline ridership, ΔTT: change in travel time, TT_0: base travel time.

The developed ridership during the AM and PM peak periods in Options 1 and 2 for Alternatives 3-1 through 4-2 is shown in Tables A-11 through A-20 and Tables in Appendix A. The total ridership (sum of ridership for all OD pairs during the AM and PM peak periods) for all alternatives is summarized in Table 4-1

Table 4-1 Ridership Summary

Routing	Time Period	Alternative				
		Transit Lanes			Bus on Shoulder	
		Short Median	Long Median	Right Side	Median	Right Side
		3-1	3-2	3-3	4-1	4-2
Option 1	AM Peak Period	168	296	291	293	262
	PM Peak Period	143	274	270	271	239
	Sum of AM and PM Peak Periods	311	570	561	564	501
Option 2	AM Peak Period	150	276	262	276	252
	PM Peak Period	122	256	244	255	231
	Sum of AM and PM Peak Periods	272	532	506	531	483

Source: Study team calculations

Alternative 3-1 has the lowest level of ridership compared to other alternatives given it does not serve the El Camino Real Station in both Options 1 and 2. Even though the calculated ridership adjustment factors for the OD pairs are the highest in Alternative 3-1, the increase in ridership as a result of travel time savings does not counteract the loss of ridership from lack of service to the El Camino Real Station.

In Option 1, the rank order of sum of total ridership during the AM and PM periods ranked from highest to lowest is Alternative 3-2, Alternative 3-3 and Alternative 4-1 (tied), Alternative 4-2, and Alternative 3-1. In Option 2, the order is Alternative 3-2, Alternative 4-1, Alternative 3-3, Alternative 4-2, and Alternative 3-1.

4.2 Construction Cost

The development of construction costs is based on the report provided in Appendix C (C1 – Cost Summary Matrix, C2 - Part 1: Proposed Engineering Features Revision 3.0, C3 - Part 2: Cross Section and Alignment Plans, C4 – Part 3: Capital Costs) supplemented with additional information from earlier work associated with implementing express lanes on SR 85 and the redesign of the El Camino Real Interchange. Given the uncertainty of the timing for this project all costs are listed as 2020 dollars. Following is a brief summary of conceptual cost estimates for each of the alternatives.

Alternative 1-1 – No Change

This alternative assumes no additional capital costs are included specifically related to implementing express lanes or new transit service in the corridor. A second scenario is included under this alternative that includes the redesign of the El Camino Real Interchange with an associated total project cost of $27 million dollars.

Alternative 2-1 – Express Lanes

This alternative simply converts the existing HOV lanes to Express Lanes. The construction is limited to the installation of the needed equipment and associated signage and pavement marking changes. This amounts to a total project cost of approximately $133 million dollars.

Alternative 2-2 – Short Dual Express Lane

This alternative builds on Alternative 2-1 by adding a second set of express lanes in the median in section two. This alternative aligns with the original Express Lanes conversion EIS that had a total project cost in 2015 dollars of $176 million. When escalated at 2% per year the resulting total project cost in 2020 dollars is $198 million.

Alternative 2-3 – Long Dual Express Lanes

Building on Alternative 2-2, this alternative adds an additional express lane in the median in sections 1 and 2. This alternative requires the reconstruction of the El Camino Real interchange and that cost is included in this alternative. The total project cost for this alternative is almost $270 million.

Alternative 3-1 – Short Median Transit Lane

The cost for this alternative includes the costs for Alternative 2-2 with the addition of station costs at Bascom, Saratoga and Stevens Creek. For Option 1 the stations would be in the median. Costs would include construction of station platforms, an elevator and stairways, associated barriers to protect passengers in the median and additional roadway for connections between the transit lanes and platforms. Amenities would be those typical of a light rail station. An additional allocation is included for work required on the cross street to provide wider sidewalks (may include some bridge widening) and appropriate pedestrian treatments at the nearest adjacent intersections. Option 2 requires the bus to exit the median to the local street. The connection to the local street would be provided by a ramp from the median to the local street. Since this would create a new intersection, the assumption is that it would be signalized and a call to the signal would be made once a bus enters the ramp. For the purpose of this study, the cost for both of the routing options are assumed to be similar. The total project cost for this alternative is almost $250 million.

Alternative 3-2 – Long Median Transit Lanes

The cost for this alternative includes the costs for Alternative 3-2 with the addition of another station at El Camino Real and a connector tunnel from the median to a local road that allows for a speeder connection to the Mountain View Transit Center. This alternative requires the reconstruction of the El Camino Real interchange so that cost is included in this alternative. The total project cost for this alternative is almost $350 million.

Alternative 3-3 – Right Side Transit Lane

This alternative requires widening of the shoulder to accommodate an additional transit lane in sections 1 and 2. This alternative also requires adjusting interchange ramp areas. For Option 1 it is assumed that stations are constructed outside the transit lane, between the ramps with access to the local street by stairs and elevator. Platform amenities would be those typically associated with LRT stations. Like the median alternatives, a cost was also included for widening the sidewalks along the local street as well as pedestrian improvements at the nearest local intersections. The total project cost for Option 1 is $355 million. For Option 2 it is assumed that since the bus was exiting SR 85 there would not be a new station constructed at the interchange and the bus would stop at the nearest local stop if appropriate. The total project cost for Option 2 is $310 million.

Alternative 4-1 – Median Bus on Shoulder

The cost associated with this alternative are like alternative 3-2 but with slightly less construction cost for median construction. The total project cost for both options is $335 million.

Alternative 4-2 – Right Side Bus on Shoulder

The cost associated with this alternative are like alternative 3-3 but with slightly lower construction cost for shoulder construction. The total project cost for Option 1 is $300 million and Option 2 is $255 million.

4.2.1 Summary of Total Project Cost

A summary table of the components and total project cost for each alternative is in Appendix C1.

4.3 Traffic Operations

Traffic analysis was conducted for the SR 85 improvement alternatives to assess and compare traffic operations performance. The performance was measured in terms of vehicle miles of travel and miles of congestion. Other traffic performance measures were also computed for information purposes and include the following: vehicle hours of travel, vehicle hours of delay at a threshold speed of 45 mph, average speed, percent of freeway miles with level of service (LOS) E or F[1] (on general purpose lanes), and percent of congested ramp influence areas.

Santa Clara Valley Transportation Authority (VTA) and City/County Association of Governments (C/CAG) of San Mateo County Regional Travel Demand Model was not available for use in this traffic analysis. The analysis was performed using a combination of field traffic data collection/processing and a spreadsheet-based sketch planning traffic operations modeling. A special case analysis using McTrans Highway Capacity Software Version 7 (HCS7) was conducted on the proposed reconfiguration of the El Camino Real interchange from the existing cloverleaf to a proposed diamond. **Appendix B** provides the full details of the traffic operations methodology.

The traffic analysis was limited to the SR 85 freeway mainline and spanned the length of SR 85 corridor study area, SR 87 in the south to US 101 in the north. The data collection was conducted for SR 85 northbound and southbound directions between 6 am and 8 pm on a weekday, while traffic operations modeling was conducted for the northbound and southbound AM peak period of 6 am to 12 pm and PM peak period of 2 pm to 8 pm on a weekday.

[1] According to the HCM 2016, level of service or LOS on freeway segments is defined by density measured in passenger cars per mile per lane (pcpmpl). The HCM defines six LOS service thresholds. LOS A (free-flow conditions): less than 11 pcpmpl, LOS B (reasonably free-flow conditions): > 11-18 pcpmpl, LOS C (speeds near free flow speed but freedom to maneuver within the traffic stream is noticeably restricted): > 18-26 pcpmpl, LOS D (speeds begin to decline below free flow speed and freedom to maneuver within the traffic stream is seriously limited): > 26-35 pcpmpl, LOS E (flow at or near capacity and little room to maneuver within the traffic stream): > 35-45 pcpmpl, and LOS F (unstable flow and traffic breakdowns): > demand exceeds capacity or density > 45 pcpmpl.

The key performance measures are discussed followed by a summary of the results for the alternatives and the special case analysis. A qualitative discussion of the traffic impacts of the alternatives on local streets is also presented.

4.3.1 Vehicle Miles of Travel

The SR 85 corridor vehicle miles of travel (VMT) varies between the alternatives due to the same factors that affect the volume changes, namely: induced demand due to addition of freeway auxiliary lane-miles or express lane-miles; transit mode shift related auto demand reduction; and HOV use restrictions and tolling related auto sub-mode demand shifts. All build alternatives have a change in VMT due to induced demand. The transit lane alternatives (3-1, 3-2, 3-3) and the bus on shoulder alternatives (4-1 and 4-2) have a change in VMT due to transit mode shift. All build alternatives (2-1, 2-2, 2-3, 3-1, 3-2, 3-3, 4-1 and 4-2) have a change in VMT due to auto sub-mode demand shifts related to HOV use restrictions and tolling. In this analysis, the volume and VMT changes were localized to the segments where the changes in lane-miles and modal or sub-modal use changes occurred.

A one percent increase in lane-miles results in a 0.75 percent increase in VMT. When no lane-miles of general purpose or managed lanes are added it is assumed there will be no change in person throughput. In other words, induced demand due only to speed changes was not estimated. A substantial increase in lane-miles and VMT comes from the development of dual express lanes under Express Lane Alternatives 2-2 and 2-3. Auxiliary lanes added to northbound SR 85 between De Anza Boulevard and Stevens Creek Boulevard interchanges under all build alternatives also contribute to a small increase in VMT.

The higher the ridership estimate under a transit service alternative, the higher is the auto VMT reduction. The analysis found that the ridership per bus estimates are low and even in the peak hour the ridership is less than 10 persons per bus on all SR 85 mainline segments. The transit mode shift has a very small impact on VMT.

Due to the changes in the HOV use restrictions and tolling, the auto sub-modes using the HOV lane would undergo a compositional change. While SOV and HOV3+ shares as percent of HOV lane total are expected to go up by 2.4 percent and 2.3 percent, respectively, the HOV2 share as percent of HOV lane total is expected to drop by 4.7 percent. The added SOV and HOV3+ vehicles would come from the GP lanes, while the removed HOV2 vehicles (and also possibly some CAVs) would travel on the GP lanes. A net decrease in VMT due to an overall increase in average vehicle occupancy on SR 85 corridor is expected and is associated with the change in HOV use restrictions and tolling.

Under the special case analysis for El Camino Real conversion from a cloverleaf to diamond interchange, the change in VMT is attributed to changes in throughput at ramp influence areas associated with the re-configured freeway-to-ramp and ramp-to-freeway flows as well as ramp capacity.

4.3.2 Miles of Congestion

A sketch planning traffic operations model was used to estimate 15-minute interval speeds by freeway mainline segment for the alternatives analysis and HCS7 was used for the special case analysis for the proposed El Camino Real improvement. Using the speed threshold of 45 mph on each SR 85 mainline segment, the peak 15-minute interval speeds in the AM and PM peak hours (by direction) were analyzed to evaluate congestion by freeway mainline segment. The length of all congested freeway segments is reported as miles of congestion. Queuing was not studied in this analysis due to model limitations and miles of congestion cannot be interpreted as queue lengths.

4.3.3 Other Performance Measures

Similar to the miles of congestion, a sketch planning traffic operations model was used to estimate other performance measures in the AM and PM peak hour for the alternatives analysis. HCS7 was used for the special case analysis of the proposed El Camino Real improvement. Average speed is a direct output of the models. Vehicle hours of travel were estimated using 15-minute interval volumes and average travel time (segment length divided by average speed) by freeway mainline segment. Vehicle hours of delay was estimated using 15-minute interval volumes and average travel time in excess of travel time at a threshold speed of 45 mph. Delay is zero when the travel time is below the travel time at the threshold speed, and increases as speed drops below 45 mph. Freeway density was computed on GP lanes as GP lane volume served in passenger cars per hour divided by GP lane speed and number of GP lanes. LOS was identified for freeway segments based on the estimated density and LOS criteria in the 2016 HCM as shown in **Figure 4-1**. Based on the network coding, the ramp influence areas (merge, diverge or weaving type mainline segments) were identified. The segments with average speed below the threshold speed of 45 mph were counted.

LOS	Density (pc/mi/ln)
A	≤11
B	>11–18
C	>18–26
D	>26–35
E	>35–45
F	Demand exceeds capacity OR density > 45

Figure 4-1: 2016 HCM's Level of Service (LOS) Criteria for Basic Freeway Segment

Source: Exhibit 12-15 of 2016 HCM

4.3.4 Local Streets

The impacts of induced traffic due to addition of lane-miles or the benefits of mode shifts on local streets is expected to be minimal compared to the impacts/benefits on the SR 85 mainline. No data was collected directly on the local streets for this analysis. However, the on-ramp and off-ramp volumes were estimated. By inspecting the speeds at the mainline merge and diverge segments under the alternatives, the impacts on local streets were indirectly evaluated. Low speeds in merge area could result in queue spillbacks from on-ramps to local streets, while low speeds in diverge area could result in delays to the traffic exiting SR 85 via off-ramps. The total number of merge, diverge and weaving areas with speeds below 45 mph by alternative in the AM and PM peak 15-minute interval by direction of movement were estimated. There are 28 ramp influence areas in each direction.

Local street traffic can also have impacts on transit operations. The off-corridor routing option includes three offline stations located at De Anza College, West Valley College, and Good Samaritan Hospital. The access to these stations would incur travel time delays due to traffic congestion on local streets. The transit operations analysis in **Appendix E** includes estimates of access times to the offline stations via local streets.

4.3.5 Results of Traffic Related Alternative Analysis

Table 4-1 is showing the year 2020 traffic performance measures estimated on SR 85 corridor between SR 87 and I-280 in the AM and PM peak hours by direction of movement for the 14 alternatives defined for the SR 85 Transit Guideway Project. Note that the results are based on the travel conditions prior to the advent of California and SF Bay Area coronavirus/COVID-19 stay home orders of 2020.

Under the No Change Alternative 1-1, the northbound VMT in the AM peak hour is 1.2 times that of PM peak hour. The southbound VMT in PM peak hour is 1.5 times that of AM peak hour. The SR 85 southbound PM peak hour VMT is 5 percent higher than the SR 85 northbound AM peak hour VMT. In terms of miles of congestion, SR 85 northbound is congested over 7.2 miles of the 18.0 miles in the AM peak hour. SR 85 southbound is congested over 7.7 miles of the 18.0 miles in the PM peak hour, which is about 7 percent higher than the SR 85 northbound AM peak hour.

Comparing the alternatives, VMT is estimated to increase as high as 23 percent in both the northbound and southbound directions under Alternative 2-3, long dual express lane compared to the no Alternative 1-1 No Change. Under Alternative 2-2 short duel express lane, VMT is slightly lower but reaches 17 percent increase over the no change alternative. Alternative 2-1, a conversion of HOV to express lane would result in about a 1 percent increase in VMT over the no change alternative. Transit alternatives (3-1, 3-2, 3-3 Transit Lanes, 4-1 and 4-2 Bus on Shoulder) and their routing options would be marginally lower than Alternative 2-1 due to a mode shift from transit to auto.

Comparing the alternatives, the miles of congestion would decrease by 94 percent in the northbound AM peak direction and by 88 percent in the southbound PM peak direction under the long dual express lane Alternative 2-3 compared to the no change alternative. Under the short dual express lane Alternative 2-2, the miles of congestion would decrease by 81 percent in the northbound AM peak direction and by 60 percent in the southbound PM peak direction. HOV to express lane conversion, Alternative 2-2 would reduce the miles of congestion by 40 percent in the northbound AM peak direction and by 33 percent in the southbound PM peak direction. Transit alternatives (3-1, 3-2, 3-3 Transit Lanes and 4-1 and 4-2 Bus on Shoulder) and their routing options would be similar to Alternative 2-2 in terms of miles of congestion reduced in the northbound AM peak direction, and slightly better in the southbound PM peak direction, where the reduction would be 44 percent.

The number of ramp influence areas congested is indicative of local street impacts. Under the no change alternative, almost 76 percent of the ramp influence areas are congested in the peak hours and directions. The percentage can be reduced to 52 percent or more by implementing any of the build alternatives. The most benefits come from Alternative 2-3, followed by Alternative 2-2. Other performance results are also shown in **Table 4-2** for information purposes.

Table 4-1: 2020 Traffic Performance Measures by SR 85 Transit Guideway Alternative

Alt. #	Alternative Description	Route Option	Alternative Short Description	VMT (veh-mi) AM Peak Hour	VMT (veh-mi) PM Peak Hour	VHT (veh-hrs) AM Peak Hour	VHT (veh-hrs) PM Peak Hour	VHD (veh-hours) AM Peak Hour	VHD (veh-hours) PM Peak Hour	Av Spd (mph) AM Peak Hour	Av Spd (mph) PM Peak Hour	% Miles of Freeway LOS E or F AM Peak Hour	% Miles of Freeway LOS E or F PM Peak Hour	Miles of Congestion* AM Peak Hour	Miles of Congestion* PM Peak Hour	Number of Ramp Influence Areas Congested* AM Peak Hour	Number of Ramp Influence Areas Congested* PM Peak Hour
SR 85 Northbound Mainline Segments (N/O of SR 87 to S/O of US 101)																	
1-1	No Changes	N.A.	1-1	79,825	66,782	2,410	1,115	1,567	107	33	60	34%	5%	7.2	0.9	22	3
2-1	HOV to Express Lane Conversion	N.A.	2-1	80,703	67,546	1,899	1,113	840	101	42	61	19%	5%	4.3	0.9	14	3
2-2	Short Dual Express Lane	N.A.	2-2	91,439	78,329	1,801	1,307	377	124	51	60	8%	5%	1.4	0.9	5	3
2-3	Long Dual Express Lane	N.A.	2-3	96,926	81,984	1,739	1,364	124	124	56	60	2%	5%	0.4	0.9	2	3
3-1	Short Median Transit Lane	In-Corr.	3-1 - RteOpt 1	80,449	67,357	1,871	1,106	818	98	43	61	19%	5%	4.3	0.9	14	3
		Off-Corr.	3-1 - RteOpt 2	80,453	67,369	1,870	1,108	817	99	43	61	19%	5%	4.3	0.9	14	3
3-2	Long Median Transit Lane	In-Corr.	3-2 - RteOpt 1	80,431	67,239	1,869	1,103	816	98	43	61	19%	5%	4.3	0.9	14	3
		Off-Corr.	3-2 - RteOpt 2	80,448	67,248	1,870	1,104	817	98	43	61	19%	5%	4.3	0.9	14	3
3-3	Right Side Median Transit Lane	In-Corr.	3-3 - RteOpt 1	80,438	67,239	1,869	1,103	816	98	43	61	19%	5%	4.3	0.9	14	3
		Off-Corr.	3-3 - RteOpt 2	80,453	67,257	1,870	1,105	817	98	43	61	19%	5%	4.3	0.9	14	3
4-1	Median Bus on Shoulder	In-Corr.	4-1 - RteOpt 1	80,434	67,263	1,869	1,104	816	98	43	61	19%	5%	4.3	0.9	14	3
		Off-Corr.	4-1 - RteOpt 2	80,448	67,248	1,870	1,104	817	98	43	61	19%	5%	4.3	0.9	14	3
4-2	Right Side Bus on Shoulder	In-Corr.	4-2 - RteOpt 1	80,466	67,295	1,873	1,105	819	98	43	61	19%	5%	4.3	0.9	14	3
		Off-Corr.	4-2 - RteOpt 2	80,469	67,257	1,872	1,105	818	98	43	61	19%	5%	4.3	0.9	14	3
SR 85 Southbound Mainline Segments (S/O of US 101 to N/O of SR 87)																	
1-1	No Changes	N.A.	1-1	55,406	83,444	884	3,181	27	2,176	63	26	0%	38%	0.3	7.7	1	21
2-1	HOV to Express Lane Conversion	N.A.	2-1	55,109	82,905	875	2,347	25	1,331	63	35	0%	30%	0.3	5.2	1	15
2-2	Short Dual Express Lane	N.A.	2-2	64,338	96,690	1,003	2,115	0	703	64	46	0%	18%	0.0	3.1	0	8
2-3	Long Dual Express Lane	N.A.	2-3	67,298	102,418	1,039	2,114	0	464	65	48	0%	5%	0.0	0.9	0	3
3-1	Short Median Transit Lane	In-Corr.	3-1 - RteOpt 1	54,985	82,781	872	2,329	25	1,279	63	36	0%	30%	0.3	4.3	1	15
		Off-Corr.	3-1 - RteOpt 2	54,984	82,750	872	2,323	25	1,274	63	36	0%	30%	0.3	4.3	1	15
3-2	Long Median Transit Lane	In-Corr.	3-2 - RteOpt 1	54,919	82,758	869	2,323	24	1,261	63	36	0%	29%	0.3	4.3	1	15
		Off-Corr.	3-2 - RteOpt 2	54,894	82,772	869	2,328	24	1,277	63	36	0%	29%	0.3	4.3	1	15
3-3	Right Side Median Transit Lane	In-Corr.	3-3 - RteOpt 1	54,919	82,758	869	2,323	24	1,261	63	36	0%	29%	0.3	4.3	1	15
		Off-Corr.	3-3 - RteOpt 2	54,909	82,772	869	2,328	24	1,277	63	36	0%	29%	0.3	4.3	1	15
4-1	Median Bus on Shoulder	In-Corr.	4-1 - RteOpt 1	54,919	82,758	869	2,323	24	1,261	63	36	0%	29%	0.3	4.3	1	15
		Off-Corr.	4-1 - RteOpt 2	54,894	82,772	869	2,328	24	1,277	63	36	0%	29%	0.3	4.3	1	15
4-2	Right Side Bus on Shoulder	In-Corr.	4-2 - RteOpt 1	54,919	82,771	869	2,328	24	1,277	63	36	0%	29%	0.3	4.3	1	15
		Off-Corr.	4-2 - RteOpt 2	54,918	82,772	870	2,328	24	1,277	63	36	0%	29%	0.3	4.3	1	15

*Based on GP Lanes - Peak Hour Peak 15-Minute Interval

AM Peak Hour: 7:45 am to 8:45 am; PM Peak Hour: 5 pm to 6 pm.

NOTE: Delay or congestion is assumed when speed on a segment falls below 45 mph (Caltrans threshold)

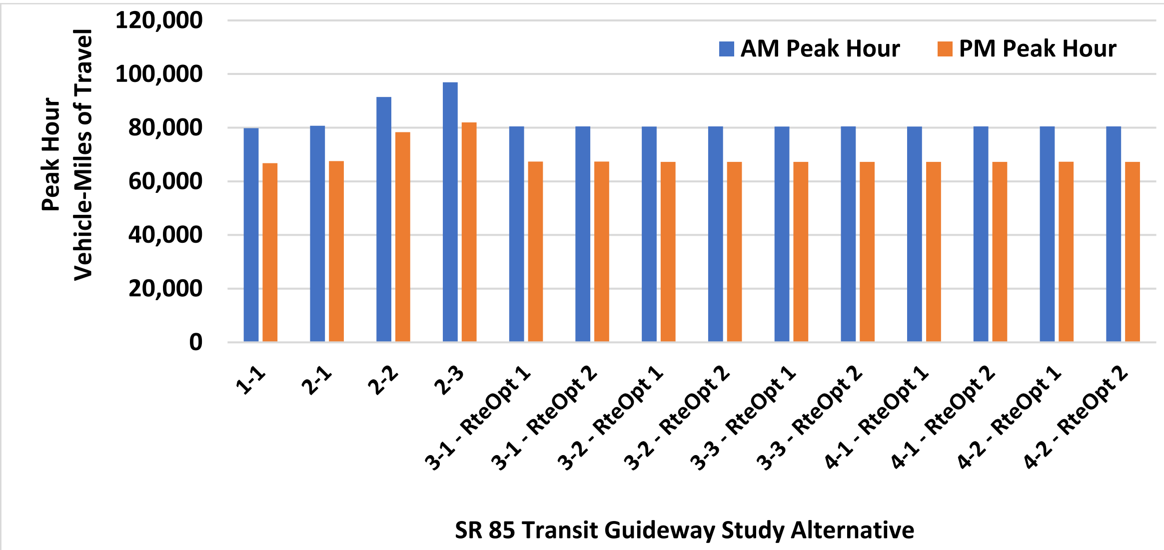
Source: Google Earth for SR 85 / El Camino Real (SR 82) Interchange No Build conditions; Traffic Counts by CDM Smith's Sub-Consultant – Quality Counts, February 2020; Caltrans Traffic Census Counts; Caltrans PeMS; SR 85 Transit Guideway Study Phase 1 Report; CDM Smith Analysis and Assumptions for SR 85 / El Camino Real (SR 82) Interchange Build conditions.

Note: Seg. = Segment, Acc. = Acceleration, Dec. = Deceleration, AM Peak Hour = 7:45 am to 8:45 am, PM Peak Hour = 5 pm to 6 pm.

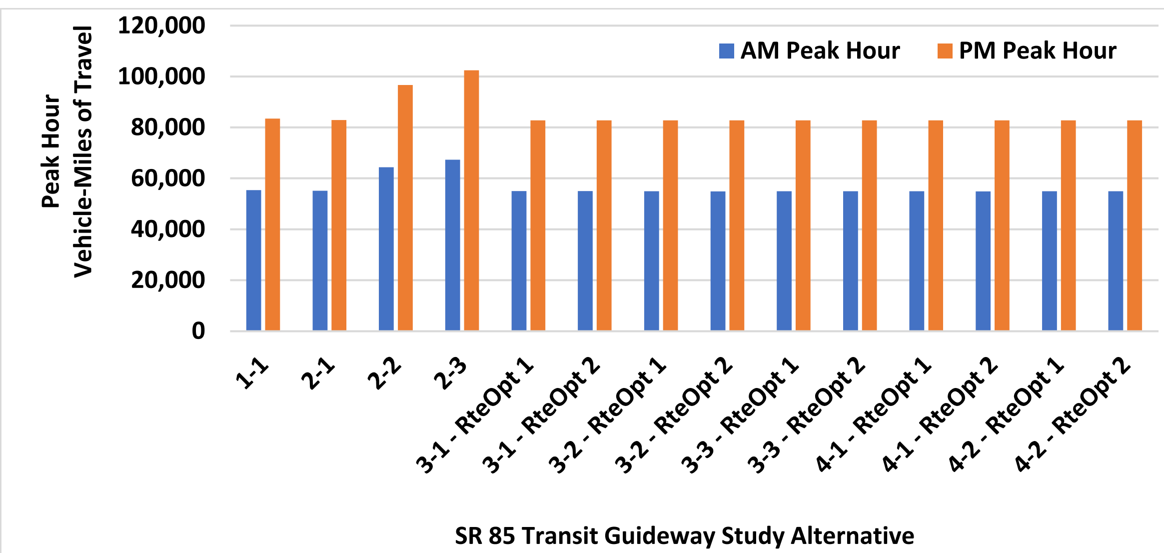
Figure 4-2, Figure 4-3, and **Figure 4-4** are graphical comparisons of the alternatives in terms of 2020 VMT, VHT and VHD by direction. Despite the increased VMT under the dual express lane alternatives (2-2 and 2-3), there is a 65 to 90 percent reduction in VHD due to improvements in travel time compared to the no change alternative. All other build alternatives result in small increases in VMT and around a 40 percent reduction in VHD over the no change alternative. VHT is also reduced under all build alternatives.

Figure 4-2: SR 85 Corridor (SR 87 to I-280) 2020 Vehicle-Miles of Travel (VMT) by Alternative

Northbound Direction



Southbound Direction

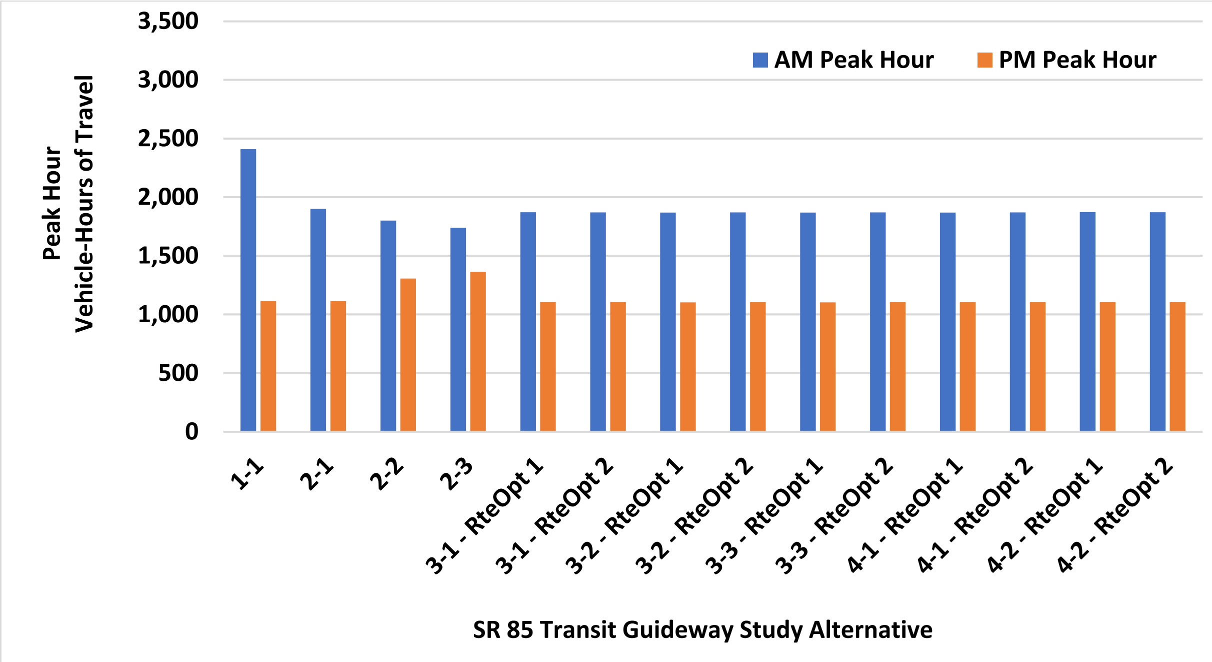


Source: Traffic Counts by CDM Smith's Sub-Consultant – Quality Counts, February 2020; Caltrans Traffic Census Counts; Caltrans PeMS; SR 85 Transit Guideway Study Phase 1 Report; CDM Smith's SR 85 Traffic Operations Model.

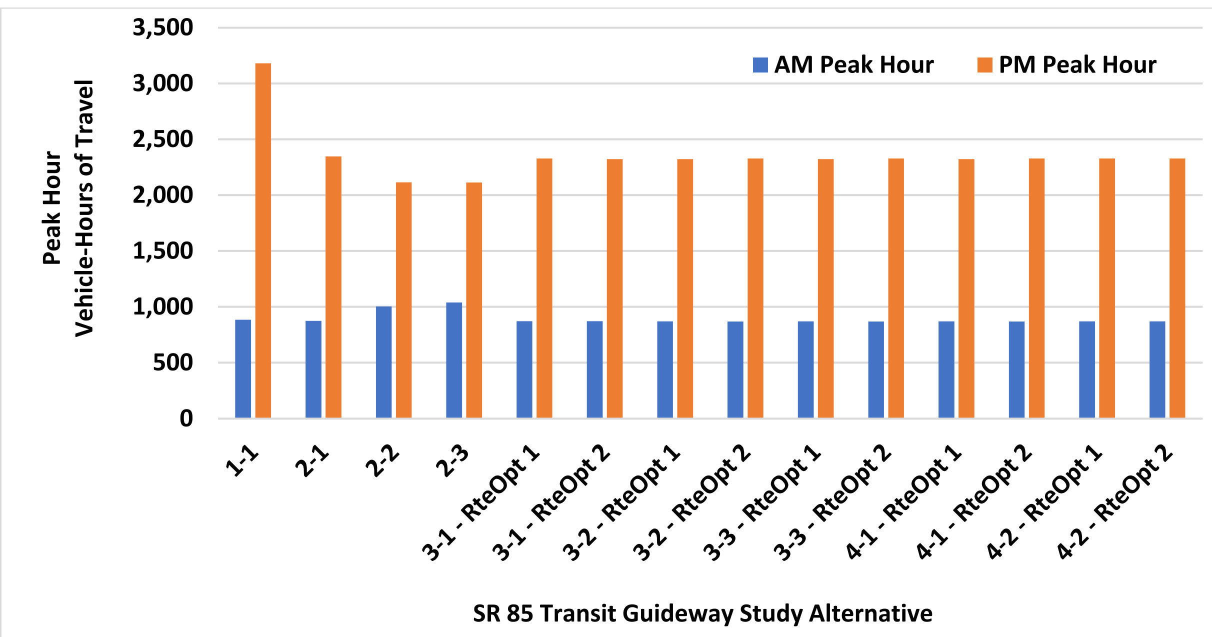
Note: Seg. = Segment, Acc. = Acceleration, Dec. = Deceleration, AM Peak Hour = 7:45 am to 8:45 am, PM Peak Hour = 5 pm to 6 pm.

Figure 4-3: SR 85 Corridor (SR 87 to I-280) 2020 Vehicle-Hours of Travel (VHT) by Alternative

Northbound Direction



Southbound Direction

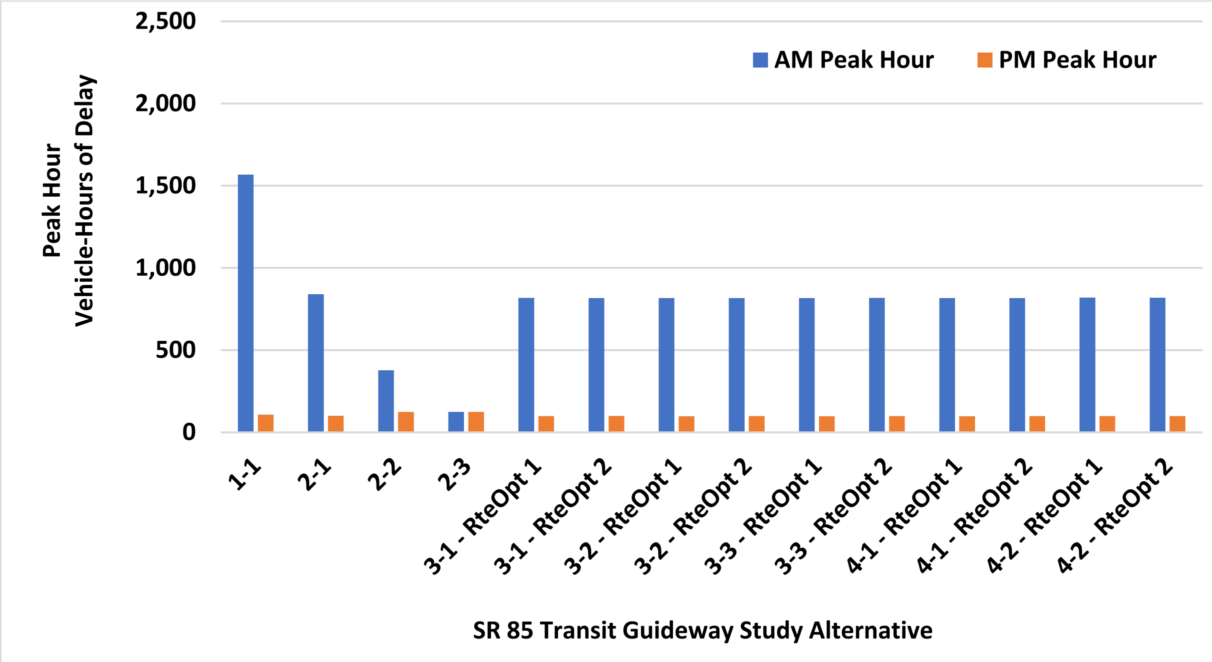


Source: Traffic Counts by CDM Smith's Sub-Consultant – Quality Counts, February 2020; Caltrans Traffic Census Counts; Caltrans PeMS; SR 85 Transit Guideway Study Phase 1 Report; CDM Smith's SR 85 Traffic Operations Model.

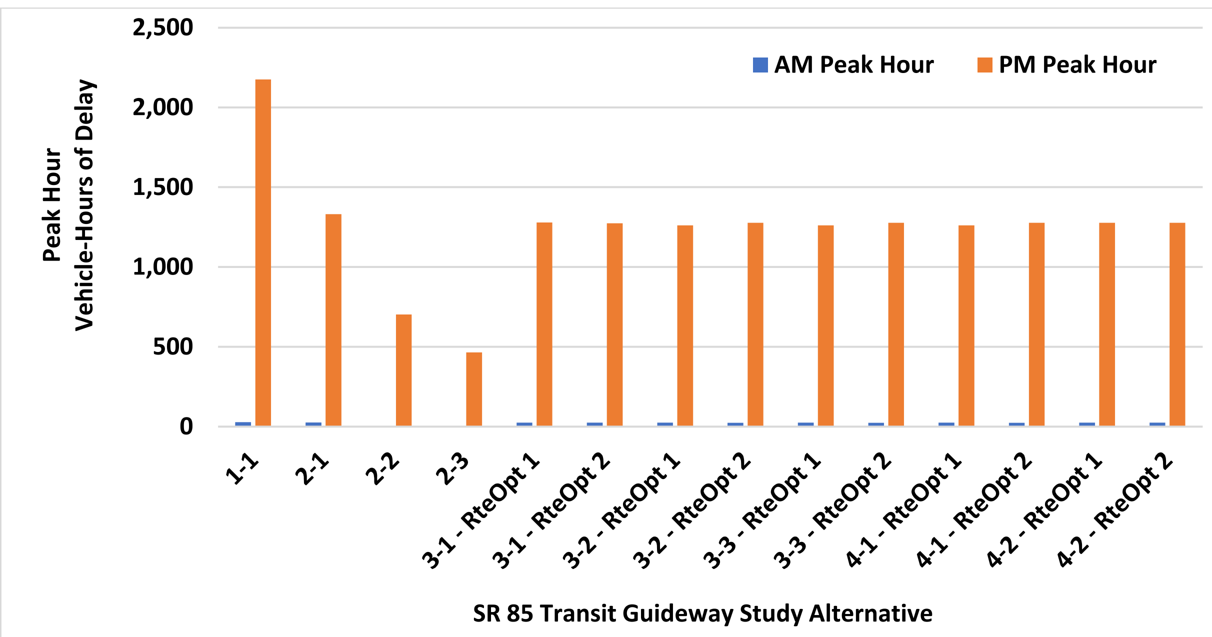
Note: Seg. = Segment, Acc. = Acceleration, Dec. = Deceleration, AM Peak Hour = 7:45 am to 8:45 am, PM Peak Hour = 5 pm to 6 pm.

Figure 4-4: SR 85 Corridor (SR 87 to I-280) 2020 Vehicle-Hours of Delay (VHD) by Alternative

Northbound Direction



Southbound Direction



Source: Traffic Counts by CDM Smith's Sub-Consultant – Quality Counts, February 2020; Caltrans Traffic Census Counts; Caltrans PeMS; SR 85 Transit Guideway Study Phase 1 Report; CDM Smith's SR 85 Traffic Operations Model.

Note: Seg. = Segment, Acc. = Acceleration, Dec. = Deceleration, AM Peak Hour = 7:45 am to 8:45 am, PM Peak Hour = 5 pm to 6 pm.

4.3.6 Results of Traffic Related Special Case Analysis

Table 4-2 shows the year 2020 traffic performance measures estimated in the AM and PM peak hours by direction of movement for scenarios with and without the El Camino Real improvement and with background traffic conditions based on the no change alternative. Note that the results are based on the travel conditions prior to the advent of California and SF Bay Area coronavirus / COVID-19 stay home orders of 2020.

Under existing traffic conditions, congestion and delays are seen on SR 85 segments in the northbound direction only in the AM peak hour. Converting the El Camino Real interchange from a cloverleaf to a diamond would result in the elimination of weaving delays within the El Camino Real interchange area, however it would also result in consolidating the off- and on-ramp volumes at this interchange to fewer ramps. The diverge area delay at the SR 85 northbound off-ramp for the diamond interchange can be mitigated by an increase in deceleration lane length. In this analysis an increase was assumed from 150 feet to 750 feet. Similarly, the merge area delay at SR 85 southbound on-ramp for the diamond interchange can be controlled by an increase in acceleration lane length. In this analysis an increase was assumed from 420 feet to 750 feet. Both these ramps are located south of the El Camino Real centerline.

There are limited opportunities to control the ramp delay added due to the traffic consolidation effect of the interchange conversion on the ramps north of the El Camino Real centerline. In the northbound direction, where traffic congestion is an issue, there are additional ramp traffic conflicts with large SR 85 northbound off-ramp traffic to SR 237 eastbound (over 1,500 vehicles in AM peak hour). The weaving area available for traffic entering via the SR 85 northbound on-ramp from El Camino Real and traffic exiting via the SR 85 northbound off-ramp to SR 237 eastbound is 460 feet. The VHD in SR 85 northbound directions increase by 54 percent, while the throughput and speed decrease by 8 percent and 19 percent, respectively.

Based on the geometric setting, a possible solution to reducing these traffic impacts would be to retain the SR 85 northbound loop on-ramp from El Camino Real while removing the SR 85 northbound loop off-ramp to El Camino Real. This will reduce the traffic consolidation effect and also eliminate weaving. This solution would result in a one leaf partial cloverleaf interchange instead of a diamond only interchange. Further analysis that is beyond the scope of this study would be needed to confirm the benefits.

Table 4-2: 2020 Traffic Performance Measures for El Camino Real Improvement under SR 85 Transit Guideway No Change Alternative (1-1)

		VMT (veh-mi)		VHT (veh-hrs)		VHD (veh-hours)		Av Spd (mph)		% Miles of Freeway LOS E or F		Miles of Congestion*	
Alt. #	Alternative Description	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
SR 85 Northbound Segments near SR 85 / El Camino Real Interchange													
1-1	Without El Camino Real Interchange Improvement	9,201	6,536	285	105	102	0	32.3	62.2	85%	0%	0.7	0.0
1-1	With El Camino Real Interchange Improvement	8,502	5,929	325	96	157	0	26.2	62.0	85%	0%	0.9	0.0
Change		-700	-608	40	-9	55	0	-6.1	-0.2	0%	0%	0.2	0.0
SR 85 Southbound Segments near SR 85 / El Camino Real Interchange													
1-1	Without El Camino Real Interchange Improvement	6,489	9,879	104	164	0	0	62.1	60.3	0%	0%	0.0	0.0
1-1	With El Camino Real Interchange Improvement	5,487	9,467	88	158	0	0	62.0	60.0	0%	0%	0.0	0.0
Change		-1,003	-412	-16	-6	0	0	-0.1	-0.3	0%	0%	0.0	0.0

*Based on GP Lanes - Peak Hour Peak 15-Minute Interval Estimates

AM Peak Hour: 7:45 am to 8:45 am; PM Peak Hour: 5 pm to 6 pm.

NOTE: Delay or congestion is assumed when speed on a segment falls below 45 mph (Caltrans threshold)

Source: Google Earth for SR 85 / El Camino Real (SR 82) Interchange No Build conditions; Traffic Counts by CDM Smith's Sub-Consultant – Quality Counts, February 2020; Caltrans Traffic Census Counts; Caltrans PeMS; SR 85 Transit Guideway Study Phase 1 Report; HCS7 Software; CDM Smith Analysis and Assumptions for SR 85 / El Camino Real (SR 82) Interchange Build conditions.

Note: Seg. = Segment, Acc. = Acceleration, Dec. = Deceleration, AM Peak Hour = 7:45 am to 8:45 am, PM Peak Hour = 5 pm to 6 pm.

4.4 Transit Operations

4.4.1 Reliability

This measure focuses on the ability of buses to maintain their schedule as they progress through the corridor. Implementing express lanes without adding capacity will most likely not improve reliability. As buses move to/from ramps, they will still encounter heavy traffic in the express lanes and the same operational issues in the general-purpose lanes. As additional express or transit only lanes are added, the reliability should improve as the buses should be able to avoid some or all the congested areas. As transit lanes are added with in-line stations, the reliability should improve as bus will no longer need to exit/enter the transit lanes to access stations.

4.4.2 Travel Time

The detailed development of transit travel times is shown in Appendix E1. Transit travel is minimized in Option 1 with the use of freeway stations as shown in **Table 4-3**.

Deviating to off-line stations and stops in Option 2 increases the one-way route length by approximately 3.7 miles, adding 12.5 minutes to the travel time. The one-way running time or travel time from Mountain View to Ohlone/Chynoweth, is 40.5 minutes with freeway stations. The same route with off-line stations, routing Option 2, results in a 53-minute travel time.

Table 4-3: Service Characteristics

Terminals	Option 1	Option 2
	Mountain View	
	Ohlone/Chynoweth	
Station Type	Freeway	Off-line
Number of Peak Buses Required	7	9
Annual Service Miles (millions)	0.86	1.03
Annual Service Hours	36,652	47,965
Annual Operating Costs (millions)	$6.53	$8.59

Notes:

1. Service is provided at 15-minute headways from 5 am to 10 pm on weekdays, 6 am to 7 pm on Saturdays, and 7 AM to 7 PM on Sundays.
2. Peak buses do not include spares.

4.4.3 Operating Cost

The detailed development of operating costs is detailed in Appendix E2. Increased route length and travel time result in an increased operating cost (refer to **Table 4-3)**. Option 1 with freeway stations requires 7 peak buses and 36,652 annual service hours. Option 2 with off-line stations and stops requires 9 peak buses and 47,965 service hours. The annual operating cost of Option 1 is $6.53 million compared to Option 2 at $8.59 million. Option 2 with increased service hours and miles will cost approximately $2.06 million annually to operate. This increased annual operating cost should be compared to the one-time capital cost and annual maintenance cost of constructing freeway stations.

4.4.4 Incremental Cost per Incremental Rider

Incremental cost per incremental rider is a measure used to evaluate the effectiveness of proposed transit service. The calculation is outlined by the Federal Transit Administration (FTA) as part of its project evaluation process. For this project, a 20-year horizon and a 7percent discount rate was used and it was assumed that all riders would be new riders. This measure ranges from $262 for Alternative 4-2, Option 2 Right Side Bus on Shoulder to $459 for Alternative 3-1 Option 2 Short Median Transit Lane.

4.4.5 Employer Shuttles

The number of private employer shuttle buses observed at multiple points within the study area were obtained from Chapter 3 of the prior SR 85 Study Phase 1 Report and are shown in **Table** 4-4.

Table 4-4: Number of Private Shuttles Observed

ID	Location of Observation	Northbound		Southbound	
		AM	PM	AM	PM
1	Middlefield Rd	97	108	73	88
2	El Camino Real	111	130	105	150
3	McClellan Rd	70	69	60	81
4	Quito Rd	69	63	57	88
5	Leigh Ave	49	31	22	38

Source: SR 85 Phase 1 Report

It is assumed that current employer shuttle buses travel through the corridor in the inside HOV/managed lane. Under the proposed alternatives, shuttle buses would travel in the same lanes as the proposed SR 85 BRT buses (under Option 1, no off-freeway stations), but would not stop at freeway stations to drop off and pick up passengers. The operations of shuttle buses under existing and proposed scenarios with transit improvements (3-1, 3-2 and 3-3 transit lanes and 4-1 and 4-2 bus on shoulder) are summarized in **Table 4-5**.

Table 4-5: Configuration of Operations

<table>
<tr><th rowspan="3">Location</th><th rowspan="3">Existing</th><th colspan="3">Transit Lanes</th><th colspan="2">Bus on Shoulder</th></tr>
<tr><th>Alt 3-1</th><th>Alt 3-2</th><th>Alt 3-3</th><th>Alt 4-1</th><th>Alt 4-2</th></tr>
<tr><th>Short</th><th>Long</th><th>Right Side</th><th>Median</th><th>Right Side</th></tr>
<tr><td>SR 85 between Moffett Blvd and I-280</td><td rowspan="2">Managed Lane</td><td>Managed Lane</td><td rowspan="2">Transit Lane</td><td rowspan="2">Transit Lane</td><td rowspan="2">Left Side BOS* (speeds same as Managed Lane)</td><td rowspan="2">Right Side BOS*</td></tr>
<tr><td>SR 85 between I-280 and Almaden Expy</td><td>Transit Lane</td></tr>
</table>

*BOS: Bus on Shoulder

Source: Study team analysis

4.5 Right of Way

One of the guiding principles in the development of the alternatives was to develop them with the goal of not taking any right of way. This is achieved for each of the alternatives with the exception of the planned ROW for the reconfiguration of the El Camino Real interchange. In many alternatives, accommodating an extra lane within the existing right of way means that adhering to Caltrans design standards—mostly for shoulder widths—is not possible. To pursue those designs, VTA will need to seek design exceptions from Caltrans. The designs exceptions for these alternatives are based on exceptions that Caltrans has granted to other freeway projects.

4.6 Environmental

An Environmental Impact Statement (EIS) for the previous SR 85 project was completed with a finding of no significant impact April 2015. The project that received environmental clearance is Alternative 2-2 from this study, short dual express lane. The existing HOV lane would be converted to an express lane and a second express lane would be added in Section 2. A preliminary review of environmental impacts can be completed using the findings of the previously approved EIS. All proposed alternatives in this study stay within the existing SR 85 right of way.

The previous EIS reviewed impacts in many categories. They include land use, growth, farmlands/timberlands, community impacts, environmental justice, utility/emergency services, traffic and transportation/pedestrian and bicycle facilities, visual/aesthetics, hydrology and floodplain, water quality and stormwater runoff, geology/soils/seismicity/topography, paleontology, hazardous waste/material, air quality, noise, natural communities, wetlands and other waters, plant species, animal species, threatened and endangered species, invasive species, and cumulative impacts. A review of these impact categories can be found in Appendix D. Previous community concerns included land use, growth, noise and traffic and transportation related impacts. This study includes a detailed analysis of traffic and transportation issues for each alternative, so it is not necessary to go into detail in the context of this preliminary environmental review.

4.6.1 Growth

The environmental documentation done previously indicates that the alternative evaluated does not have any impact on growth. It is stated that the growth projected in the corridor will occur with or without project construction. None of the build alternatives would involve providing new access to undeveloped areas. The build alternatives would locate stations within the existing SR 85 right of way or use existing transit stations or stops. These new stations and use of the exiting off corridor stops would not alter land use patterns or intensity.

4.6.2 Land Use

It was concluded that the previous project if constructed would not change or conflict with the land use patterns in the corridor and that projected development in the corridor would occur with or without construction of the project. Given that the project connects existing and established transit centers, and all new stations would be located within SR 85 right of way and any off corridor stops or stations would be existing facilities located in already developed areas, any of the build alternatives is not anticipated to contribute to land use changes.

The environmental documentation done previously indicates that the alternative evaluated does not have any impact on growth. It is stated that the growth projected in the corridor will occur with or without project construction. None of the build alternatives would involve providing new access to undeveloped areas. The build alternatives would locate stations within the existing SR 85 right of way or use existing transit stations or stops. These new stations and use of the exiting off corridor stops would not alter land use patterns or intensity.

4.6.3 Noise

Traffic noise levels would vary by alternative. All alternatives will increase the volume of buses along SR 85 and thus increase traffic related noise, but not perhaps a perceptible increase. The alternative evaluated in the previous environmental work was determined to have no effect on existing noise levels, or no more than a 3-decible increase. Three decibels or less is not a perceptible increase. Alternatives such as Alternative 3-3 that involves a right-side transit lane implemented by reducing the right-side shoulder as well as Alternative 3-3, right-side bus on shoulder have potential to increase traffic noise levels, but most likely not a perceptible increase in noise given the limited increase in bus traffic. Some segments of the corridor have existing noise barriers. These may need to be relocated in some cases.

Chapter 5

Alternatives Analysis

The alternatives can be evaluated on the criteria described in Chapter 4. A summary matrix of the evaluation criteria by alternative and option can be found in Appendix F.

5.1 Ridership

Ridership is evaluated in terms of new passengers per day. Under Alternative 1-1, existing or no change, it is assumed no new ridership will be generated on the existing services that operate in parts of the corridor. Under the express lane Alternatives 2-1, 2-2, and 2-3, it is assumed there will be some minimal increase in ridership on existing routes and services attributed to improved travel times associated with new express lanes and conversion of the HOV lane to an express lane. Under the no change Alternative and the Express Lane Alternatives, no new transit routing will be provided.

Under the Transit Lanes and Bus on Shoulder Alternatives, a new transit service is assumed with freeway stations (Option 1) or off-line existing stops and stations (Option 2). Option 2 under all Alternatives increases the travel time making the service less attractive to new riders.

Alternative 3-1, produces the lowest number of new riders per day at 311 under Option 1 and 272 under Option 2. Alternative 3-1 is the only alternative that does not include an El Camino Real Station. This eliminates ridership with an El Camino Real area origin or destination. Alternative 3-1 also has a shorter length of transit lane, resulting in less travel time improvement as compared to the alternatives with improvements in both sections 1 and 2. In general, the Transit Lanes Alternatives provide marginally higher ridership than the Bus on Shoulder Alternatives. This is a result of slightly improved travel times on transit lanes and a restricted maximum transit travel speed on the shoulder. Alternative 3-2, Option 1 results in the most new riders per day at 570. Option 2 of Alternative 3-2 result in 532 new riders per day. These results are similar to Alternative 4-1 Bus on Shoulder with 561 new riders under Option 1 and 531 under Option 2.

5.2 Total Project Cost

There is considerable variation in the total project cost. There is no project cost associated with the no build alternative under Option 1. Under Option 2, No Build, it is assumed the El Camino Real intersection will be rebuilt at a cost of $27 million. Converting existing HOV lanes to Express lanes, Alternative 2-1, is the least costly alternative and requires only minimal improvements. This alternative has a cost of $135 million and is the least costly of any of the build alternatives. Adding new express lane, transit lanes or bus on shoulder lanes are more costly alternatives. These all require adding, widening or improving pavement to construct new travel lanes. All the Express Lane, Transit Lane and Bus on Shoulder Alternatives include the HOV to express lane conversion in Alternative 2-1. The cost for the rest of the alternatives varies by how much new lane area is constructed in the median or shoulder area.

Another key component of cost is right of way acquisition and reconstruction of the El Camino Real interchange. Reconstruction of the interchange is assumed in No Change Option 2, Alternative 2-3 Express Lanes, Alternatives 3-2 and 3-3 Transit Lanes and Alternatives 4-1 and 4-2 Bus on Shoulder. Other alternatives with a center median transit lane or bus on shoulder, 3-1, 3-2, and 4-1, would require additional ramp construction, increasing the total project cost. Taking all required construction into consideration, Alternative 3-3 Option 1, and Alternative 4-1 Options 1 and 2 are the costliest of the build alternatives. Alternative 2-2, Short Dual Express Lane is the least costly of the build alternatives in terms of total construction costs.

5.3 Transit Operations

There are several factors to consider under transit operations. One of the primary considerations from an agency perspective is operating cost. Operating cost is influenced by the level of transit service as well as the vehicle miles and hours of service provided. Option 2 with offline stops and stations under the Transit Lane and the Bus on Shoulder Alternatives is more costly to provide in terms of annual operating cost. This is due to the increased miles and hours of service associated with deviating off SR 85. Additional operating costs associated with the transit alternatives are $6.6 million if freeway stations are constructed. For a service that uses existing off-line stations and stops, the annual operating cost is higher than the low end of the freeway station option at $8.6 million.

A key statistic when looking at productivity or cost effectiveness of the service is the incremental cost per passenger. This is calculated by averaging the capital cost of the project by boardings over a 20-year period. This incremental cost passenger is lowest for Alternative 4-1 Bus on Shoulder Option 2. The highest incremental cost per passenger is $35.20 to $38.50 per passenger for Alternative 3-1, Short Median Transit Lane. Generally, the estimated operating cost of all the transit alternatives is the same at this level of analysis. The incremental cost per passenger is driven by new ridership development. The more new riders, the lower the cost per new rider.

Transit reliability, or improved schedule adherence achieved by minimizing traffic delays makes transit more attractive to riders. Predictability in travel time to work is important to commuters and improves customer satisfaction with transit services. Alternatives 1-1 and 2-1 do not make significant changes to traffic that change transit reliability on existing transit services. Alternative 2-2 and 2-3 adds some additional reliability to transit through use of additional express lanes, adding some reliability improvement. For the transit alternatives, transit reliability is improved only in the sections that include transit improvements such as transit lanes and bus on shoulder.

5.4 Shuttle Passengers

There are a significant number of employer shuttle buses operating in the corridor. Employer shuttle bus passengers will benefit from the improved transit travel time associated with the express lane and transit lane alternatives on SR 85 as well as the bus on shoulder alternatives. Employer shuttle passengers will not use any stops or stations as identified in routing Options 1 or 2.

5.5 Traffic Operations

As shown in the SR 85 transit study evaluation matrix in Appendix F, traffic operations are being evaluated in terms of three metrics. These are vehicle miles of travel, vehicle hours of delay and miles of congestion. All three metrics are compared to the existing condition, Alternative 1-1 No Change and are represented as change from existing conditions.

Vehicle miles of travel increase under all express lane alternatives with the highest increase of 21.4% in the AM peak and 22.7% in the PM peak under Alternative 2-3 Long Dual Express Lane. The smallest increase in VMT of the non-transit alternatives is under Alternative 2-1 HOV to Express Lane Conversion at 0.4% in the AM peak and 0.2% in the PM peak. Under the transit alternatives, both Transit Lanes (3-1, 3-2, 3-3) and Bus on Shoulder (4-1, 4-2), VMT increases slightly in the AM peak due to latent demand and decreases in the PM peak period. Alternative 3-2 Long Transit Lane, routing Option 1 and Alternative 3-3 Long Median Transit Lane, routing Option 1 decrease PM peak VMT the most by 0.2% with all other alternatives and routing options decreasing PM peak VMT by 0.1%.

Vehicle hours of delay are reduced under all build alternatives. The express lane alternatives reduce vehicle hours of delay the most given that they provide benefit to all vehicles. The range of reduction in vehicle hours of delay for the express lane alternatives is 37.3% under Alternative 2-1 HOV to Express Lane in the PM peak to 92.2% under Alternative 2-3 Long Dual Express Lane in the AM peak. All the transit alternatives reduced vehicle hours of delay by just over 47% in the AM peak and around 40% in the PM peak.

As with vehicle hours of delay, miles of congestion area reduced under all the build alternatives. They are reduced the most under the express lane options. Miles of congestion are reduced the most under Alternative 3-3 Long Dual Express Lane with a 94.7% reduction in the AM peak and a 79% reduction in the PM peak. The reduction in miles of congestion is the same across all the transit alternatives at 38.7% percent in the AM peak and 39.5% in the PM peak.

5.6 Local Streets

Impacts to local streets depend on the rebuild of the El Camino Real interchange and the need for new ramps. Alternatives that involve new ramps and off-line stops such as 3-1 Option 2, 3-2 Option 2, and 4-1 Option 2 may have some impact on traffic operations on local streets.

5.7 Environment

Numerous environmental impacts are considered in a federal NEPA documentation process. Three of these appear to be relevant based on public outreach and engagement activities. These are growth, land use and noise impacts. None of the alternatives are assumed to have any impact to growth patterns in the SR 85 corridor or any changes in land use. All build alternatives are limited to SR 85 right of way or use existing stops or stations in already developed areas. All build alternatives are expected to increase noise levels during operating hours, but the increase in noise is minimal and most likely not a perceptible increase.

APPENDIX A

RIDERSHIP DEVELOPMENT

Appendix A -
Ridership Development

This section documents the data collection effort, methodology, and analysis results of the SR 85 BRT service ridership development.

A.1 Data Collection

Data was collected to determine the number of work-related trips in station areas, the mode of transportation to work, as well as travel patterns within the corridor.

A.1.1 US Census LEHD Trips Data

The US Census Longitudinal Employer-Household Dynamics (LEHD) OnTheMap online portal was utilized to collect the daily work-related trips around station areas. The LEHD program provides origin-destination employment information at the Census block level. The total daily inflow and outflow trips in the station catchment areas were collected. These data represent 2017 work-related trips, the most recent available.

Inflow represents the number of trips generated by commuters employed in the selected area and living elsewhere. Outflow represents the number of trips generated by commuters living in the selected area and employed outside. Therefore, Inflow trips represent "attraction" trips in the AM peak period while Outflow trips represent "production" trips in the AM peak period. These trips are reversed during the PM peak period. A sample snapshot of LEHD trips from the database using the OnTheMap online portal is shown in **Figure A-1**.

Figure A-1 OnTheMap Queried Trips

A.1.2 American Community Survey

American Community Survey (ACS) 2017 means of transportation to work (ID: B08301) 5-year estimate data were used to calculate the potential transit mode share of trips that could use the SR 85 service once it is built.

ACS is an ongoing survey providing socio-demographic information at multiple geographical levels. The Means of Transportation to Work data provides estimates of the number of commuters using different modes of transportation to work (e.g., private vehicle, carpool, taxi, and public transportation). The number of commuters using public transportation was gathered and compared to the total number of commuters to derive the percentage of public transportation use at the Census tract level.

A.1.3 StreetLight Data

StreetLight Data, Inc. obtains data from location-based services such as smartphone apps, global positioning system (GPS) enabled devices, and traditional data sources. StreetLight processes these data by transforming data points into contextualized, aggregated, and normalized travel patterns and evaluates the data using StreetLight Insight, a big data platform. StreetLight data was used to understand the O-D patterns in the study area.

The O-D trips during the AM (6-11 AM) and PM (2-8 PM) peak periods collected in the previous phase of this project were used to establish the O-D distribution of potential SR 85 trips in the study area.

A.2 Methodology

This section documents the scenarios being evaluated and processes and methods of using the data to estimate SR 85 BRT ridership.

A.2.1 Scenarios

Two routing options along with stations are being evaluated.

- Option 1 - Mountain View-Ohlone/Chynoweth with Freeway Stations: BRT buses travel between the Mountain View and Ohlone/Chynoweth terminal stations and stop at on-line freeway stations (BRT does not exit SR 85). The stations along SR 85 are as follows.
  - 1: Mountain View Transit Center
  - 2: El Camino Real
  - 3: Stevens Creek Blvd
  - 4: Saratoga Ave
  - 5: Bascom Ave
  - 6: Ohlone-Chynoweth LRT Station
- Option 2 - Mountain View-Ohlone/Chynoweth with Freeway and Offline Stations: BRT buses travel between the Mountain View and Ohlone/Chynoweth terminal stations and stop at freeway and offline stations. The stations along SR 85 are as follows.

- 1: Mountain View Transit Center
- 2: El Camino Real
- 3: De Anza College Transit Center
- 4: West Valley College Transit Center
- 5: Good Samaritan Hospital
- 6: Ohlone-Chynoweth LRT Station

The analysis periods are the AM and PM peak periods that correspond to the VTA Regional Travel Demand Model's peak periods. The assumed peak period duration is four hours.

A.2.2 Station Catchment Area

A station catchment area is defined as a third-mile buffer around each station. A third of a mile equates to approximately 7 to 8 minutes of walk time. The transit network around the study area was assessed, and it was determined that no connecting service should be considered due to the existing established transit network northeast of the study area (i.e., denser areas in San Jose and nearby cities) and limited frequent connecting service at the proposed stations along SR 85. Potential trips using SR 85 service are considered to be generated from these station catchment areas (both production and attraction).

The station catchment areas for Options 1 and 2 are shown in **Figures A-2 and A-3**.

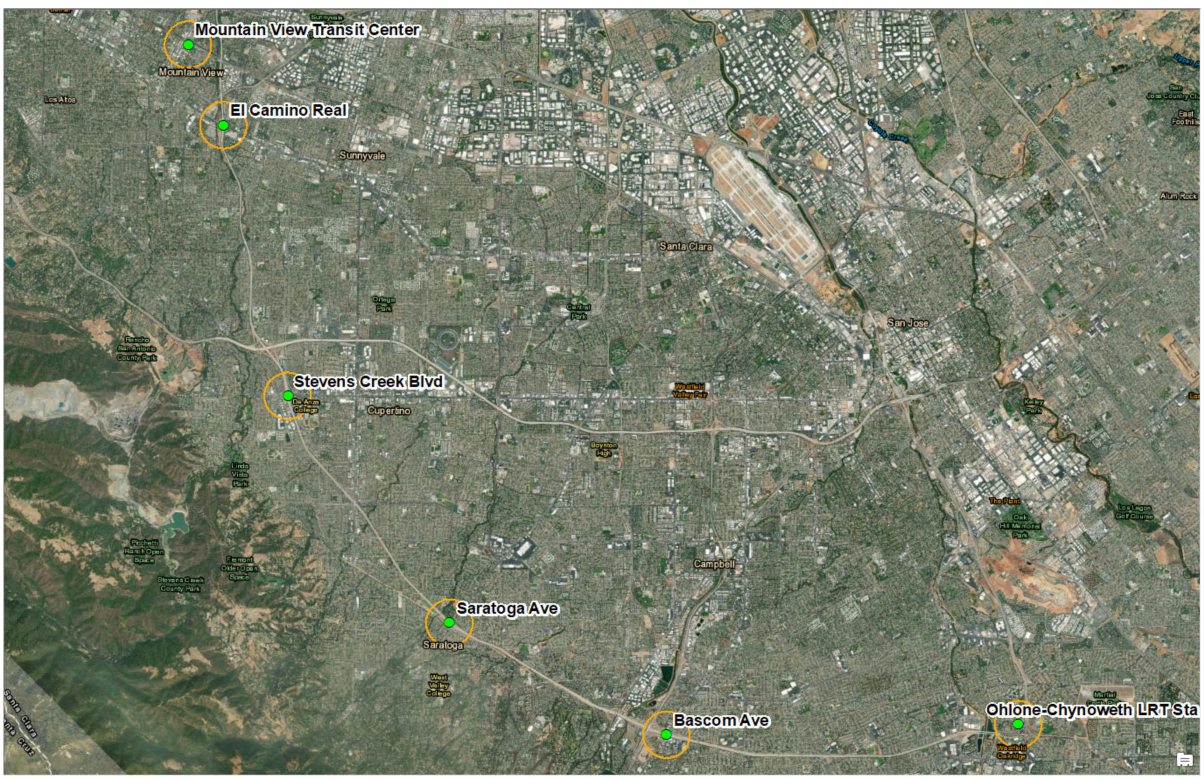


Figure A-2 Station Catchment Areas - Option 1

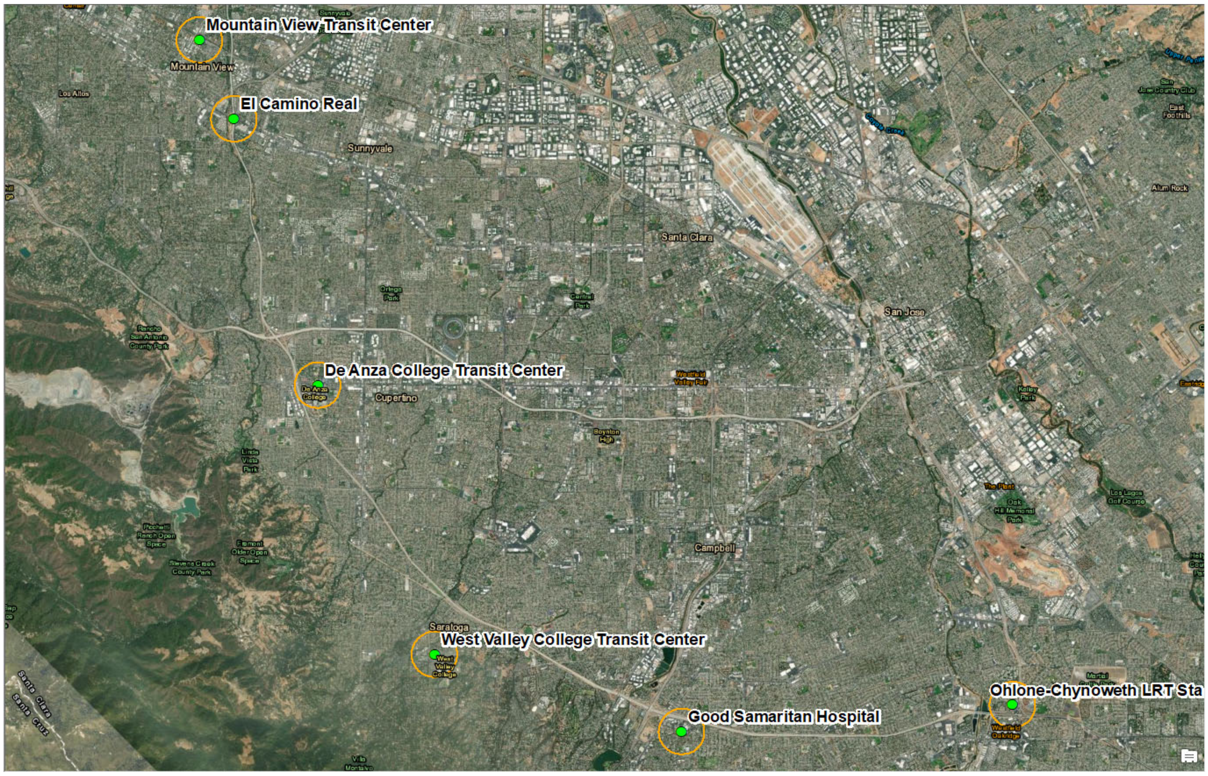


Figure A-3 Station Catchment Areas - Option 2

A.2.2 Trip Generation

A third-mile buffer was specified in the OnTheMap portal to collect 2017 daily inflow and outflow trips from the LEHD database. It is assumed that the Inflow trips are the "attraction" trips during the AM peak period and "production" trips during the PM peak period. On the contrary, the daily Outflow trips in an area are the "production" trips during the AM peak period and "attraction" trips during the PM peak period. The collected Inflow and Outflow trips for the two routing options are shown in **Tables A-1** and **A-2**.

Table A-1 LEHD Trips - Option 1

ID	Station	Census Blocks	Inflow	Outflow	Internal
1	Mountain View Transit Center	73	4,269	1,675	34
2	El Camino Real	41	1,430	2,170	20
3	Stevens Creek Blvd Stop	28	2,356	805	10
4	Saratoga Ave	29	102	835	0
5	Bascom Ave	57	3,844	693	13
6	Ohlone-Chynoweth LRT Station	10	545	951	15
		Total	**12,546**	**7,129**	**92**

Source: US Census, LEHD, 2017

Table A-2 LEHD Trips - Option 2

ID	Station	Census Blocks	Inflow	Outflow	Internal
1	Mountain View Transit Center	73	4,269	1,675	34
2	El Camino Real	41	1,430	2,170	20
3	De Anza College Transit Center	26	2,158	705	8
4	West Valley College Transit Center	18	744	226	0
5	Good Samaritan Hospital	34	3,823	1,084	24
6	Ohlone-Chynoweth LRT Station	10	545	951	15
		Total	**12,969**	**6,811**	**101**

Source: US Census, LEHD, 2017

The attraction and production trips during the AM and PM periods under Option 1 and Option 2 scenarios are shown in **Tables A-3** and **A-4**.

Table A-3 Trip Generation - Option 1

ID	Station	AM Peak Period		PM Peak Period	
		Attraction	Production	Attraction	Production
1	Mountain View Transit Center	218	85	85	218
2	El Camino Real	73	111	111	73
3	Stevens Creek Blvd	120	41	41	120
4	Saratoga Ave	5	43	43	5
5	Bascom Ave	196	35	35	196
6	Ohlone-Chynoweth LRT Station	28	49	49	28
	Total	**640**	**364**	**364**	**640**

Source: US Census, LEHD Data, 2017, Study team calculations

Table A-4 Trip Generation - Option 2

ID	Station	AM Peak Period		PM Peak Period	
		Attraction	Production	Attraction	Production
1	Mountain View Transit Center	218	85	85	218
2	El Camino Real	73	111	111	73
3	De Anza College Transit Center	110	36	36	110
4	West Valley College Transit Center	38	12	12	38
5	Good Samaritan Hospital	195	55	55	195
6	Ohlone-Chynoweth LRT Station	28	49	49	28
	Total	**661**	**347**	**347**	**661**

Source: US Census, LEHD Data, 2017, Study team calculations

Under Alternative 3-1 buses do not stop at the El Camino Real interchange (only passing by). There is no trip generation from the El Camino Real station area. The attraction and production trips for Alternative 3-1 under the Option 1 and Option 2 scenarios are shown in **Tables A-5** and **A-6**.

Table A-5 Trip Production - Option 1, Alternative 3-1

ID	Station	AM Peak Period		PM Peak Period	
		Attraction	Production	Attraction	Production
1	Mountain View Transit Center	218	85	85	218
3	Stevens Creek Blvd Stop	120	41	41	120
4	Saratoga Ave	5	43	43	5
5	Bascom Ave	196	35	35	196
6	Ohlone-Chynoweth LRT Station	28	49	49	28
	Total	**567**	**253**	**253**	**567**

Source: US Census, LEHD Data, 2017, Study team calculations

Table A-6 Trip Production - Option 2, Alternative 3-1

ID	Station	AM Peak Period		PM Peak Period	
		Attraction	Production	Attraction	Production
1	Mountain View Transit Center	218	85	85	218
3	De Anza College Transit Center	110	36	36	110
4	West Valley College Transit Center	38	12	12	38
5	Good Samaritan Hospital	195	55	55	195
6	Ohlone-Chynoweth LRT Station	28	49	49	28
	Total	**588**	**237**	**237**	**588**

Source: US Census, LEHD Data, 2017, Study team calculations

A.2.3 Mode Split

Because the SR 85 service is not yet built, existing mode share for the area around the proposed stations along SR 85 does not reflect the true potential for commuters to take the BRT bus. To develop a mode share assumption, the Santa Clara countywide Census tract level data from the ACS Means of Transportation to Work dataset was collected and plotted.

The plotted mode shares in the total of 372 Census tracts are shown in **Figure A-4**. Transit service exists or is accessible in the Census Tracts with higher mode shares. The average mode share of 5.1 percent from the top 300 Census Tracts was selected to represent the potential share of commuters in the station areas that would use the SR 85 BRT service when it is implemented, based on the observation that the proposed transit service levels on the SR 85 corridor under each of the build alternatives represents a relatively high level of service.

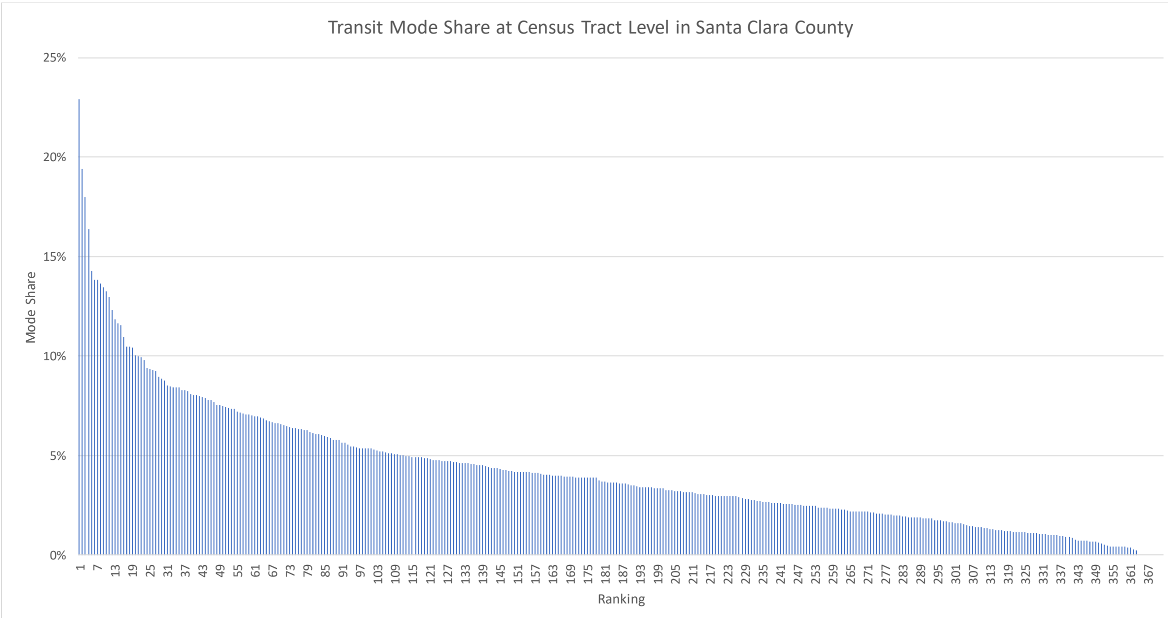


Figure A-4 ACS Transit Mode Share

Source: US Census, ACS 5-Year Estimate Data, 2017, Study team calculations

The attraction and production trips estimated in the Trip Generation phase were multiplied by the 5.1 percent mode share to estimate the potential trips that would use the SR 85 BRT service once it is implemented.

A.2.4 Trip Distribution

The StreetLight O-D trips during the AM and PM peak periods were collected during the previous phase of this project. The O-D trip percentages based on origin were calculated. Each station catchment area encompasses multiple StreetLight zones. Therefore, StreetLight zone ID numbers were assigned to each station catchment area. Land area and the relative percentages within each station catchment area were calculated, in order to assign trips generated in each station catchment area proportionally to each assigned StreetLight Zone.

An O-D matrix documenting the assigned StreetLight zones and percentages based on origin was developed. Then the SR 85 BRT production trips between stations were derived based on potential BRT production trips calculated under Section A.2.3, StreetLight zone area percentages in each station, and StreetLight OD percentages based on origin. An example of the trip distribution based on StreetLight origin trip patterns between the Mountain View Transit Center and El Camino Real is shown in **Figure A-5**.

Origin ID	Station	Destination ID			1				2					
		StreetLight Zone	Area (sq mi)	Area %	4	7	12	9	4	7	8	9	12	13
1	Mountain View	4	0.300	88%						2%	0%	5%	6%	1%
	Transit Center	7	0.042	12%					16%		1%	8%	13%	2%
2	El Camino Real	4	0.001	0%		2%	6%	5%						
		7	0.151	44%	16%		13%	8%						
		8	0.149	44%	7%	2%	8%	13%						
		9	0.018	5%	9%	2%	4%							
		12	0.021	6%	7%	3%		3%						
		13	0.002	1%	2%	1%	14%	3%						

Figure A-5 Example - StreetLight O-D Patterns

Similarly, in order to derive the SR 85 BRT attraction trips, the O-D trip percentages based on destination were calculated. An O-D matrix documenting the assigned StreetLight zones and percentages based on destination was developed. The SR 85 BRT attraction trips between stations were derived based on potential BRT attraction trips calculated under Section A.2.3 and, StreetLight zone area percentages in each station, and StreetLight OD percentages based on destination.

An O-D Fratar balancing spreadsheet was developed. The SR 85 BRT production O-D trips were plugged into this Fratar spreadsheet. Initially, the origin sums for all the stations matched the origin target sums. Then the destination sums for all the stations from the attraction trips were entered. A Fratar balancing process was conducted for ten iterations. It was observed that at iteration 10, further iterations would do little to improve the balancing. The final step was to derive the final O-D trips based on origin by multiplying the O-D trips developed in iteration 10 by a multiplying factor averaged from each row and column in order to minimize the relative difference of the developed O-D trips to the target total in each row and column. An example of the final AM O-D trips based on origin from the Fratar spreadsheet is shown in **Table A-6**.

Table A-6 Example - O-D Fratar Balancing Result (Option 2 PM)

	ID	Station	Destination 1	2	3	4	5	6	Origin Sum	Target Total	Difference
Origin	**1**	Mountain View Transit Center	0	48	4	0	3	0	**56**	**64**	1.1404
	2	El Camino Real	26	0	5	0	3	0	**35**	**40**	1.1404
	3	De Anza College Transit Center	8	25	0	1	5	0	**39**	**44**	1.1404
	4	West Valley College Transit Center	1	2	2	0	12	0	**17**	**20**	1.1404
	5	Good Samaritan Hospital	14	30	13	6	0	13	**76**	**86**	1.1404
	6	Ohlone-Chynoweth LRT Station	1	1	1	0	7	0	**10**	**11**	1.1404
		Destination Sum	**49**	**106**	**25**	**8**	**30**	**15**			
		Target Total	**42**	**91**	**21**	**6**	**26**	**12**			
		Difference	0.8591	0.8595	0.8586	0.8563	0.8680	0.8562			

Source: Study team calculations

As with the production O-D trips, the SR 85 BRT attraction O-D trips were plugged into the Fratar spreadsheet. Initially, the destination sums for all the stations matched the destination target sums. Then the origin sums for all the stations from the production trips were put in. Fratar balancing process was conducted for ten iterations. Then the O-D trips developed in iteration 10 were multiplied by a multiplying factor averaged from each row and column to derive the final O-D trips based on destination.

The O-D trips based on origin and O-D trips based on destination, were averaged to derive the final O-D trips. The abovementioned processes were conducted for both AM and PM peak periods.

A.2.5 Other Factors

Other factors to consider that could affect the baseline O-D trips include existing transit service around the study area and BRT bus capacity.

Several light rail or bus service lines presently travel across or within the study corridor, including Light Rail Blue Line (Baypointe - Santa Teresa), Express Bus 102 (South San Jose - Stanford Research Park), Express Bus 185 (Gilroy/Morgan Hill - Mountain View), Express Bus 182 (Palo Alto - IBM & Bailey Avenue), Express Bus 168 (Gilroy/Morgan Hill - San Jose Diridon), and Local Bus 27 (Winchester Station - Kaiser San Jose via Downtown Los Gatos).

The trains and buses on these routes either stop at no more than one station in the study area or provide local service that serves a different purpose than the SR 85 BRT service. Therefore, none of the potential SR 85 O-D trips were assumed to replace trips made on the existing light rail and BRT service.

In terms of BRT bus capacity, a 60-foot articulated bus with a seating capacity of 57 passengers[21] was assumed as the bus type for the SR 85 BRT service. The number of riders needing to be served between each set of two adjacent stations along the study corridor was calculated. The home-to-work trips have a peak hour factor of 0.37 in the AM and 0.33 in the PM from the VTA Regional Travel Demand Model. These peak hour factors were used to convert the four-hour peak period ridership to one peak hour ridership in order to determine if bus (seating) capacity was adequate to cover the peak hour demand.

A 15-minute headway (translating to four buses per hour) is enough to cover the derived peak hour O-D trips both in the AM and PM under both Option 1 and Option 2 scenarios. Therefore, no O-D trips were taken out due to potential limited bus capacity. If the seating capacity is reached, there is standing capacity available. In the event that ridership is higher than projected, the transit agency can adjust the schedule to provide more frequent service during the peak hours to accommodate additional riders.

[2] Information page – High Capacity Bus, Los Angeles County Metropolitan Transportation Authority; at https://www.metro.net/about/metro-service-changes/high-capacity-bus/

A.3 Results

A.3.1 Baseline Ridership

The O-D trips in Options 1 and 2 constitute the baseline ridership that is used as the basis to further develop SR 85 BRT ridership for the different alternatives. The baseline ridership for the AM and PM peak periods in Options 1 and 2 for all of the alternatives except Alternative 3-1 are shown in **Tables A-7** and **A-8**. The baseline ridership used as the basis for Alternative 3-1 are shown in **Tables A-9** and **A-10**.

Table A-7 Baseline AM and PM Peak Period Ridership - Option 1

	ID	Station	Destination					
			1	3	4	5	6	Total
	AM Peak Period							
Origin	1	Mountain View Transit Center	0	10	0	5	0	**39**
	3	Stevens Creek Blvd	8	0	1	6	0	**24**
	4	Saratoga Ave	4	12	0	26	0	**45**
	5	Bascom Ave	6	9	2	0	4	**25**
	6	Ohlone-Chynoweth LRT Station	2	3	0	25	0	**31**
	Total		**19**	**33**	**3**	**61**	**5**	**165**
	PM Peak Period							
	1	Mountain View Transit Center	0	6	1	3	0	**10**
	3	Stevens Creek Blvd	8	0	6	5	0	**19**
	4	Saratoga Ave	0	1	0	1	0	**3**
	5	Bascom Ave	10	13	27	0	12	**62**
	6	Ohlone-Chynoweth LRT Station	1	1	1	7	0	**9**
	Total		**19**	**21**	**35**	**16**	**13**	**103**

Source: Study team calculations

Table A-8 Baseline AM and PM Peak Period Ridership - Option 2

	ID	Station	Destination 1	2	3	4	5	6	Total
		AM Peak Period							
Origin	1	Mountain View Transit Center	0	26	9	1	7	0	**42**
	2	El Camino Real	62	0	22	1	15	1	**101**
	3	De Anza College Transit Center	7	8	0	2	8	0	**24**
	4	West Valley College Transit Center	0	0	1	0	8	0	**10**
	5	Good Samaritan Hospital	7	7	12	11	0	4	**41**
	6	Ohlone-Chynoweth LRT Station	1	1	2	1	28	0	**34**
	Total		**77**	**43**	**47**	**15**	**66**	**5**	**252**
		PM Peak Period							
	1	Mountain View Transit Center	0	48	4	0	3	0	**56**
	2	El Camino Real	26	0	5	0	3	0	**35**
	3	De Anza College Transit Center	8	25	0	1	5	0	**39**
	4	West Valley College Transit Center	1	2	2	0	12	0	**17**
	5	Good Samaritan Hospital	14	30	13	6	0	13	**76**
	6	Ohlone-Chynoweth LRT Station	1	1	1	0	7	0	**10**
	Total		**49**	**106**	**25**	**8**	**30**	**15**	**233**

Source: Study team calculations

Table A-9 Baseline AM and PM Peak Period Ridership - Option 1 (Alternative 3-1 Only)

	ID	Station	Destination 1	3	4	5	6	Total
		AM Peak Period						
Origin	1	Mountain View Transit Center	0	14	0	6	0	**20**
	3	Stevens Creek Blvd	13	0	1	5	0	**19**
	4	Saratoga Ave	8	13	0	25	1	**47**
	5	Bascom Ave	11	10	2	0	3	**26**
	6	Ohlone-Chynoweth LRT Station	4	4	0	26	0	**34**
	Total		**35**	**27**	**2**	**56**	**4**	**124**
		PM Peak Period						
	1	Mountain View Transit Center	0	12	3	7	1	**23**
	3	Stevens Creek Blvd	11	0	7	5	0	**24**
	4	Saratoga Ave	0	1	0	1	0	**2**
	5	Bascom Ave	13	11	28	0	12	**64**
	6	Ohlone-Chynoweth LRT Station	1	1	1	6	0	**9**
	Total		**25**	**12**	**36**	**13**	**13**	**99**

Source: Study team calculations

Table A-10 Baseline AM and PM Peak Period Ridership - Option 2 (Alternative 3-1 Only)

	ID	Station	Destination 1	3	4	5	6	Total
		AM Peak Period						
Origin	1	Mountain View Transit Center	0	14	0	6	0	**20**
	3	De Anza College Transit Center	13	0	1	5	0	**18**
	4	West Valley College Transit Center	8	13	0	25	1	**47**
	5	Good Samaritan Hospital	11	10	2	0	3	**26**
	6	Ohlone-Chynoweth LRT Station	4	4	0	26	0	**33**
	Total		**35**	**40**	**3**	**62**	**5**	**145**
		PM Peak Period						
	1	Mountain View Transit Center	0	12	3	7	1	**23**
	3	De Anza College Transit Center	11	0	7	5	0	**24**
	4	West Valley College Transit Center	0	1	0	1	0	**3**
	5	Good Samaritan Hospital	13	11	28	0	12	**64**
	6	Ohlone-Chynoweth LRT Station	1	1	1	6	0	**9**
	Total		**25**	**24**	**39**	**20**	**14**	**121**

Source: Study team calculations

A.4 Ridership by Alternative

The bus OD travel time from the traffic analysis differentiates the time buses travel between two stations during the AM and PM peak periods were used as the inputs to derive ridership for the different alternatives. The round-trip travel time based on origin (i.e., leaving for work during the AM period and coming home during the PM period) was calculated for each alternative. A base travel time OD pair was calculated based on the highest travel time among the alternatives in each OD pair.

Since the base travel time OD pairs are the highest possible travel times among the alternatives, the OD travel time for all the alternatives is either lower or the same as the base travel time pair. If a travel time OD pair from an alternative is lower than the base travel time OD pair, it is considered more attractive to transit riders and therefore results in higher ridership. Then, an elasticity of -0.6 was used to calculate the percent change in ridership as a result of percent change in travel time. The elasticity formula can be expressed as follows:

$$E = (\Delta Q / Q_0)/(\Delta TT / TT_0)$$

Where E: Elasticity, ΔQ: change in ridership, Q_0: baseline ridership, ΔTT: change in travel time, TT_0: base travel time

The ridership adjustment ratios (increase in ridership, expressed in percentage) were derived for all the OD pairs and converted to ridership adjustment factors. These factors were then applied to the baseline ridership to derive the ridership for the alternatives.

The developed ridership during the AM and PM peak periods in Options 1 and 2 for Alternatives 3-1 through 4-2 is shown in **Tables A-11** through **A-20**. The total ridership (sum of ridership for all OD pairs during the AM and PM peak periods) for all alternatives is summarized in **Table A-21**.

As shown in these tables, Alternative 3-1 has the lowest level of ridership compared to other alternatives due to the lack of service to the El Camino Real Station in both Options 1 and 2. Even though the calculated ridership adjustment factors for the OD pairs are the highest in Alternative 3-1, the increase in ridership as a result of travel time savings does not counteract the loss of ridership from lack of service to the El Camino Real Station.

In Option 1, the rank order of sum of total ridership during the AM and PM periods ranked from highest to lowest is Alternative 3-2, Alternative 3-3 and Alternative 4-1 (tied), Alternative 4-2, and Alternative 3-1. In Option 2, the order is Alternative 3-2, Alternative 4-1, Alternative 3-3, Alternative 4-2, and Alternative 3-1.

Table A-11 AM and PM Peak Period Ridership - Alternative 3-1, Option 1

	ID	Station	Destination					
			1	3	4	5	6	Total
		AM Peak Period						
Origin	1	Mountain View Transit Center	0	15	0	6	0	**21**
	3	Stevens Creek Blvd	15	0	1	6	0	**22**
	4	Saratoga Ave	10	16	0	28	1	**55**
	5	Bascom Ave	13	12	2	0	4	**31**
	6	Ohlone-Chynoweth LRT Station	5	4	0	30	0	**39**
	Total		**43**	**47**	**3**	**70**	**5**	**168**
		PM Peak Period						
	1	Mountain View Transit Center	0	14	3	7	1	**25**
	3	Stevens Creek Blvd	13	0	8	6	1	**28**
	4	Saratoga Ave	0	1	0	2	0	**3**
	5	Bascom Ave	15	14	35	0	13	**77**
	6	Ohlone-Chynoweth LRT Station	1	1	1	7	0	**10**
	Total		**29**	**30**	**47**	**22**	**15**	**143**

Source: Study team calculations

Table A-12 AM and PM Peak Period Ridership - Alternative 3-1, Option 2

	ID	Station	Destination					
			1	3	4	5	6	Total
	AM Peak Period							
Origin	1	Mountain View Transit Center	0	15	1	9	0	**25**
	3	De Anza College Transit Center	13	0	1	6	0	**20**
	4	West Valley College Transit Center	1	2	0	9	0	**12**
	5	Good Samaritan Hospital	20	15	11	0	4	**50**
	6	Ohlone-Chynoweth LRT Station	4	3	1	35	0	**43**
	Total		**38**	**35**	**14**	**59**	**4**	**150**
	PM Peak Period							
	1	Mountain View Transit Center	0	10	0	10	1	**21**
	3	De Anza College Transit Center	12	0	1	8	0	**21**
	4	West Valley College Transit Center	1	1	0	11	0	**13**
	5	Good Samaritan Hospital	21	14	8	0	16	**59**
	6	Ohlone-Chynoweth LRT Station	1	0	0	7	0	**8**
	Total		**35**	**25**	**9**	**36**	**17**	**122**

Source: Study team calculations

Table A-13 AM and PM Peak Period Ridership - Alternative 3-2, Option 1

	ID	Station	Destination 1	2	3	4	5	6	Total
		AM Peak Period							
Origin	1	Mountain View Transit Center	0	26	10	0	5	0	**41**
	2	El Camino Real	70	0	24	0	12	1	**107**
	3	Stevens Creek Blvd	9	11	0	1	7	0	**28**
	4	Saratoga Ave	5	5	14	0	29	1	**54**
	5	Bascom Ave	7	6	12	2	0	4	**31**
	6	Ohlone-Chynoweth LRT Station	2	2	3	0	28	0	**35**
	Total		**93**	**50**	**63**	**3**	**81**	**6**	**296**
		PM Peak Period							
	1	Mountain View Transit Center	0	53	7	1	3	0	**64**
	2	El Camino Real	30	0	7	1	3	1	**42**
	3	Stevens Creek Blvd	9	28	0	7	5	0	**49**
	4	Saratoga Ave	0	1	1	0	2	0	**4**
	5	Bascom Ave	13	27	16	34	0	12	**102**
	6	Ohlone-Chynoweth LRT Station	1	2	1	1	8	0	**13**
	Total		**53**	**111**	**32**	**44**	**21**	**13**	**274**

Source: Study team calculations

Table A-14 AM and PM Peak Period Ridership for Alternative 3-2, Option 2

	ID	Station	Destination 1	2	3	4	5	6	Total
			AM Peak Period						
Origin	1	Mountain View Transit Center	0	27	10	1	7	0	**45**
	2	El Camino Real	70	0	24	1	16	1	**112**
	3	De Anza College Transit Center	8	10	0	2	8	0	**28**
	4	West Valley College Transit Center	0	0	2	0	8	0	**10**
	5	Good Samaritan Hospital	8	8	13	12	0	4	**45**
	6	Ohlone-Chynoweth LRT Station	1	1	2	1	31	0	**36**
	Total		**87**	**46**	**51**	**17**	**70**	**5**	**276**
			PM Peak Period						
	1	Mountain View Transit Center	0	51	5	0	3	0	**59**
	2	El Camino Real	29	0	6	0	4	0	**39**
	3	De Anza College Transit Center	10	29	0	1	5	0	**45**
	4	West Valley College Transit Center	1	3	2	0	12	0	**18**
	5	Good Samaritan Hospital	16	33	14	7	0	13	**83**
	6	Ohlone-Chynoweth LRT Station	1	2	1	0	8	0	**12**
	Total		**57**	**118**	**28**	**8**	**32**	**13**	**256**

Source: Study team calculations

Table A-15 AM and PM Peak Period Ridership - Alternative 3-3, Option 1

	ID	Station	Destination 1	2	3	4	5	6	Total
		AM Peak Period							
Origin	1	Mountain View Transit Center	0	26	10	0	5	0	**41**
Origin	2	El Camino Real	65	0	24	0	12	1	**102**
Origin	3	Stevens Creek Blvd	9	11	0	1	7	0	**28**
Origin	4	Saratoga Ave	4	5	14	0	29	1	**53**
Origin	5	Bascom Ave	7	6	12	2	0	4	**31**
Origin	6	Ohlone-Chynoweth LRT Station	2	2	3	0	29	0	**36**
Origin	**Total**		**87**	**50**	**63**	**3**	**82**	**6**	**291**
		PM Peak Period							
Origin	1	Mountain View Transit Center	0	52	7	1	3	0	**63**
Origin	2	El Camino Real	28	0	7	1	3	1	**40**
Origin	3	Stevens Creek Blvd	9	28	0	7	5	0	**49**
Origin	4	Saratoga Ave	0	1	1	0	2	0	**4**
Origin	5	Bascom Ave	12	27	16	34	0	12	**101**
Origin	6	Ohlone-Chynoweth LRT Station	1	2	1	1	8	0	**13**
Origin	**Total**		**50**	**110**	**32**	**44**	**21**	**13**	**270**

Source: Study team calculations

Table A-16 AM and PM Peak Period Ridership - Alternative 3-3, Option 2

	ID	Station	Destination						
			1	2	3	4	5	6	Total
			AM Peak Period						
Origin	1	Mountain View Transit Center	0	26	9	1	7	0	**43**
	2	El Camino Real	63	0	24	1	16	1	**105**
	3	De Anza College Transit Center	7	9	0	2	8	0	**26**
	4	West Valley College Transit Center	0	0	1	0	8	0	**9**
	5	Good Samaritan Hospital	8	7	12	12	0	4	**43**
	6	Ohlone-Chynoweth LRT Station	1	1	2	1	31	0	**36**
	Total		**79**	**43**	**48**	**17**	**70**	**5**	**262**
			PM Peak Period						
	1	Mountain View Transit Center	0	48	5	0	3	0	**56**
	2	El Camino Real	26	0	6	0	4	0	**36**
	3	De Anza College Transit Center	9	27	0	1	5	0	**42**
	4	West Valley College Transit Center	1	3	2	0	12	0	**18**
	5	Good Samaritan Hospital	15	32	13	7	0	13	**80**
	6	Ohlone-Chynoweth LRT Station	1	2	1	0	8	0	**12**
	Total		**52**	**112**	**27**	**8**	**32**	**13**	**244**

Source: Study team calculations

Table A-17 AM and PM Peak Period Ridership - Alternatives 4-1, Option 1

	ID	Station	Destination 1	2	3	4	5	6	Total
		AM Peak Period							
Origin	1	Mountain View Transit Center	0	26	10	0	5	0	**41**
	2	El Camino Real	70	0	24	0	12	1	**107**
	3	Stevens Creek Blvd	9	11	0	1	7	0	**28**
	4	Saratoga Ave	4	4	14	0	29	1	**52**
	5	Bascom Ave	7	6	11	2	0	4	**30**
	6	Ohlone-Chynoweth LRT Station	2	2	3	0	28	0	**35**
	Total		**92**	**49**	**62**	**3**	**81**	**6**	**293**
		PM Peak Period							
	1	Mountain View Transit Center	0	54	7	1	3	0	**65**
	2	El Camino Real	30	0	7	1	3	1	**42**
	3	Stevens Creek Blvd	9	27	0	7	5	0	**48**
	4	Saratoga Ave	0	1	1	0	2	0	**4**
	5	Bascom Ave	12	26	16	33	0	12	**99**
	6	Ohlone-Chynoweth LRT Station	1	2	1	1	8	0	**13**
	Total		**52**	**110**	**32**	**43**	**21**	**13**	**271**

Source: Study team calculations

Table A-18 AM and PM Peak Period Ridership - Alternative 4-1, Option 2

	ID	Station	Destination						
			1	2	3	4	5	6	Total
	AM Peak Period								
Origin	1	Mountain View Transit Center	0	28	10	1	7	0	**46**
	2	El Camino Real	71	0	25	1	16	1	**114**
	3	De Anza College Transit Center	8	10	0	2	8	0	**28**
	4	West Valley College Transit Center	0	0	1	0	8	0	**9**
	5	Good Samaritan Hospital	8	8	13	11	0	4	**44**
	6	Ohlone-Chynoweth LRT Station	1	1	2	1	30	0	**35**
	Total		**88**	**47**	**51**	**16**	**69**	**5**	**276**
	PM Peak Period								
	1	Mountain View Transit Center	0	52	5	0	3	0	**60**
	2	El Camino Real	29	0	6	0	4	0	**39**
	3	De Anza College Transit Center	9	29	0	1	5	0	**44**
	4	West Valley College Transit Center	1	3	2	0	12	0	**18**
	5	Good Samaritan Hospital	15	33	14	7	0	13	**82**
	6	Ohlone-Chynoweth LRT Station	1	2	1	0	8	0	**12**
	Total		**55**	**119**	**28**	**8**	**32**	**13**	**255**

Source: Study team calculations

Table A-19 AM and PM Peak Period Ridership - Alternatives 4-2, Option 1

	ID	Station	Destination 1	2	3	4	5	6	Total
			AM Peak Period						
Origin	1	Mountain View Transit Center	0	25	10	0	5	0	**40**
	2	El Camino Real	61	0	22	0	10	1	**94**
	3	Stevens Creek Blvd	8	9	0	1	6	0	**24**
	4	Saratoga Ave	4	4	12	0	26	0	**46**
	5	Bascom Ave	6	5	9	2	0	4	**26**
	6	Ohlone-Chynoweth LRT Station	2	2	3	0	25	0	**32**
	Total		**81**	**45**	**56**	**3**	**72**	**5**	**262**
			PM Peak Period						
	1	Mountain View Transit Center	0	50	6	1	3	0	**60**
	2	El Camino Real	26	0	7	1	3	1	**38**
	3	Stevens Creek Blvd	8	23	0	6	5	0	**42**
	4	Saratoga Ave	0	1	1	0	1	0	**3**
	5	Bascom Ave	10	22	13	27	0	12	**84**
	6	Ohlone-Chynoweth LRT Station	1	2	1	1	7	0	**12**
	Total		**45**	**98**	**28**	**36**	**19**	**13**	**239**

Source: Study team calculations

Table A-20 AM and PM Peak Period Ridership - Alternative 4-2, Option 2

	ID	Station	Destination 1	2	3	4	5	6	Total
		AM Peak Period							
Origin	1	Mountain View Transit Center	0	26	9	1	7	0	**43**
	2	El Camino Real	62	0	22	1	15	1	**101**
	3	De Anza College Transit Center	7	8	0	2	8	0	**25**
	4	West Valley College Transit Center	0	0	1	0	8	0	**9**
	5	Good Samaritan Hospital	7	7	12	11	0	4	**41**
	6	Ohlone-Chynoweth LRT Station	1	1	2	1	28	0	**33**
	Total		**77**	**42**	**46**	**16**	**66**	**5**	**252**
		PM Peak Period							
	1	Mountain View Transit Center	0	48	4	0	3	0	**55**
	2	El Camino Real	26	0	5	0	3	0	**34**
	3	De Anza College Transit Center	8	25	0	1	5	0	**39**
	4	West Valley College Transit Center	1	2	2	0	12	0	**17**
	5	Good Samaritan Hospital	14	30	13	6	0	13	**76**
	6	Ohlone-Chynoweth LRT Station	1	1	1	0	7	0	**10**
	Total		**50**	**106**	**25**	**7**	**30**	**13**	**231**

Source: Study team calculations

Table A-21 AM and PM Peak Period Ridership Summary

Routing Scenario	Time Period	Alternative				
		3-1	3-2	3-3	4-1	4-2
Option 1	AM Peak Period	168	296	291	293	262
	PM Peak Period	143	274	270	271	239
	Sum of AM and PM Peak Periods	**311**	**570**	**561**	**564**	**501**
Option 2	AM Peak Period	150	276	262	276	252
	PM Peak Period	122	256	244	255	231
	Sum of AM and PM Peak Periods	**272**	**532**	**506**	**531**	**483**

Source: Study team calculations

A.5 Additional Factors

In this study, bus travel times between the stations are a key factor used to differentiate potential SR 85 BRT ridership among the alternatives based on the travel time savings elasticity. However, several other factors that may affect ridership were not incorporated into quantitative calculations. Some of these potential factors are:

- Availability and capacity of park-and-ride lots

  Park-and-ride lots allow people living outside of the station catchment areas to access the station by private vehicle. Park-and-ride lots currently exist in the terminal stations - Mountain View Transit Center and Ohlone-Chynoweth LRT Station and are utilized by light rail transit riders. If parking is available at the proposed way stations, the SR 85 BRT transit service could potentially attract additional transit riders. However, if providing park-and-ride lots requires taking the existing commercial or residential properties, the trip generation from employment and population could be reduced. Parking lots may also have a negative impact on the perceived quality of the built environment.

  Apart from availability, capacity makes a difference. The park-and-ride lot would be more attractive to transit riders if it is easy for them to find parking spaces.

- Population/employment growth

  The current ridership development is based on the current observed work-related trips. In the future, there could be more potential transit riders utilizing the SR 85 BRT service coming from the population and employment growths along the SR 85 BRT corridor.

- Service frequency

  If the service is more frequent, it would reduce the wait time at the stations and therefore be more attractive to transit riders. A 2011 study published by the Victoria Transport

Policy Institute[3] found that the time spent walking to and waiting for transit vehicles generally has unit costs (in terms of travelers' perception of delay) averaging two to five times higher than in-vehicle time. Therefore, reducing the wait time by the same amount as in-vehicle travel time could result in higher ridership gain per unit time reduction.

- Service reliability

  Service reliability affects potential wait time and in-vehicle travel time spent by transit riders. Higher service reliability could potentially lead to higher ridership. The same Victoria Transport Policy Institute's study suggests that improvements in reliability should be valued at a higher rate, reflecting the higher unit costs of unexpected delay. Each minute of delay beyond the published schedule should be valued at three to five times the standard in-vehicle travel time.

[3] Todd Litman (2011), Valuing Transit Service Quality Improvements: Considering Comfort and Convenience in Transport Project Evaluation, Victoria Transport Policy Institute (www.vtpi.org); at http://www.trpa.org/documents/rseis/New%20References%20for%20Final%20EIS/Victoria%20Transport%20Policy%20Institute%202011.pdf

APPENDIX B

TRAFFIC

Appendix B - Traffic

B.1 Introduction

Included in this appendix are the details of the data collection and methodology for the traffic analysis used to evaluate the SR 85 improvement alternatives. Also provided is a comparison of the traffic operations performance results terms of vehicle miles of travel and miles of congestion, as well as other performance measures.

The traffic analysis was limited to the SR 85 freeway mainline and spanned the length of SR 85 corridor study area, SR 85 between SR 87 in the south and US 101 in the north. The traffic analysis was conducted for a 6-hour AM peak period (6 am to 12 pm) and a 6-hour PM peak period (2 pm to 8 pm) with volume and speed data collected between 6 am and 8 pm.

This Appendix is organized into the following six sections:

1. Introduction to the traffic analysis
2. Traffic volume data collection/processing for Alternative 1-1 No Change
3. Traffic speed data collection/processing for no change alternative
4. A spreadsheet-based sketch planning traffic operations model to estimate changes in volumes and speeds under the following build alternatives:
    - 2-1 HOV to Express Lane Conversion
    - 2-2 Short Dual Express Lane
    - 2-3 Long Dual Express Lane
    - 3-1 Short Median Transit Lane
    - 3-2 Long Median Transit Lane alternative
    - 3-3 Right Side Median Transit Lane alternative
    - 4-1 Median Bus on Shoulder alternative
    - 4-4 Right Side Bus on Shoulder alternative
5. McTrans' Highway Capacity Software Version 7 (HCS7) based special case analysis of proposed El Camino Real interchange reconfiguration from a cloverleaf to a diamond (included in all build alternatives).
6. Comparison of traffic operations performance results

Santa Clara Valley Transportation Authority (VTA) and City/County Association of Governments (C/CAG) of San Mateo County Regional Travel Demand Model was not available to use in this traffic analysis.

B.2 Traffic Volume Data Collection/Processing

B.2.1 Field Traffic Counts and Surveys

Traffic counts and surveys on the mainline and ramps along SR 85 were collected as follows:

- **Traffic and vehicle classification counts on SR 85 mainline segments** were conducted using a video data collection method from four (4) freeway overpass locations as shown in **Figure B-1**. The traffic count data was collected in both directions of traffic for 14 hours (6 am to 8 pm), in15-minute interval in February 2020. Vehicle classes included: auto, bus and truck. The counts were also separated into general purpose or GP lanes and high occupancy vehicle or HOV lanes.

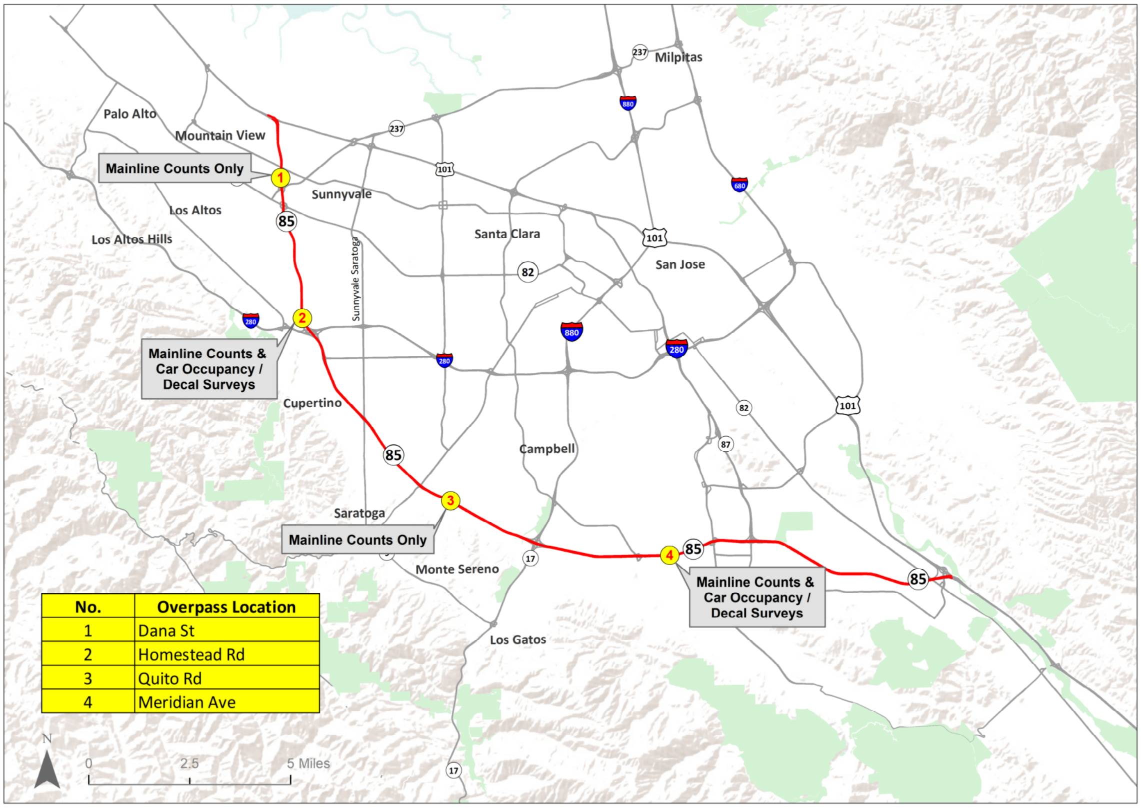
- **Occupancy and clean air vehicle decal (CAV decal) surveys on high occupancy vehicle (HOV) lanes only** were conducted at two (2) out of these four (4) freeway overpass locations, as identified in **Figure B-1**. The survey data were collected on high occupancy vehicle (HOV) lanes only in both directions of traffic for 2 morning hours (7 am to 9 am) and 2 evening hours (4 pm to 6 pm), by 15-minute interval in February 2020.

- **Traffic and vehicle classification counts on SR 85 ramps** were conducted using pneumatic tube data collection at fifty (50) ramps spread over thirteen (13) interchange locations as shown in **Figure B-2**. This excludes all freeway-to-freeway interchange ramps, the volumes for which were estimated using an alternate data source and method as explained in **Section B.2.2**. These counts were also collected in both directions of traffic for 14 hours (6 am to 8 pm), in 15-minute intervals in February 2020. Vehicle classes included: auto, bus and truck.

Due to a large number of locations, the counts and surveys were conducted over multiple midweek days (Tuesday to Thursday) in February 2020[1] as summarized in **Tables B-1** and **B-2**.

[1] Prior to the advent of California and SF Bay Area coronavirus / COVID-19 stay home orders of 2020.

Figure B-1 Locations of SR 85 Mainline Counts and Surveys Data Collection



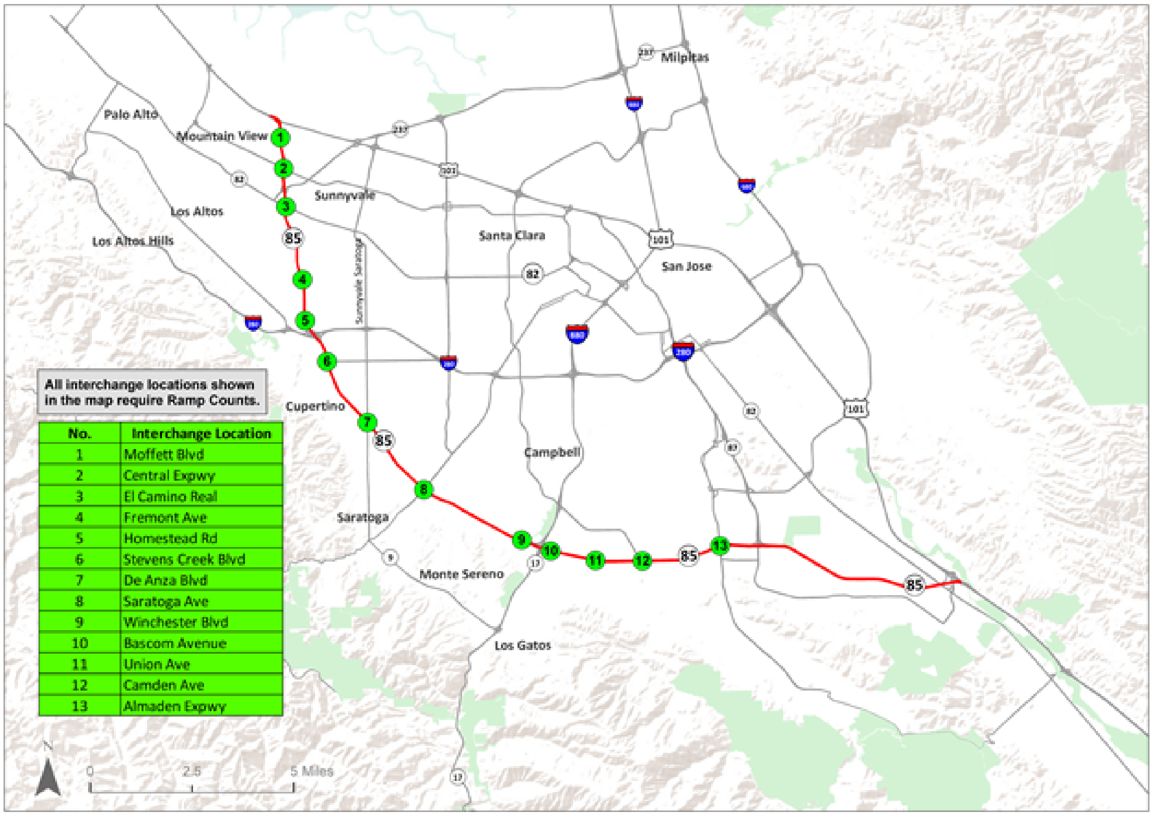
Source: SR 85 Transit Guideway Study Task 1 Report Basemap; CDM Smith.

Table B-1 Dates of SR 85 Mainline Counts and Surveys Data Collection

Map ID	Location ID	Count Location	Type	Data Collection Method	Date (Day of the Week)	Times
Fig. B-1 #1	ML-3	SR 85 at Dana Street	Traffic Counts & Vehicle Classification	Video	2/4/2020 (Tue)	6 AM - 8 PM
Fig. B-1 #2	ML-1	SR 85 at Homestead Road	Traffic Counts & Vehicle Classification	Video	2/4/2020 (Tue)	6 AM - 8 PM
Fig. B-1 #3	ML-4	SR 85 at Quito Road	Traffic Counts & Vehicle Classification	Video	2/6/2020 (Thu)	6 AM - 8 PM
Fig. B-1 #4	ML-2	SR 85 at Meridian Avenue	Traffic Counts & Vehicle Classification	Video	2/11/2020 (Tue)	6 AM - 8 PM
Fig. B-1 #2	ML-1	SR 85 at Homestead Road	HOV Lane Occupancy Counts	Manual	2/5/2020 (Wed)	7 AM - 9 AM 4 PM - 6 PM
Fig. B-1 #4	ML-2	SR 85 at Meridian Avenue	HOV Lane Occupancy Counts	Manual	2/11/2020 (Tue)	7 AM - 9 AM 4 PM - 6 PM
Fig. B-1 #2	ML-1	SR 85 at Homestead Road	Clean Air Vehicle Decal Counts	Manual	2/13/2020 (Thu)	7 AM - 9 AM 4 PM - 6 PM
Fig. B-1 #4	ML-2	SR 85 at Meridian Avenue	Clean Air Vehicle Decal Counts	Manual	2/11/2020 (Tue)	7 AM - 9 AM 4 PM - 6 PM

Source: Quality Counts, a subcontractor to CDM Smith.

Figure B-2 Locations of SR 85 Interchanges (Ramps) Counts Data Collection



Source: SR 85 Transit Guideway Study Task 1 Report Basemap; CDM Smith.

Table B-2 Dates of SR 85 Ramp Counts Data Collection

Map ID	Location ID	Count Location	Type	Data Collection Method	Date	Times
Fig. B-2 #1	RM-1	SR 85 SB On Ramp from Moffett Blvd	Traffic Counts & Vehicle Classification	Tube	2/4/2020 (Tue)	6 AM - 8 PM
Fig. B-2 #1	RM-2	SR 85 NB Off Ramp to Moffett Blvd	Traffic Counts & Vehicle Classification	Tube	2/4/2020 (Tue)	6 AM - 8 PM
Fig. B-2 #2	RM-3	SR 85 SB Off Ramp to Central Expy	Traffic Counts & Vehicle Classification	Tube	2/4/2020 (Tue)	6 AM - 8 PM
Fig. B-2 #2	RM-4	SR 85 SB On Ramp from Central Expy	Traffic Counts & Vehicle Classification	Tube	2/4/2020 (Tue)	6 AM - 8 PM
Fig. B-2 #2	RM-5	SR 85 NB On Ramp from Central Expy	Traffic Counts & Vehicle Classification	Tube	2/4/2020 (Tue)	6 AM - 8 PM
Fig. B-2 #2	RM-6	SR 85 NB Off Ramp to Central Expy	Traffic Counts & Vehicle Classification	Tube	2/4/2020 (Tue)	6 AM - 8 PM
Fig. B-2 #3	RM-7	SR 85 SB On Ramp from WB El Camino Real	Traffic Counts & Vehicle Classification	Tube	2/4/2020 (Tue)	6 AM - 8 PM
Fig. B-2 #3	RM-8	SR 85 NB Off Ramp to WB El Camino Real	Traffic Counts & Vehicle Classification	Tube	2/4/2020 (Tue)	6 AM - 8 PM
Fig. B-2 #3	RM-9	SR 85 NB On Ramp from WB El Camino Real	Traffic Counts & Vehicle Classification	Tube	2/4/2020 (Tue)	6 AM - 8 PM
Fig. B-2 #3	RM-10	SR 85 NB Off Ramp to EB El Camino Real	Traffic Counts & Vehicle Classification	Tube	2/4/2020 (Tue)	6 AM - 8 PM
Fig. B-2 #3	RM-11	SR 85 NB On Ramp from EB El Camino Real	Traffic Counts & Vehicle Classification	Tube	2/4/2020 (Tue)	6 AM - 8 PM

Map ID	Location ID	Count Location	Type	Data Collection Method	Date	Times
Fig. B-2 #3	RM-12	SR 85 SB Off Ramp to EB El Camino Real	Traffic Counts & Vehicle Classification	Tube	2/4/2020 (Tue)	6 AM - 8 PM
Fig. B-2 #3	RM-13	SR 85 SB On Ramp from EB El Camino Real	Traffic Counts & Vehicle Classification	Tube	2/4/2020 (Tue)	6 AM - 8 PM
Fig. B-2 #4	RM-14	SR 85 SB Off Ramp to W Fremont Ave	Traffic Counts & Vehicle Classification	Tube	2/4/2020 (Tue)	6 AM - 8 PM
Fig. B-2 #4	RM-15	SR 85 NB Off Ramp to W Fremont Ave	Traffic Counts & Vehicle Classification	Tube	2/4/2020 (Tue)	6 AM - 8 PM
Fig. B-2 #4	RM-16	SR 85 SB On Ramp from W Fremont Ave	Traffic Counts & Vehicle Classification	Tube	2/4/2020 (Tue)	6 AM - 8 PM
Fig. B-2 #4	RM-17	SR 85 NB On Ramp from W Fremont Ave	Traffic Counts & Vehicle Classification	Tube	2/4/2020 (Tue)	6 AM - 8 PM
Fig. B-2 #5	RM-18	SR 85 SB Off Ramp to Homestead Rd	Traffic Counts & Vehicle Classification	Tube	2/4/2020 (Tue)	6 AM - 8 PM
Fig. B-2 #5	RM-19	SR 85 NB On Ramp from Homestead Rd	Traffic Counts & Vehicle Classification	Tube	2/4/2020 (Tue)	6 AM - 8 PM
Fig. B-2 #6	RM-20	SR 85 SB Off Ramp to Stevens Creek Blvd	Traffic Counts & Vehicle Classification	Tube	2/4/2020 (Tue)	6 AM - 8 PM
Fig. B-2 #6	RM-21	SR 85 NB Off Ramp to Stevens Creek Blvd	Traffic Counts & Vehicle Classification	Tube	2/4/2020 (Tue)	6 AM - 8 PM
Fig. B-2 #6	RM-22	SR 85 SB On Ramp from Stevens Creek Blvd	Traffic Counts & Vehicle Classification	Tube	2/4/2020 (Tue)	6 AM - 8 PM
Fig. B-2 #7	RM-23	SR 85 NB On Ramp from S De Anza Blvd	Traffic Counts & Vehicle Classification	Tube	2/6/2020 (Thu)	6 AM - 8 PM
Fig. B-2 #7	RM-24	SR 85 SB On Ramp from S De Anza Blvd	Traffic Counts & Vehicle Classification	Tube	2/6/2020 (Thu)	6 AM - 8 PM
Fig. B-2 #7	RM-25	SR 85 NB Off Ramp to S De Anza Blvd	Traffic Counts & Vehicle Classification	Tube	2/6/2020 (Thu)	6 AM - 8 PM
Fig. B-2 #7	RM-26	SR 85 SB Off Ramp to S De Anza Blvd	Traffic Counts & Vehicle Classification	Tube	2/6/2020 (Thu)	6 AM - 8 PM
Fig. B-2 #8	RM-27	SR 85 NB On Ramp from Saratoga Ave	Traffic Counts & Vehicle Classification	Tube	2/6/2020 (Thu)	6 AM - 8 PM
Fig. B-2 #8	RM-28	SR 85 SB On Ramp from Saratoga Ave	Traffic Counts & Vehicle Classification	Tube	2/6/2020 (Thu)	6 AM - 8 PM
Fig. B-2 #8	RM-29	SR 85 SB Off Ramp to Saratoga Ave	Traffic Counts & Vehicle Classification	Tube	2/6/2020 (Thu)	6 AM - 8 PM
Fig. B-2 #8	RM-30	SR 85 NB Off Ramp to Saratoga Ave	Traffic Counts & Vehicle Classification	Tube	2/6/2020 (Thu)	6 AM - 8 PM
Fig. B-2 #9	RM-31	SR 85 NB On Ramp from Winchester Blvd	Traffic Counts & Vehicle Classification	Tube	2/6/2020 (Thu)	6 AM - 8 PM
Fig. B-2 #9	RM-32	SR 85 SB Off Ramp to Winchester Blvd	Traffic Counts & Vehicle Classification	Tube	2/6/2020 (Thu)	6 AM - 8 PM
Fig. B-2 #10	RM-33	SR 85 NB On Ramp from S Bascom Ave	Traffic Counts & Vehicle Classification	Tube	2/11/2020 (Tue)	6 AM - 8 PM
Fig. B-2 #10	RM-34	SR 85 SB On Ramp from S Bascom Ave	Traffic Counts & Vehicle Classification	Tube	2/11/2020 (Tue)	6 AM - 8 PM
Fig. B-2 #10	RM-35	SR 85 NB Off Ramp to S Bascom Ave	Traffic Counts & Vehicle Classification	Tube	2/11/2020 (Tue)	6 AM - 8 PM
Fig. B-2 #10	RM-36	SR 85 SB Off Ramp to S Bascom Ave	Traffic Counts & Vehicle Classification	Tube	2/11/2020 (Tue)	6 AM - 8 PM
Fig. B-2 #11	RM-37	SR 85 NB Off Ramp to Union Ave	Traffic Counts & Vehicle Classification	Tube	2/11/2020 (Tue)	6 AM - 8 PM
Fig. B-2 #11	RM-38	SR 85 SB Off Ramp to Union Ave	Traffic Counts & Vehicle Classification	Tube	2/11/2020 (Tue)	6 AM - 8 PM

Map ID	Location ID	Count Location	Type	Data Collection Method	Date	Times
Fig. B-2 #11	RM-39	SR 85 NB On Ramp from Union Ave	Traffic Counts & Vehicle Classification	Tube	2/11/2020 (Tue)	6 AM - 8 PM
Fig. B-2 #11	RM-40	SR 85 SB On Ramp from Union Ave	Traffic Counts & Vehicle Classification	Tube	2/11/2020 (Tue)	6 AM - 8 PM
Fig. B-2 #12	RM-41	SR 85 NB On Ramp from Camden Ave	Traffic Counts & Vehicle Classification	Tube	2/11/2020 (Tue)	6 AM - 8 PM
Fig. B-2 #12	RM-42	SR 85 SB On Ramp from Camden Ave	Traffic Counts & Vehicle Classification	Tube	2/11/2020 (Tue)	6 AM - 8 PM
Fig. B-2 #12	RM-43	SR 85 SB Off Ramp to Camden Ave	Traffic Counts & Vehicle Classification	Tube	2/11/2020 (Tue)	6 AM - 8 PM
Fig. B-2 #12	RM-44	SR 85 NB Off Ramp to Branham Ln	Traffic Counts & Vehicle Classification	Tube	2/11/2020 (Tue)	6 AM - 8 PM
Fig. B-2 #13	RM-45	SR 85 NB On Ramp from SB Almaden Expy	Traffic Counts & Vehicle Classification	Tube	2/11/2020 (Tue)	6 AM - 8 PM
Fig. B-2 #13	RM-46	SR 85 NB On Ramp from NB Almaden Expy	Traffic Counts & Vehicle Classification	Tube	2/11/2020 (Tue)	6 AM - 8 PM
Fig. B-2 #13	RM-47	SR 85 NB Off Ramp to Almaden Expy	Traffic Counts & Vehicle Classification	Tube	2/11/2020 (Tue)	6 AM - 8 PM
Fig. B-2 #13	RM-48	SR 85 SB Off Ramp to Almaden Plaza Way	Traffic Counts & Vehicle Classification	Tube	2/11/2020 (Tue)	6 AM - 8 PM
Fig. B-2 #13	RM-49	SR 85 SB On Ramp from SB Almaden Expy	Traffic Counts & Vehicle Classification	Tube	2/11/2020 (Tue)	6 AM - 8 PM
Fig. B-2 #13	RM-50	SR 85 SB On Ramp from Almaden Expy	Traffic Counts & Vehicle Classification	Tube	2/11/2020 (Tue)	6 AM - 8 PM

Source: Quality Counts, a sub consultant to CDM Smith

B.2.2 Other Traffic Counts

Other sources of traffic counts were used to compare and adjust the field traffic counts collected in February 2020 (see **Section B.2.1**) when needed. Other sources were also used to estimate traffic volumes on the ramps that are freeway-to-freeway interchanges, which were not collected in the field but were required to produce balanced flow volumes[2] for the SR 85 corridor.

B.2.2.1 Caltrans Traffic Census Counts

Seven-day (7-day) hourly Caltrans traffic census counts dated November 2015 were collected for SR 85 at Dana Street overcrossing. The midweek day average count volume was estimated using the 7-day counts for comparison to the field mainline counts collected in February 2020.

B.2.2.2 Caltrans Performance Measurement System (PeMS) Counts

Hourly counts averaged over the midweek days in February 2020[3] were collected from the Caltrans Performance Measurement System (PeMS) data portal for comparison to the field mainline counts collected in February 2020.

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[2] "Balanced" flow volumes refer to a situation where the total inflow volumes to SR 85 corridor (via start of mainline or on-ramps) equals the total outflow volumes from SR 85 corridor (via end of mainline or off-ramps).

[3] In the week of February 4 (Tuesday) to February 6 (Thursday) of the year 2020, which matches with one of the weeks for the field data collection.

B.2.2.3 SR 85 Transit Guideway Study Phase 1 Report Balanced Volumes

From the Phase 1 Report of this Study, hourly balanced flow volume estimates dated April 2019 were available for the SR 85 corridor. These were developed by a consultant to VTA (Parsons) using an older field data collection effort. These volume estimates were used to compare with the field mainline counts collected in February 2020 and to derive estimates of traffic volumes on the ramps with freeway-to-freeway interchanges that fall within the traffic analysis limits of the SR 85 corridor. These include, from north to south: SR 85 at SR 237 (4 ramps in total for both directions); SR 85 at I-280 (6 ramps in total for both directions); and, SR 85 at 17 (4 ramps total for both directions).

B.2.3 Traffic Counts Data Processing

As noted previously, given the large number of locations, the counts and surveys were conducted over multiple midweek days in February 2020. There was no repetition of any count site. These counts are subject to day-to-day variations but have been combined for modeling traffic operations. There has been on a steady increase in the annual average employment in Santa Clara County since 2009, increasing from 782,400 in 2009 to 1,027,500 in 2019[4]. Steady growth in vehicular traffic volumes on the SR 85 corridor are expected. For these reasons, adjustments were performed on the traffic counts.

Disclaimer: Note that the traffic volume estimates made in this traffic analysis are based on the travel conditions prior to the advent of California and SF Bay Area coronavirus / COVID-19 stay home orders of 2020.

B.2.3.1 SR 85 Mainline Traffic Adjustments

Peak directional traffic counts taken at four mainline sites in February 2020 were compared to the peak directional average traffic volumes at the same sites computed from the three other sources including Caltrans Traffic Census Counts, Caltrans PeMS Counts and SR 85 Transit Guideway Study Phase 1 Report Balanced Volumes. The comparisons were made for the total counts over the following peak directions of traffic flow: Northbound AM (morning) peak period of 6 am to 12 pm and Southbound PM (evening) peak period of 2 pm to 8 pm. For each mainline site, if the average of the comparable data was higher than the February 2020 traffic count then the count was adjusted to the average of the comparable data, if not the count was used without any adjustment. The calculatedf mainline adjustment factors were applied to the 15-minute interval mainline counts to estimate unbalanced 15-minute interval mainline volumes. **Table B-3** shows the comparison of traffic volumes on the mainline count locations and estimated adjustment factors by peak direction.

Figures B-3 through **B-10** show a comparison of the raw 15-minute interval counts and unbalanced 15-minute interval volumes after application of the adjustment factors.

[4] California Employment Development Department, Historical Data for Unemployment Rate and Labor Force (Not Seasonally Adjusted) in Santa Clara County, Available at: https://www.labormarketinfo.edd.ca.gov/ (last accessed on May 11, 2020)

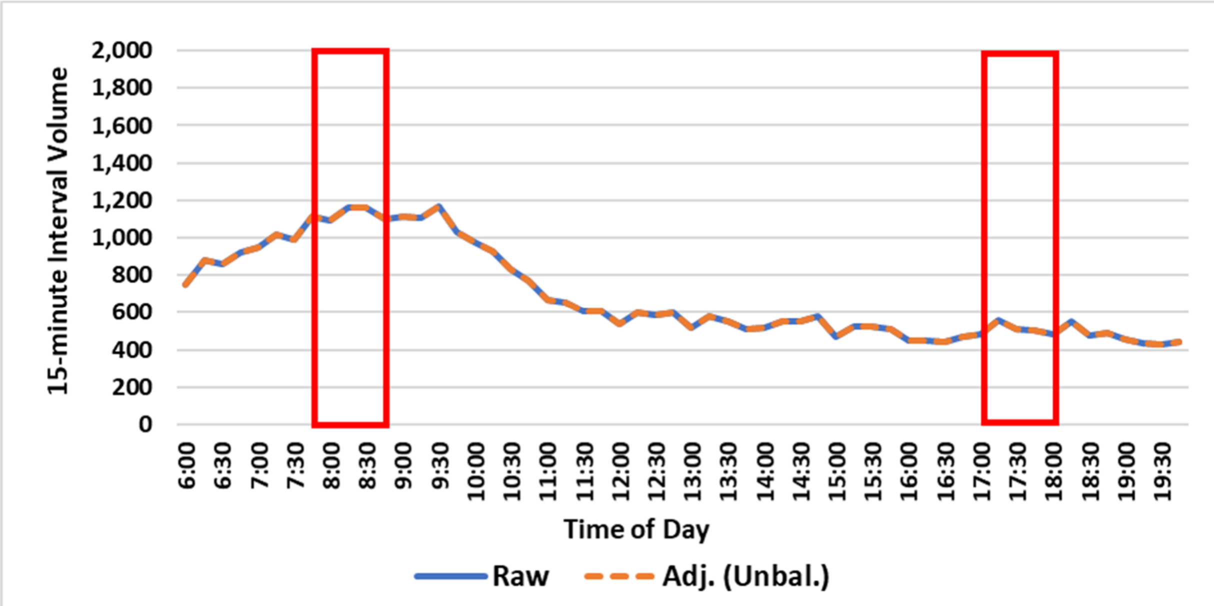
Table B-3 Comparisons of February 2020 SR 85 Mainline Counts with Volumes from Other Sources by Peak Direction of Travel

Map ID	Location ID	Count Location	Dir.	Time Period	Feb 2020 Traffic Count	Comp. Data #1 - Census Traffic Count	Comp. Data #2 -PeMS Traffic Count	Comp. Data #3 – Ph. 1 Report Traffic Volume	Avg. of Comp. Data – Traffic Volume	Adjustment Factor
Fig. B-1 #1	ML-3	SR 85 at Dana Street	NB	AM	**22,451**	21,875	23,404	21,106	**22,129**	**1.00**
			SB	PM	**19,801**	20,052	21,275	21,888	**21,072**	**1.06**
Fig. B-1 #2	ML-1	SR 85 at Homestead Road	NB	AM	**27,619**	N.A.	31,522	29,065	**30,293**	**1.10**
			SB	PM	**29,198**	N.A.	30,820	29,086	**29,953**	**1.03**
Fig. B-1 #3	ML-4	SR 85 at Quito Road	NB	AM	**30,022**	N.A.	30,663	21,688	**26,176**	**1.00**
			SB	PM	**30,047**	N.A.	28,248	27,556	**27,902**	**1.00**
Fig. B-1 #4	ML-2	SR 85 at Meridian Avenue	NB	AM	**26,558**	N.A.	26,938	16,726	**21,832**	**1.00**
			SB	PM	**30,312**	N.A.	29,264	29,425	**29,344**	**1.00**

Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; Caltrans Traffic Census Counts; Caltrans PeMS; SR 85 Transit Guideway Study Phase 1 Report; CDM Smith Analysis.

Note: Comp. = Comparable, Ph. = Phase, NB = Northbound, SB = Southbound, AM Period = 6 am to 12 pm, PM Period = 2 pm to 8 pm.

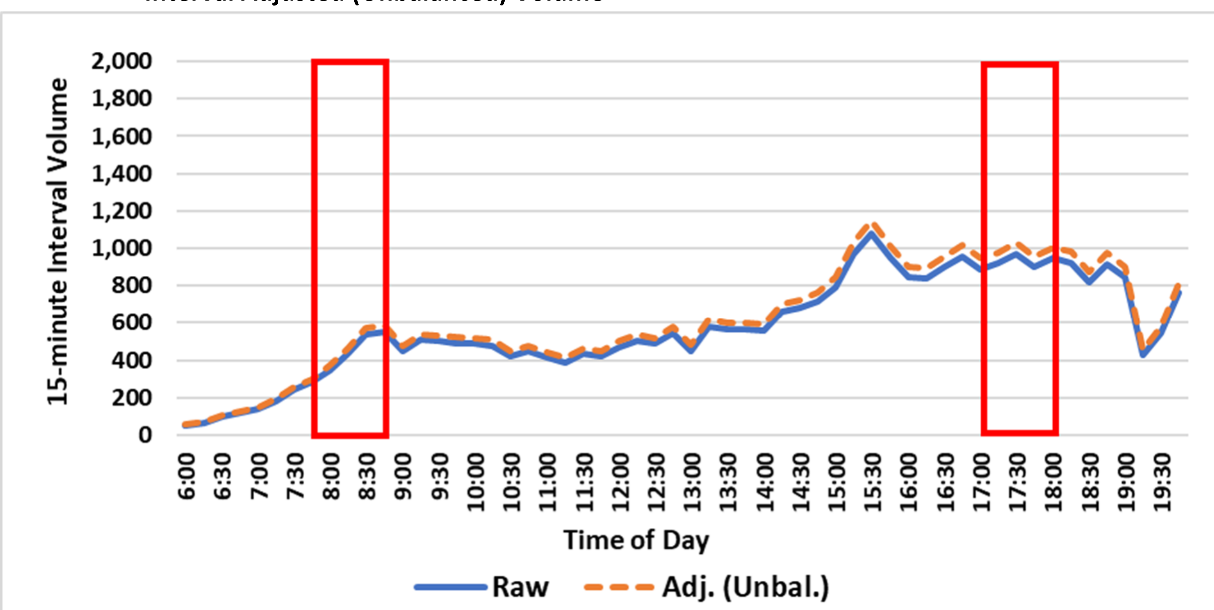
Figure B-3 SR 85 at Dana Street Northbound 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; Caltrans Traffic Census Counts; Caltrans PeMS; SR 85 Transit Guideway Study Phase 1 Report; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

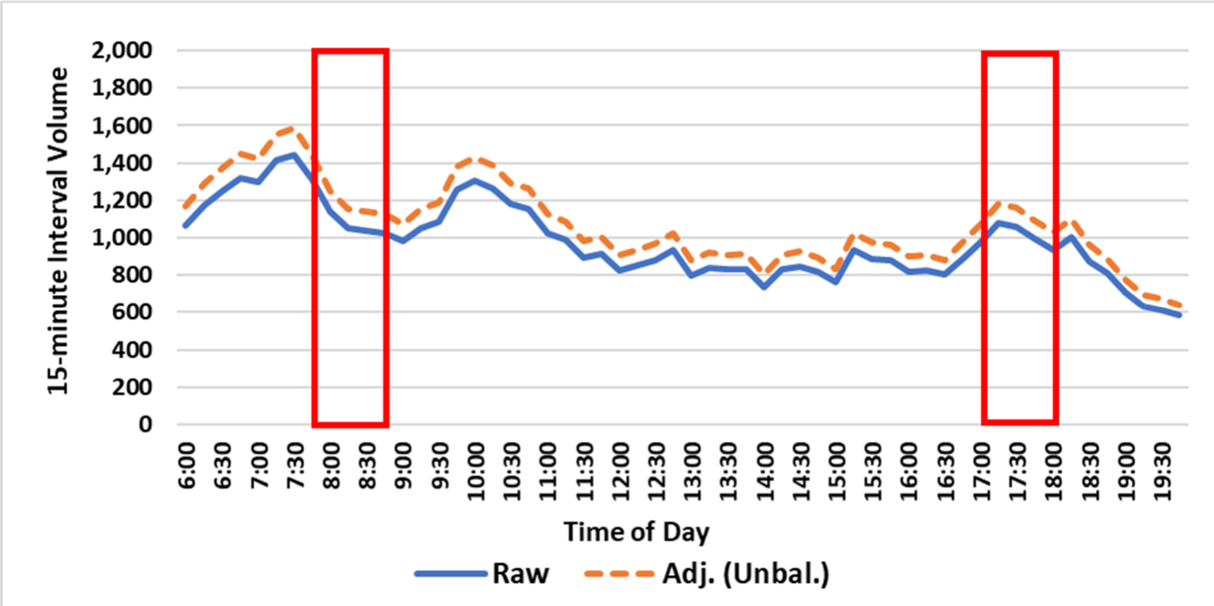
Figure B-4 SR 85 at Dana Street Southbound 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; Caltrans Traffic Census Counts; Caltrans PeMS; SR 85 Transit Guideway Study Phase 1 Report; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

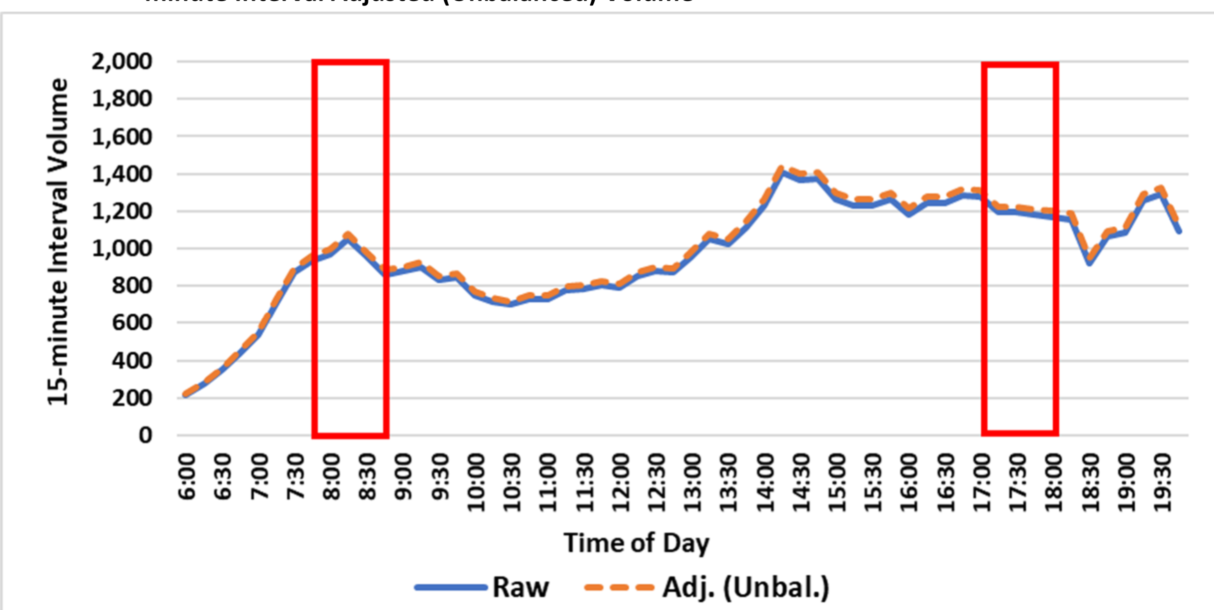
Figure B-5 SR 85 at Homestead Road Northbound 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; Caltrans Traffic Census Counts; Caltrans PeMS; SR 85 Transit Guideway Study Phase 1 Report; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

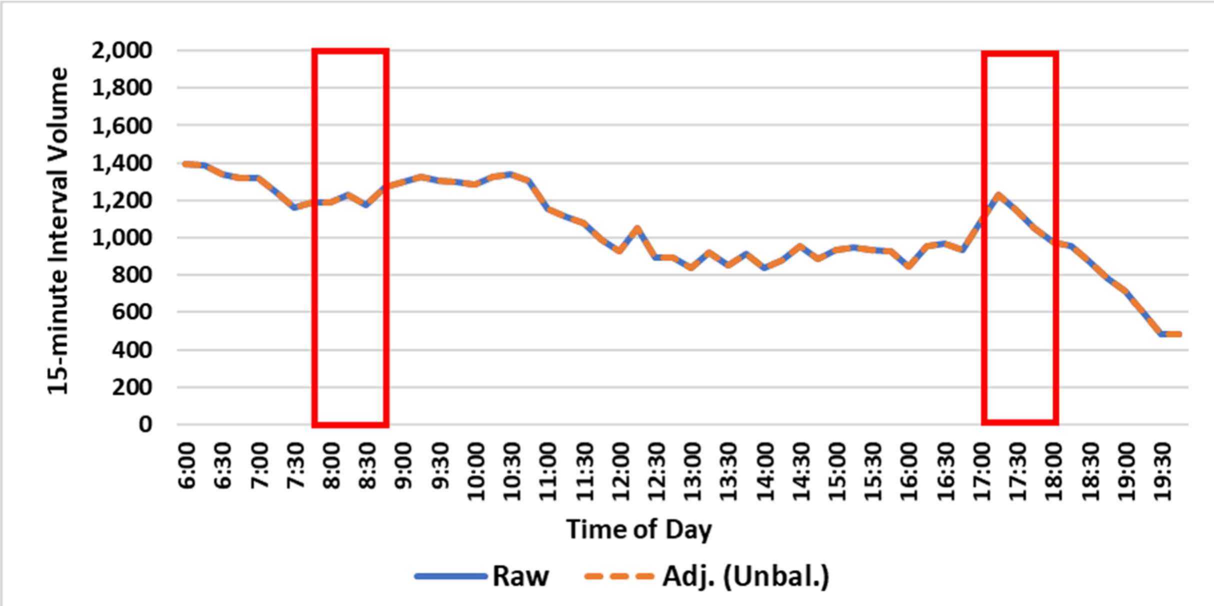
Figure B-6 SR 85 at Homestead Road Southbound 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; Caltrans Traffic Census Counts; Caltrans PeMS; SR 85 Transit Guideway Study Phase 1 Report; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

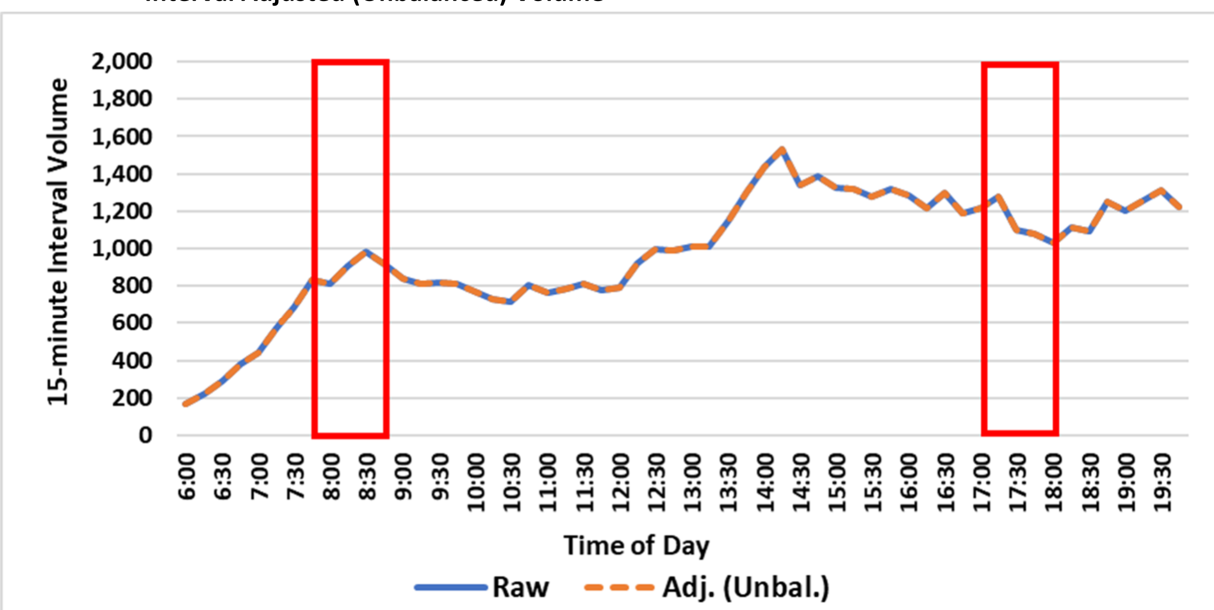
Figure B-7 SR 85 at Quito Road Northbound 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; Caltrans Traffic Census Counts; Caltrans PeMS; SR 85 Transit Guideway Study Phase 1 Report; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

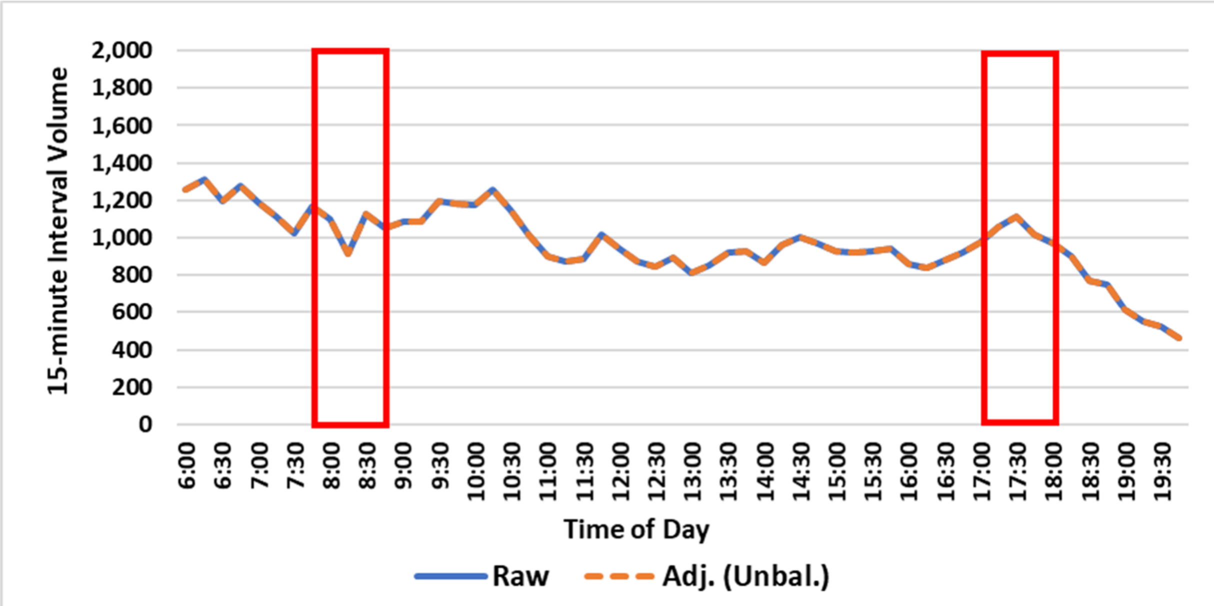
Figure B-8 SR 85 at Quito Road Southbound 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; Caltrans Traffic Census Counts; Caltrans PeMS; SR 85 Transit Guideway Study Phase 1 Report; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

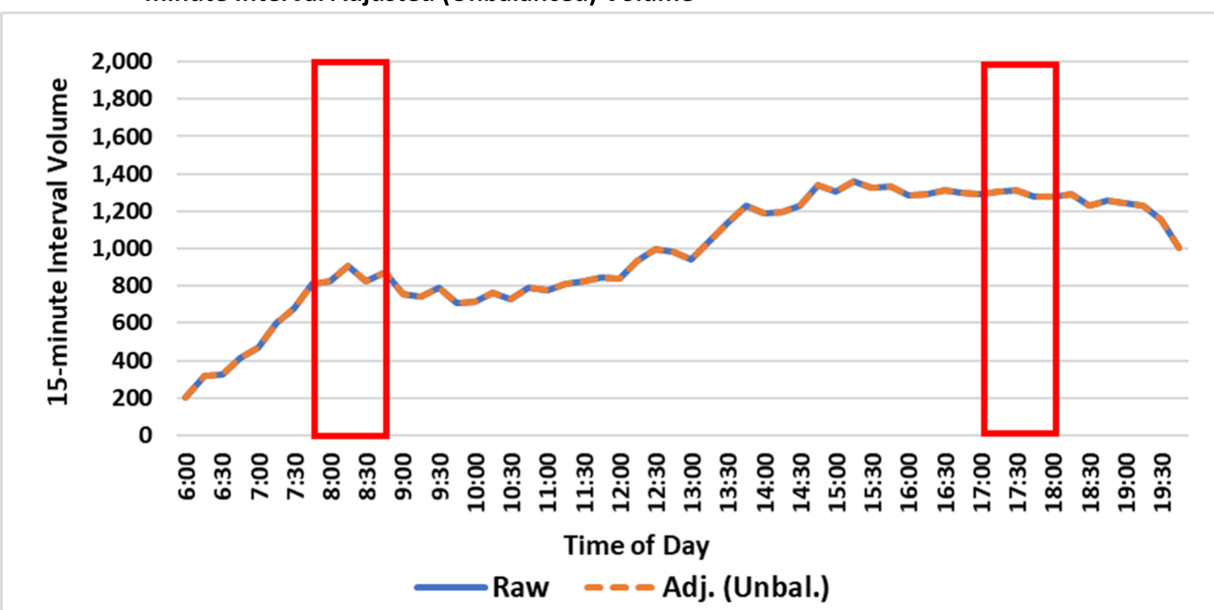
Figure B-9 SR 85 at Meridian Avenue Northbound 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; Caltrans Traffic Census Counts; Caltrans PeMS; SR 85 Transit Guideway Study Phase 1 Report; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

Figure B-10 SR 85 at Meridian Avenue Southbound 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; Caltrans Traffic Census Counts; Caltrans PeMS; SR 85 Transit Guideway Study Phase 1 Report; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

B.2.3.2 Peak Hour Determination

Peak hours on the SR 85 corridor in the AM and PM peak periods were determined based on the hour (four consecutive 15-minute intervals) with the highest combined total volume at the four mainline data collection sites. The adjusted (unbalanced) mainline volumes were used for this purpose. The AM peak hour was determined to be 7:45 am to 8:45 am and the PM peak hour was determined to be 5:00 pm to 6:00 pm, which formed 18.4 percent of AM peak period (6 am to 12 pm) and 18.1 percent of PM peak period (2 pm to 8 pm) daily combined total volume at the mainline data collection sites, respectively. The peak hours are marked as *red* rectangles in **Figures B-3** through **B-10**.

Table B-4 is showing the unbalanced volumes and vehicle classification information in the identified AM and PM peak hours for mainline locations. **Figure B-11** is showing the peak hour total volume information on mainline locations in a bar chart format. Prior to balancing, the mainline location of SR 85 at Homestead Road has the highest traffic volume of approximately 4,980 vehicles in the northbound direction in the AM peak hour; while the mainline location of SR 85 at Meridian Avenue has the highest traffic volume of 5,190 vehicles in the southbound direction in the PM peak hour.

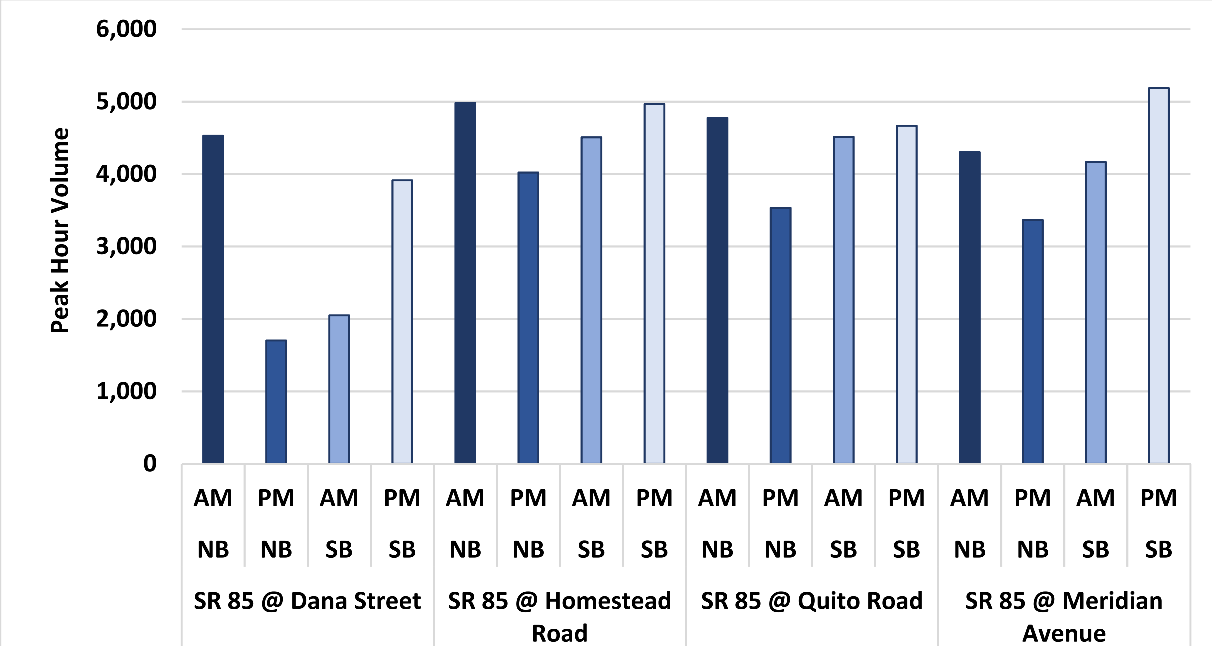
Table B-4 SR 85 AM and PM Peak Hour Unbalanced Volumes at Mainline Count Locations

Map ID	Location ID	Count Location	Dir.	Peak Hour	Non-HOV Lanes - Auto Vol.	Non-HOV Lanes - Bus Vol.	Non-HOV Lanes - Truck Vol.	Non-HOV Lanes - Total Vol.	HOV Lanes - Auto Vol.	HOV Lanes - Bus Vol.	HOV Lanes - Truck Vol.	HOV Lanes - Total Vol.	All – Auto Vol.	All – Bus Vol.	All – Truck Vol.	All Lanes - Total Vol.
Fig. B-1 #1	ML-3	SR 85 at Dana Street	NB	AM	3,140	5	23	**3,168**	1,329	30	2	**1,361**	4,469	35	25	**4,529**
			NB	PM	1,354	15	21	**1,390**	303	9	1	**313**	1,657	23	22	**1,703**
			SB	AM	1,624	12	14	**1,650**	378	17	5	**400**	2,002	29	19	**2,050**
			SB	PM	2,555	1	9	**2,565**	1,317	30	2	**1,349**	3,873	31	11	**3,914**
Fig. B-1 #2	ML-1	SR 85 at Homestead Road	NB	AM	3,394	4	36	**3,434**	1,517	29	1	**1,547**	4,911	33	37	**4,981**
			NB	PM	3,576	19	65	**3,660**	345	15	1	**361**	3,921	35	66	**4,021**
			SB	AM	4,117	24	14	**4,156**	336	15	0	**351**	4,453	39	14	**4,507**
			SB	PM	3,853	16	5	**3,875**	1,068	23	1	**1,092**	4,921	39	6	**4,966**
Fig. B-1 #3	ML-4	SR 85 at Quito Road	NB	AM	3,146	1	16	**3,163**	1,581	28	4	**1,613**	4,727	29	20	**4,776**
			NB	PM	3,122	16	10	**3,148**	379	7	0	**386**	3,501	23	10	**3,534**
			SB	AM	3,685	6	8	**3,699**	792	23	0	**815**	4,477	29	8	**4,514**
			SB	PM	3,028	5	0	**3,033**	1,605	27	2	**1,634**	4,633	32	2	**4,667**
Fig. B-1 #4	ML-2	SR 85 at Meridian Avenue	NB	AM	2,747	4	16	**2,767**	1,521	11	4	**1,536**	4,268	15	20	**4,303**
			NB	PM	2,967	10	9	**2,986**	379	1	0	**380**	3,346	11	9	**3,366**
			SB	AM	3,325	3	9	**3,337**	821	7	2	**830**	4,146	10	11	**4,167**
			SB	PM	3,550	10	4	**3,564**	1,606	8	9	**1,623**	5,156	18	13	**5,187**

Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; Caltrans Traffic Census Counts; Caltrans PeMS; SR 85 Transit Guideway Study Phase 1 Report; CDM Smith Analysis.

Note: HOV = High Occupancy Vehicle, Dir. = Direction, Vol. = Volume, NB = Northbound, SB = Southbound, AM Peak Hour = 7:45 am to 8:45 am, PM Peak Hour = 5 pm to 6 pm.

Figure B-11 SR 85 AM and PM Peak Hour Unbalanced Volumes at Mainline Count Locations



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; Caltrans Traffic Census Counts; Caltrans PeMS; SR 85 Transit Guideway Study Phase 1 Report; CDM Smith Analysis.

Note: NB = Northbound, SB = Southbound, AM Peak Hour = 7:45 am to 8:45 am, PM Peak Hour = 5 pm to 6 pm.

B.2.3.3 SR 85 Ramp Traffic Adjustments

Ramp counts were collected along SR 85 between SR 87 in the south and US 101 in the north for 50 ramps on all interchanges except freeway-to-freeway interchanges across multiple days. To smooth the spatial and temporal fluctuations over the large number of ramp counts introduced by varying mainline and cross street traffic conditions and to ease the volume balancing for the SR 85 corridor, hourly traffic counts on the ramps were aggregated and an average hourly pattern for ramp volumes was established. Before the averaging of hourly patterns, the ramps were classified into four groups:

Sec 1, Type 1: Ramps within Section 1 of SR 85 Corridor and with AM peak period (6 am to 12 pm) total volume greater than PM peak period (2 pm to 8 pm) total volume

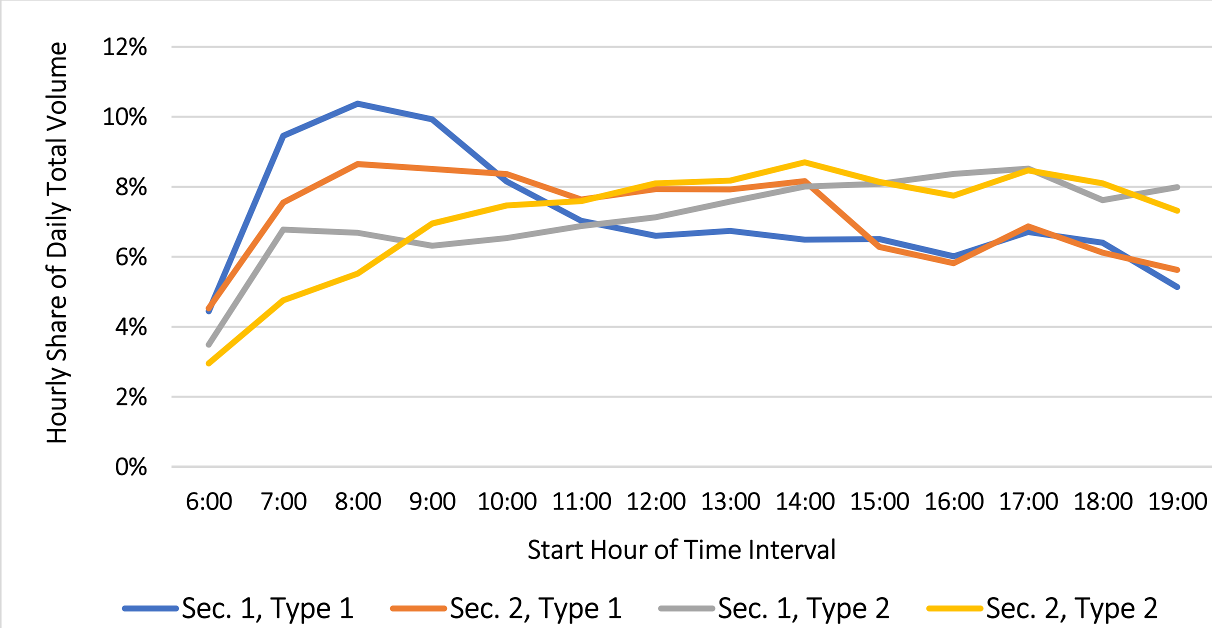
Sec 2, Type 1: Ramps within Section 2 of SR 85 Corridor and with AM peak period (6 am to 12 pm) total volume greater than PM peak period (2 pm to 8 pm) total volume

Sec 1, Type 2: Ramps within Section 1 of SR 85 Corridor and with AM peak period (6 am to 12 pm) total volume less than or equal to PM peak period (2 pm to 8 pm) total volume

Sec 2, Type 2: Ramps within Section 2 of SR 85 Corridor and with AM peak period (6 am to 12 pm) total volume less than or equal to PM peak period (2 pm to 8 pm) total volume

Figure B-12 shows the average hourly traffic distribution by ramp group type. The average hourly traffic pattern for a ramp group was applied to the 15-minute interval ramp counts for ramps within each ramp group to estimate unbalanced 15-minute interval ramp volumes. Comparison of the raw counts and unbalanced volume estimates for ramps from the north to the south along SR 85 are shown in **Figures B-13** through **B-63**.

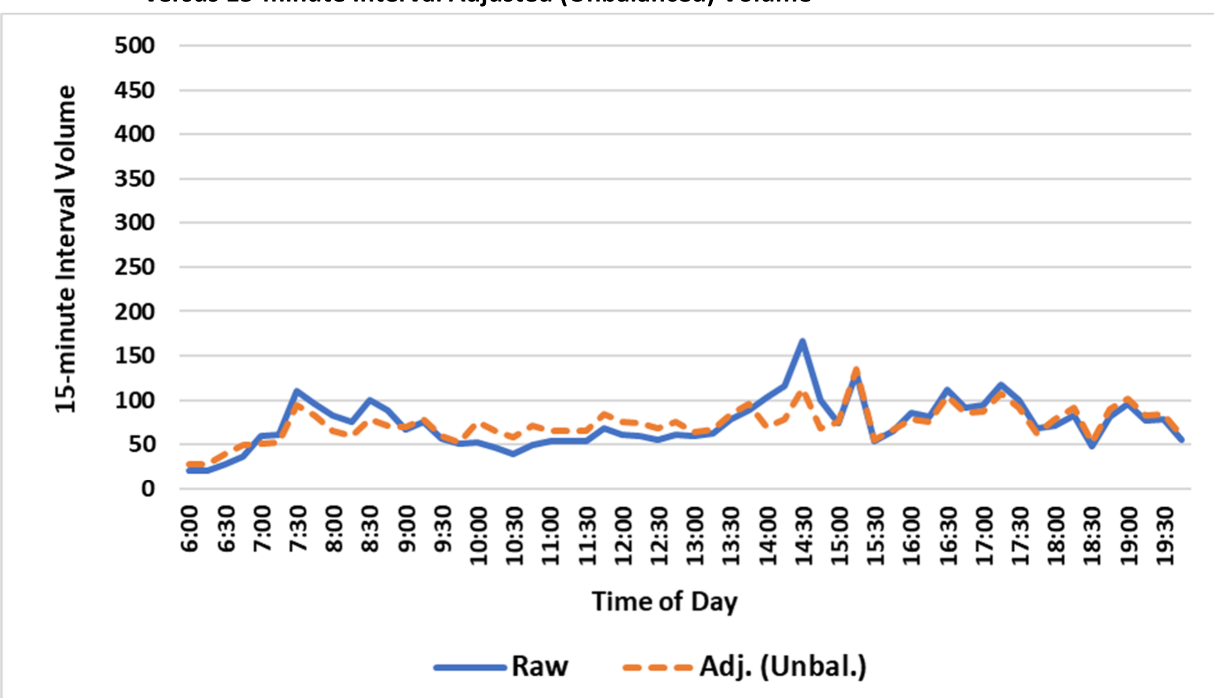
Figure B-12 SR 85 Ramp Average Hourly Traffic Distribution by Ramp Group Type



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

Note: Ramp groups are defined by Section and Type. Section can be either Sec. 1: US 101 to I-280; or Sec. 2: I-280 to SR 87. Type can be either Type 1: AM peak period (6 am to 12 pm) total volume greater than PM peak period (2 pm to 8 pm) total volume, or Type 2: AM peak period (6 am to 12 pm) total volume less than or equal to PM peak period (2 pm to 8 pm) total volume.

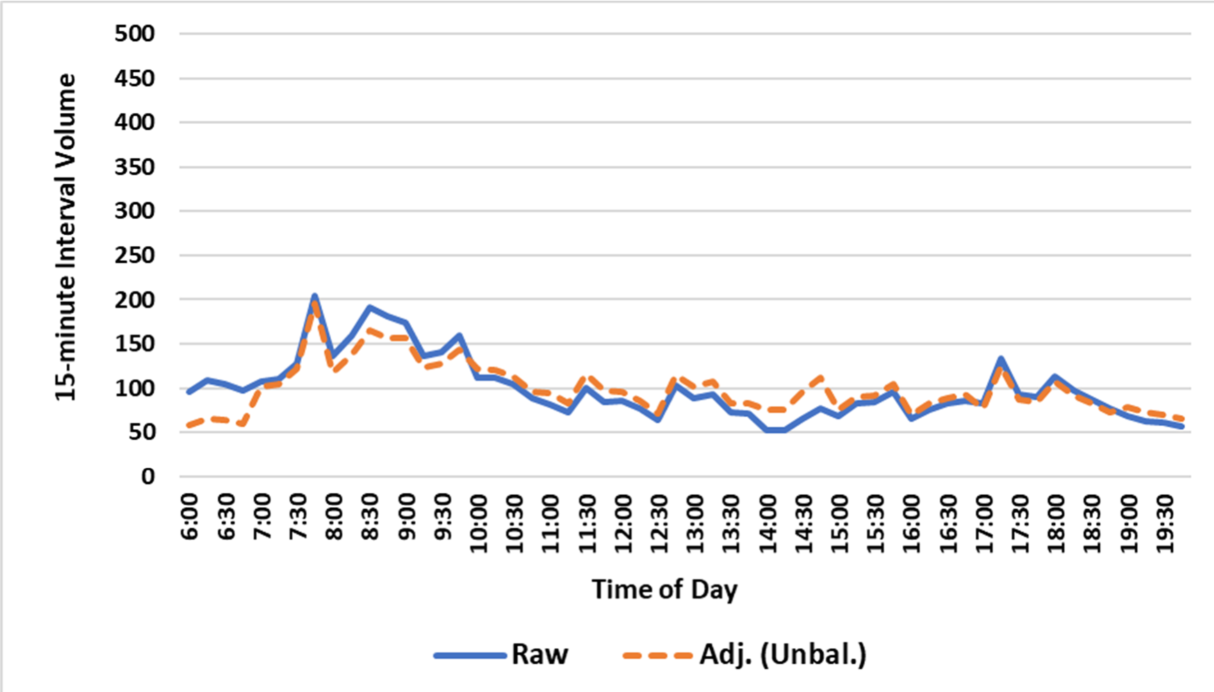
Figure B-13 SR 85 Southbound On-Ramp at Moffett Boulevard 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

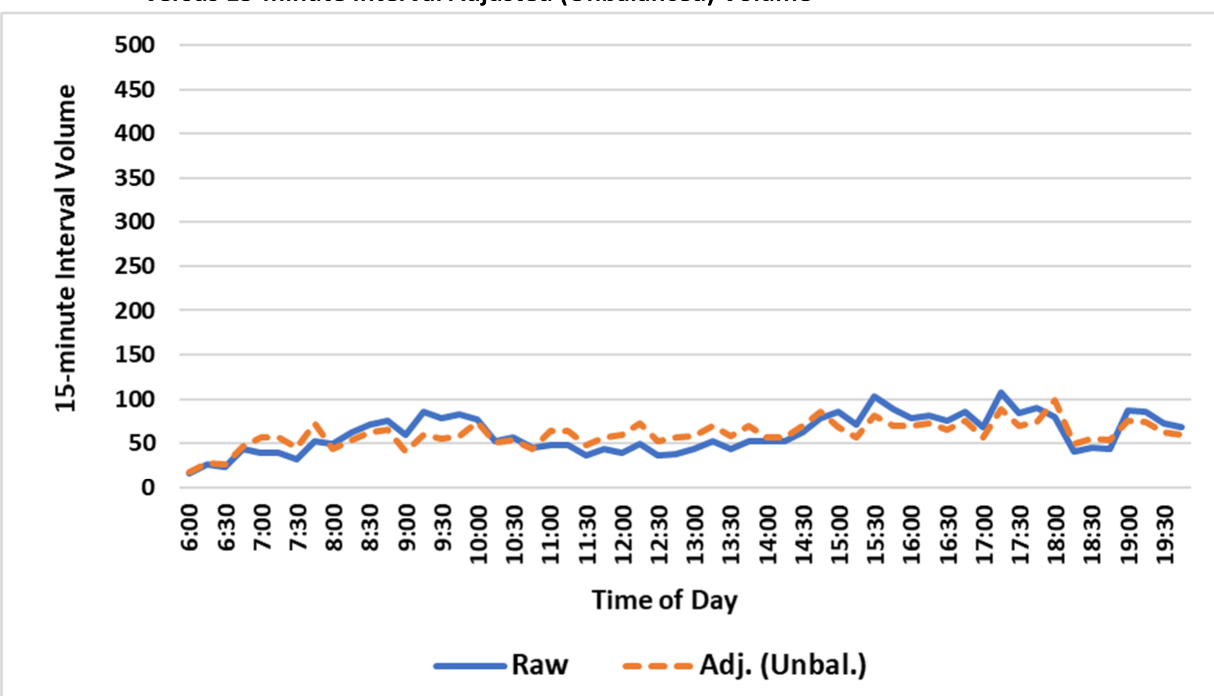
Note: Adj. = Adjusted, Unbal. = Unbalanced.

Figure B-14 SR 85 Northbound Off-Ramp at Moffett Boulevard 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



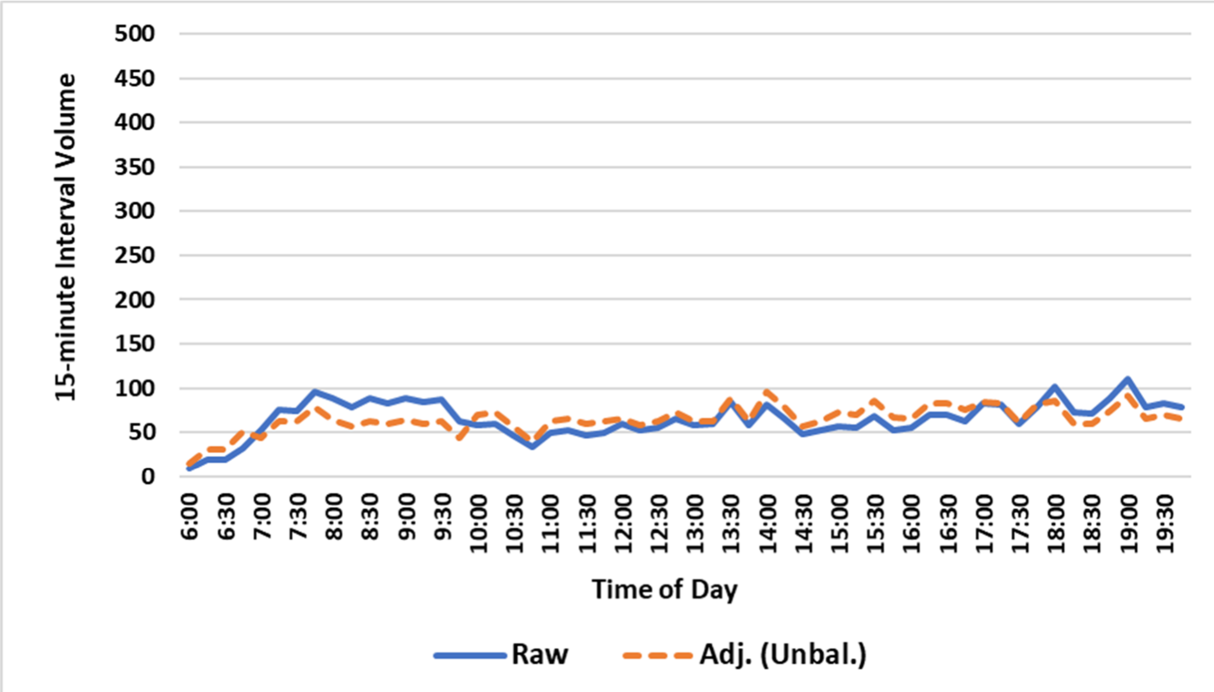
Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.
Note: Adj. = Adjusted, Unbal. = Unbalanced.

Figure B-15 SR 85 Southbound Off-Ramp at Central Expressway 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.
Note: Adj. = Adjusted, Unbal. = Unbalanced.

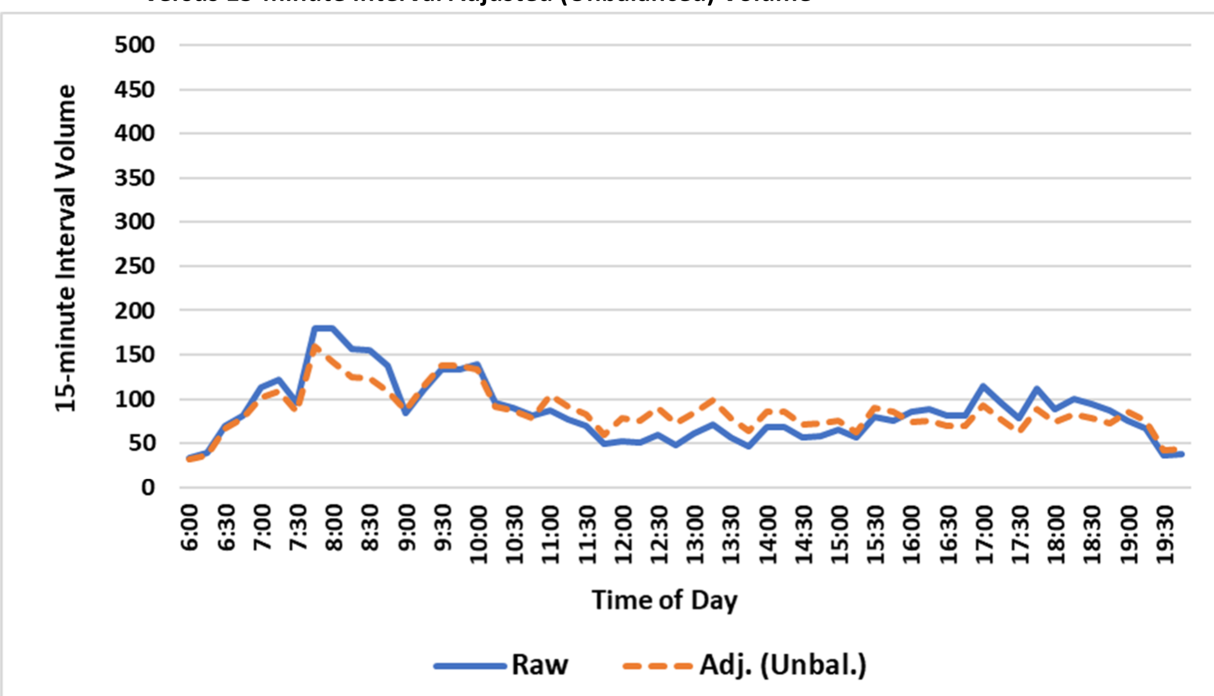
Figure B-16 SR 85 Southbound On-Ramp at Central Expressway 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

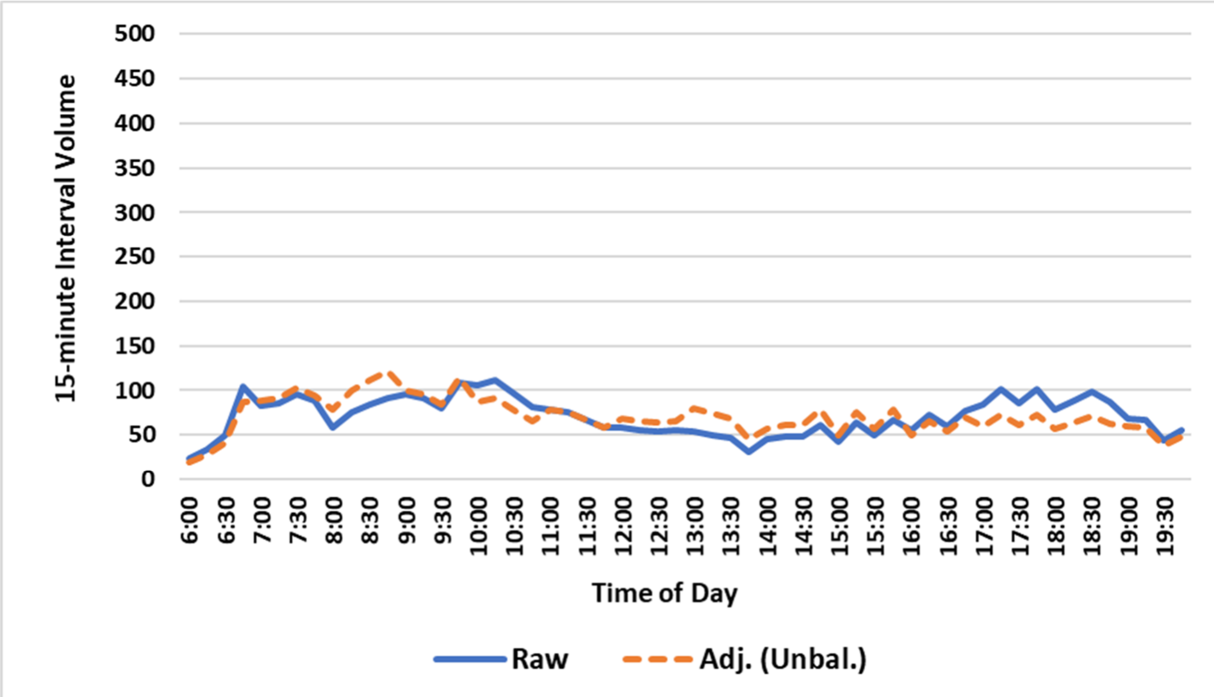
Figure B-17 SR 85 Northbound On-Ramp at Central Expressway 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

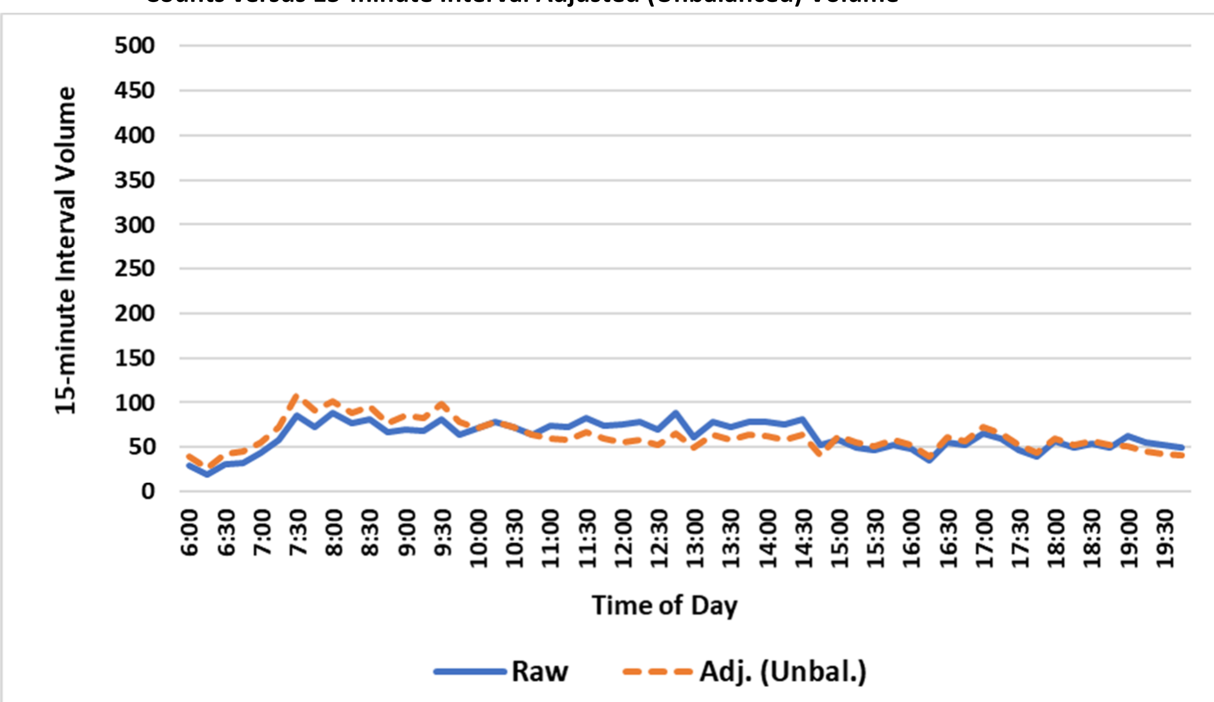
Note: Adj. = Adjusted, Unbal. = Unbalanced.

Figure B-18 SR 85 Northbound Off-Ramp at Central Expressway 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



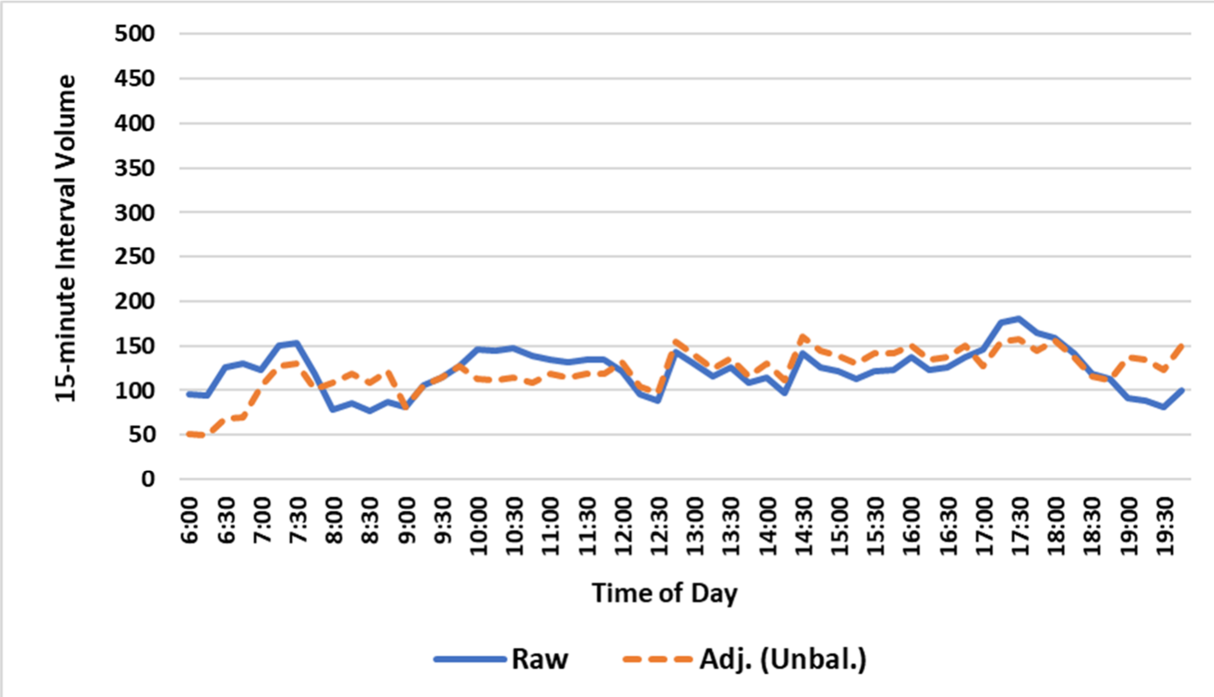
Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.
Note: Adj. = Adjusted, Unbal. = Unbalanced.

Figure B-19 SR 85 Southbound On-Ramp at Westbound El Camino Real 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.
Note: Adj. = Adjusted, Unbal. = Unbalanced.

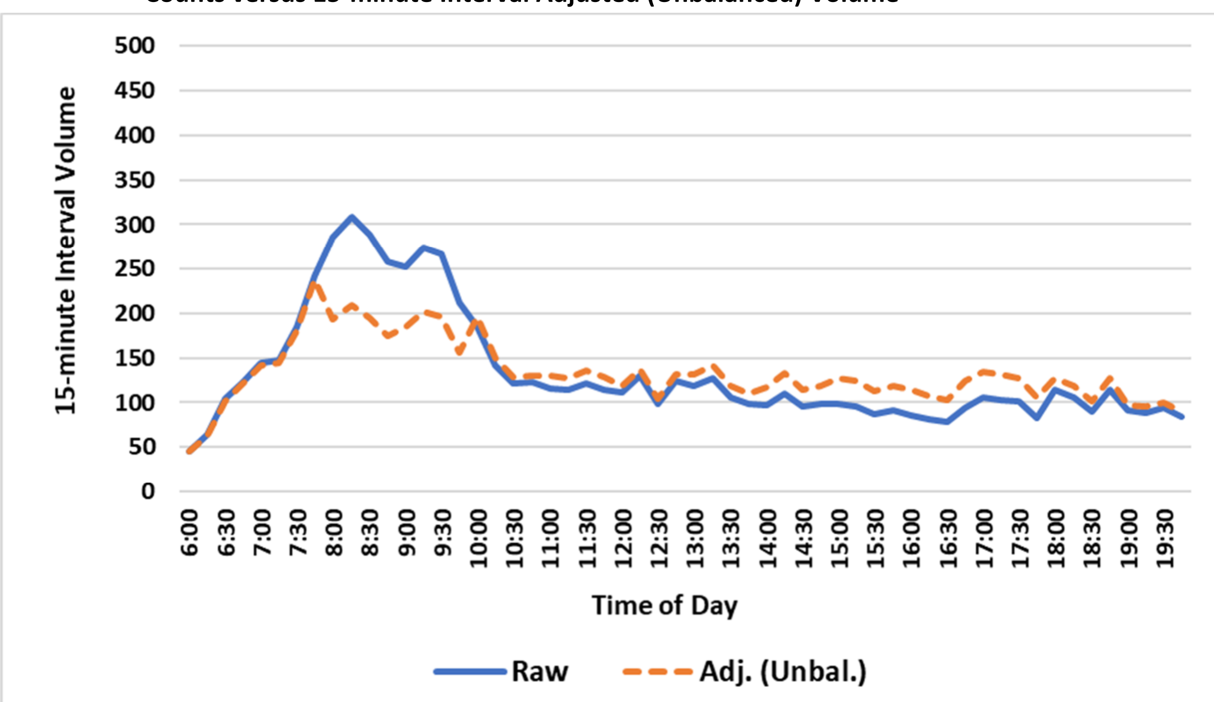
Figure B-20 SR 85 Northbound Off-Ramp at Westbound El Camino Real 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

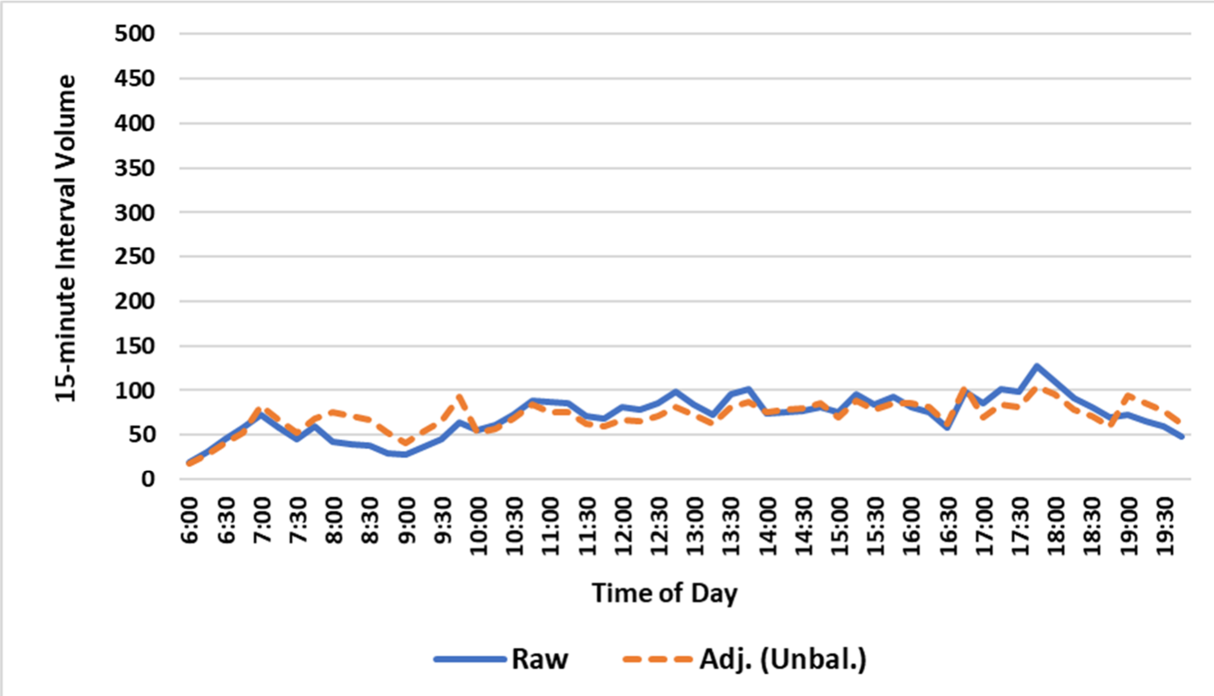
Figure B-21 SR 85 Northbound On-Ramp at Westbound El Camino Real 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

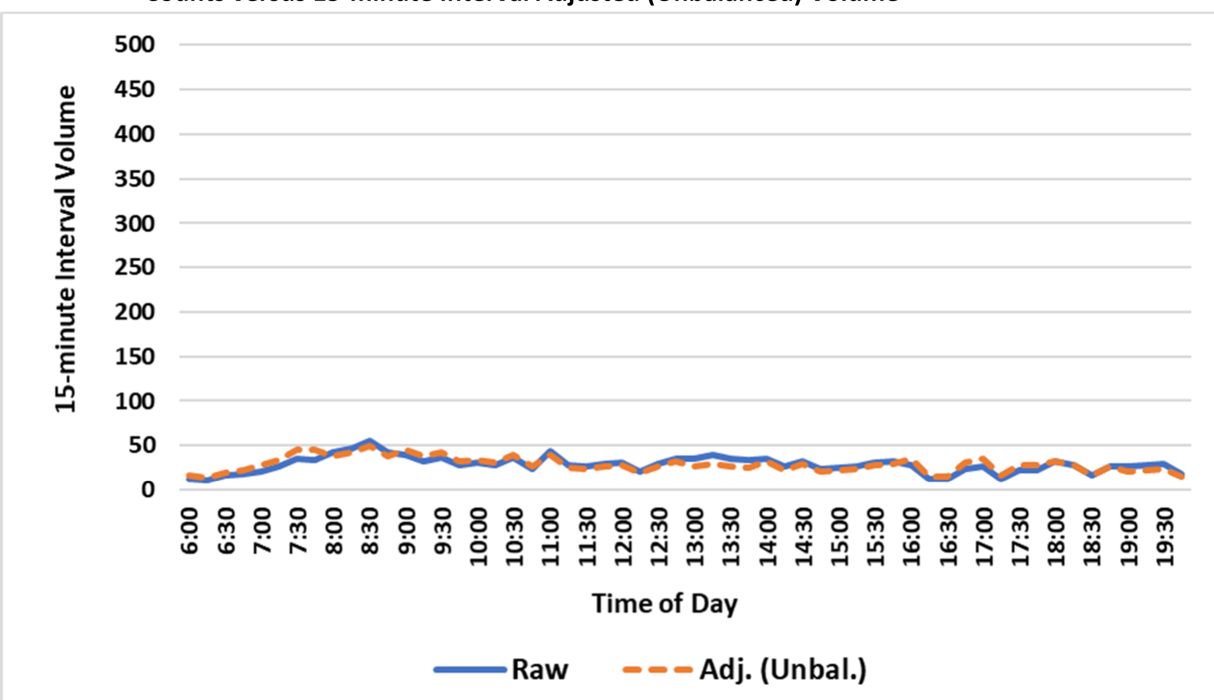
Figure B-22 SR 85 Northbound Off-Ramp at Eastbound El Camino Real 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

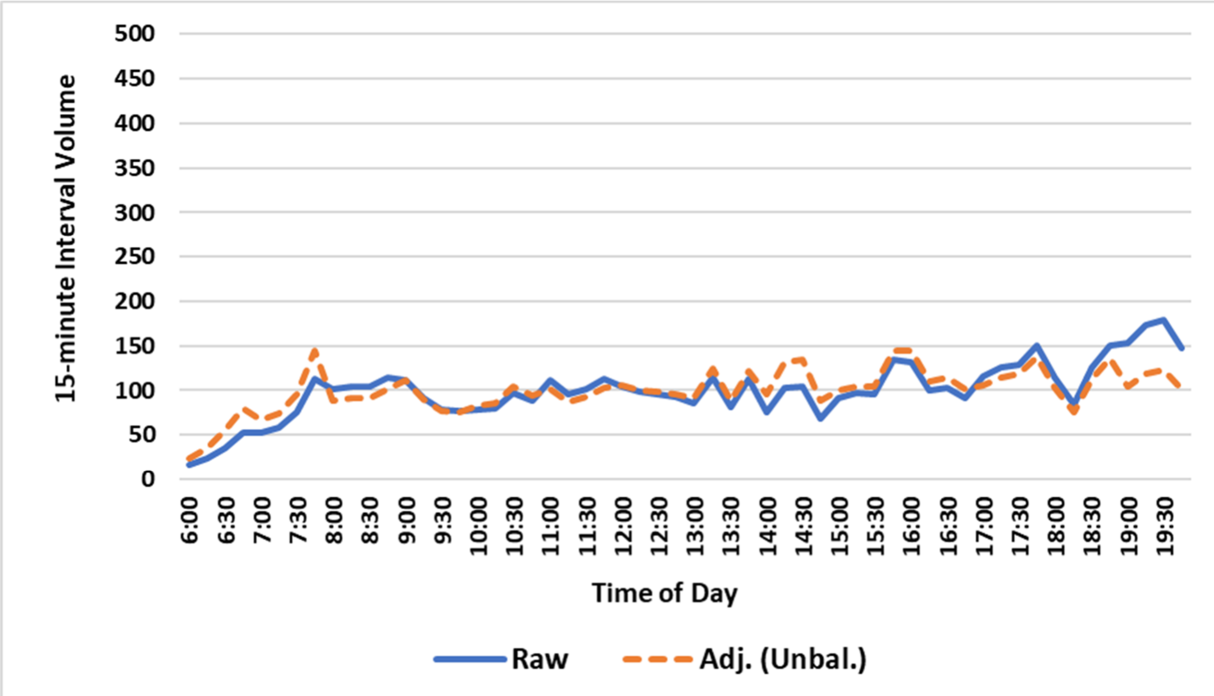
Figure B-23 SR 85 Northbound On-Ramp at Eastbound El Camino Real 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

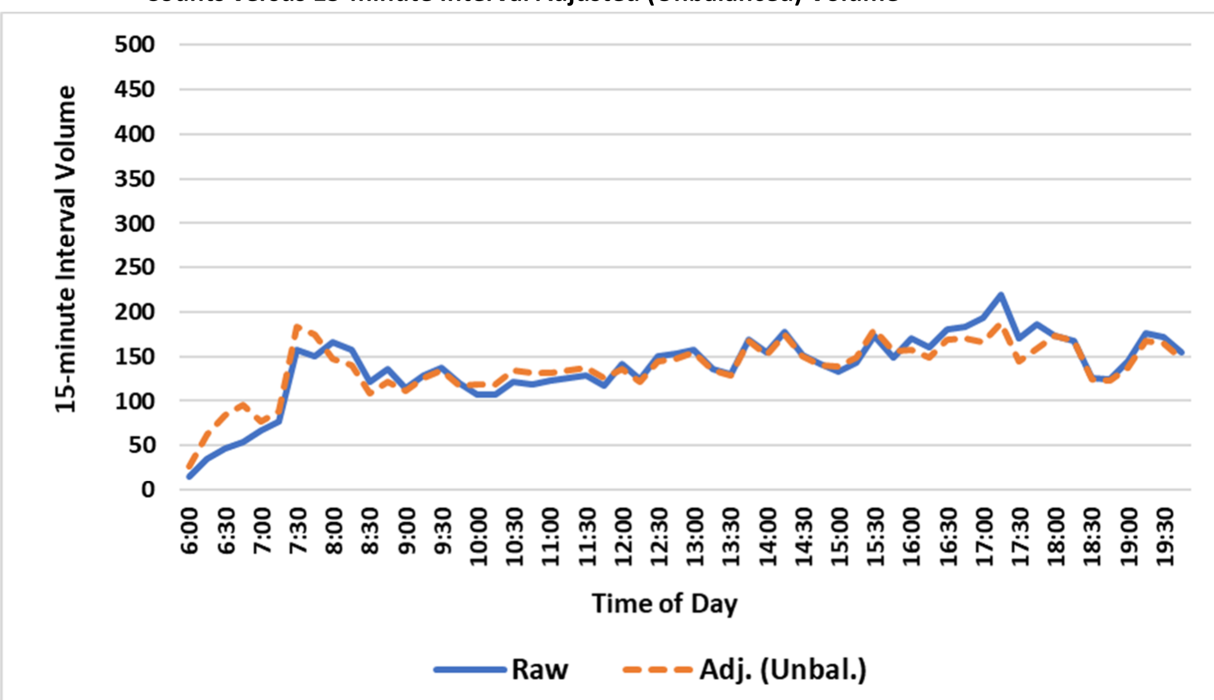
Figure B-24 SR 85 Southbound Off-Ramp at Eastbound El Camino Real 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

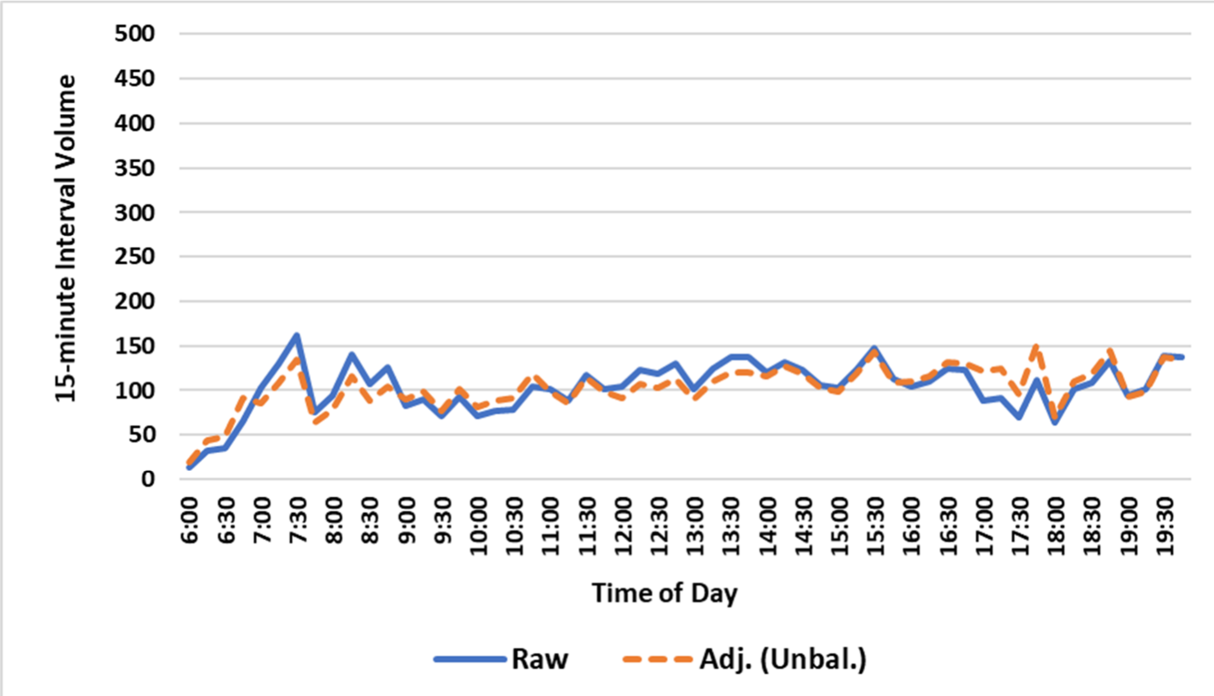
Figure B-25 SR 85 Southbound On-Ramp at Eastbound El Camino Real 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

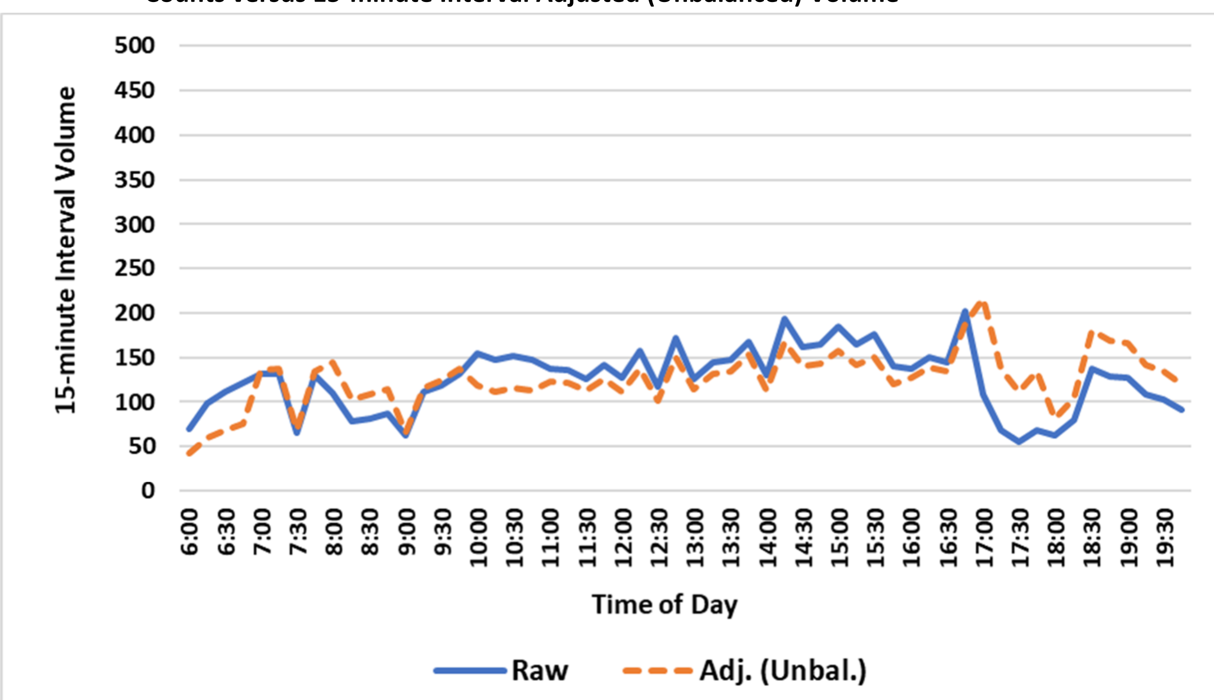
Figure B-26 SR 85 Southbound Off-Ramp at West Fremont Avenue 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

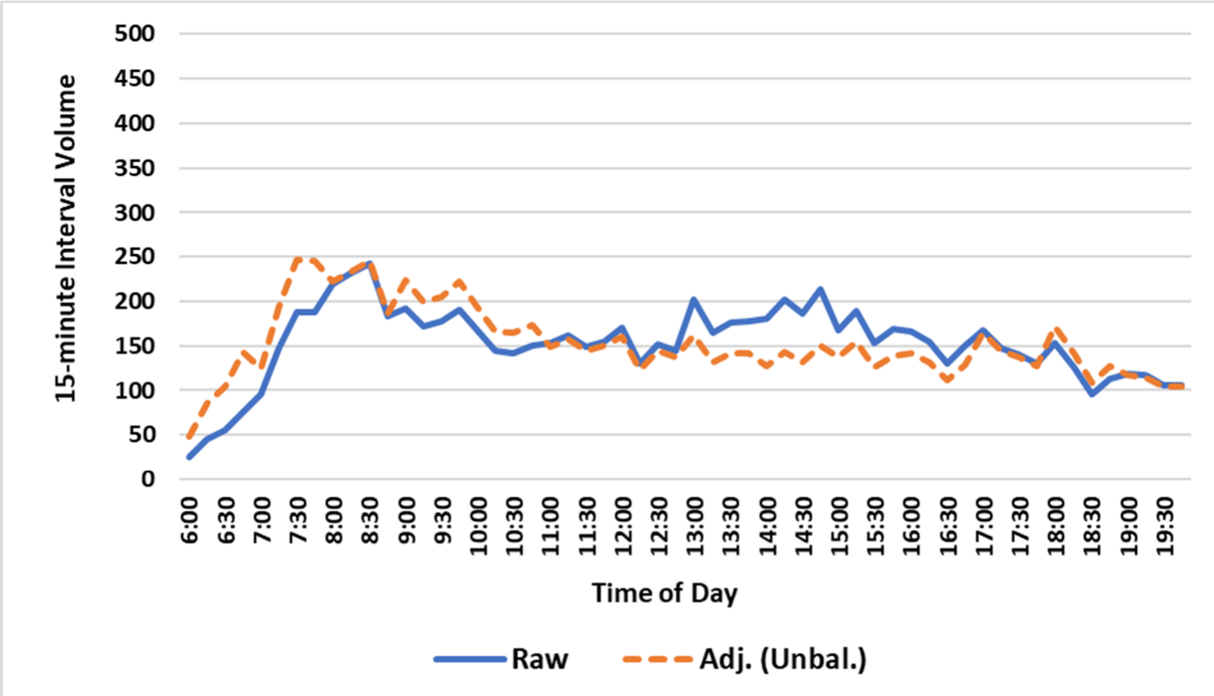
Figure B-27 SR 85 Northbound Off-Ramp at West Fremont Avenue 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

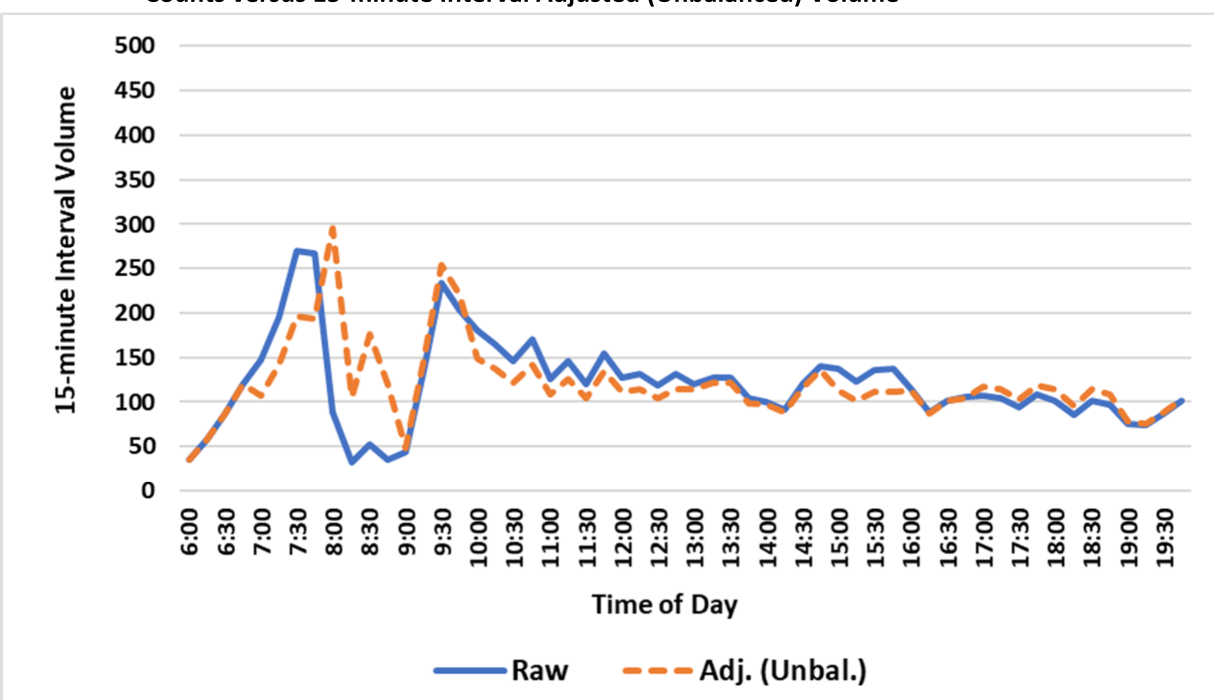
Figure B-28 SR 85 Southbound On-Ramp at West Fremont Avenue 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

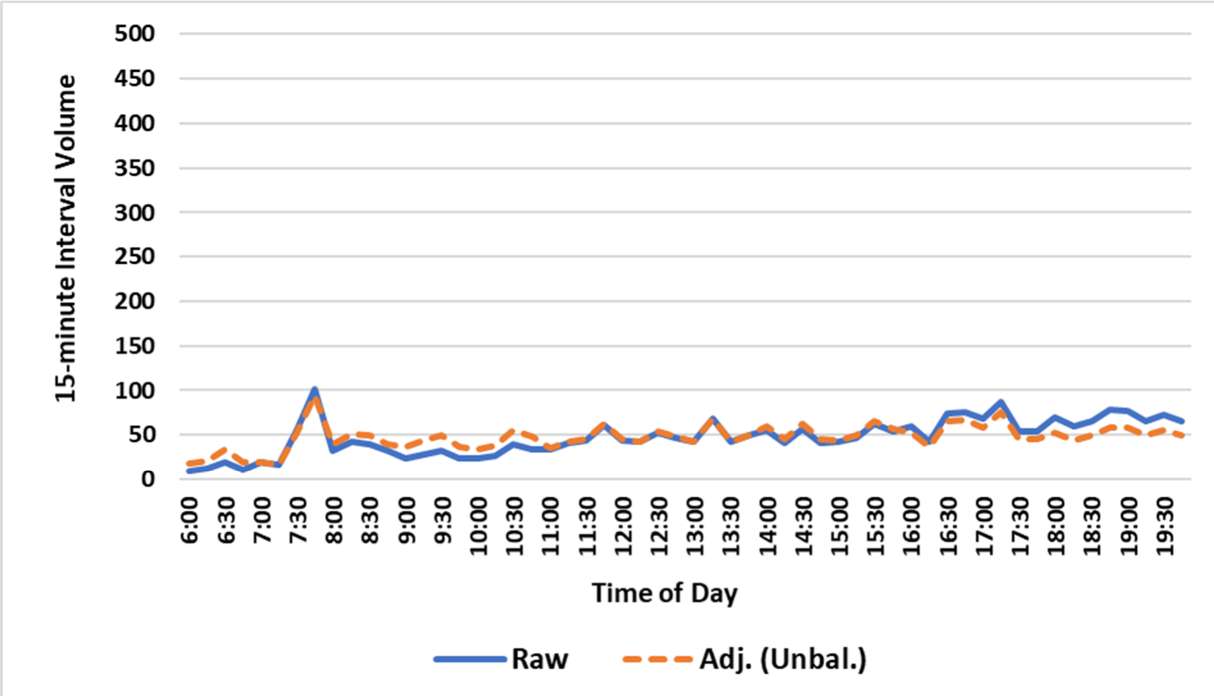
Figure B-29 SR 85 Northbound On-Ramp at West Fremont Avenue 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

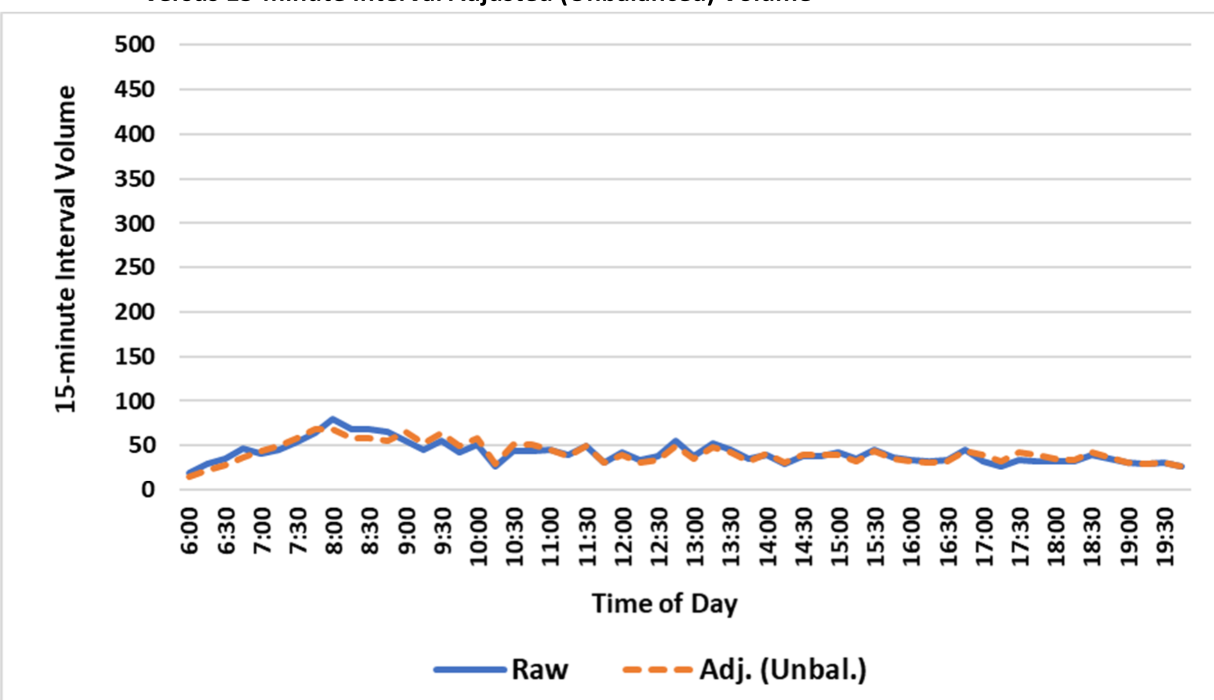
Figure B-30 SR 85 Southbound Off-Ramp at Homestead Road 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

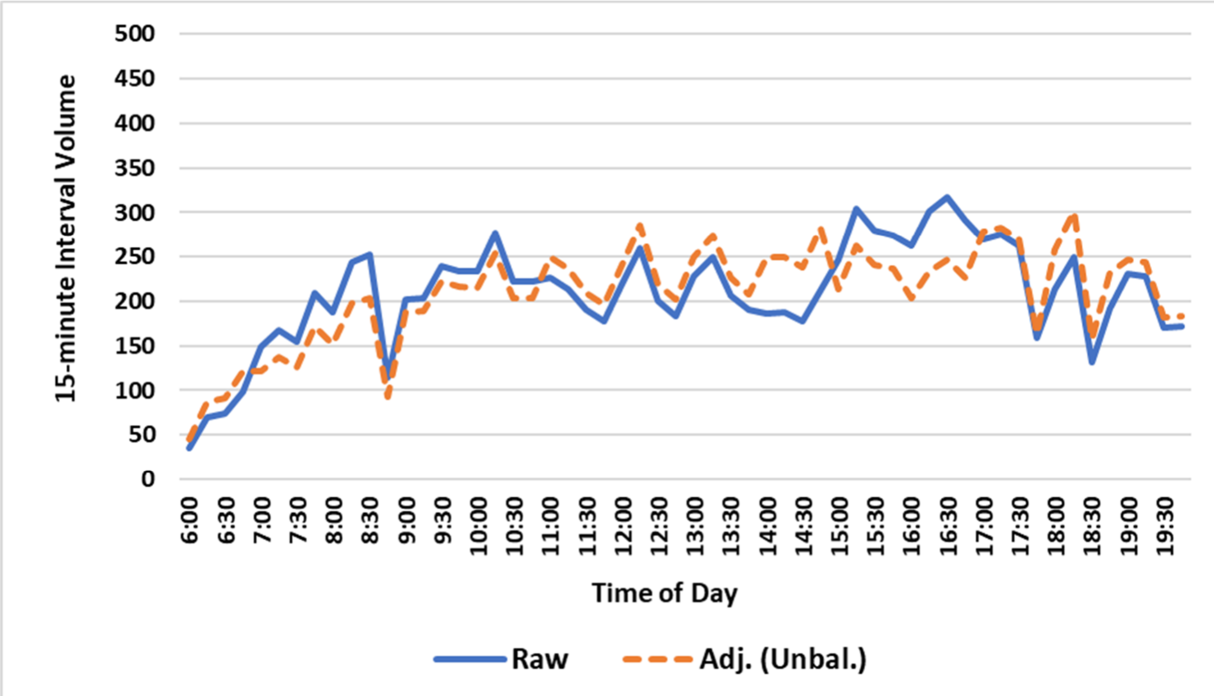
Figure B-31 SR 85 Northbound On-Ramp at Homestead Road 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

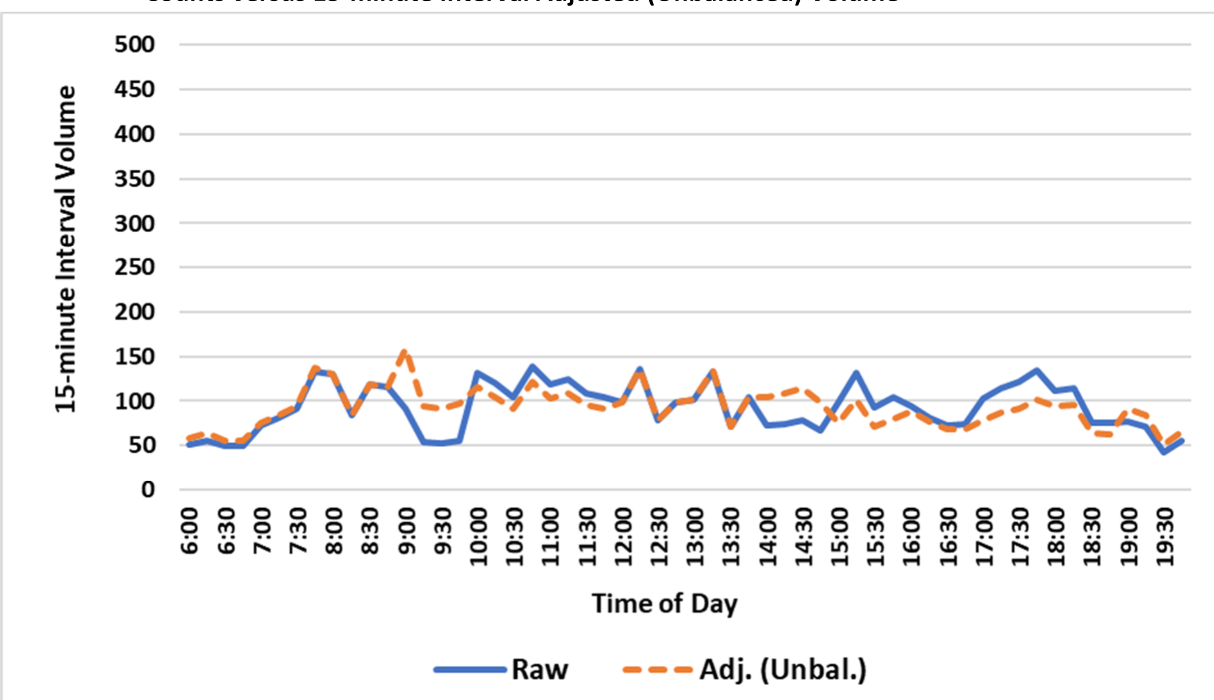
Figure B-32 SR 85 Southbound Off-Ramp at Stevens Creek Boulevard 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

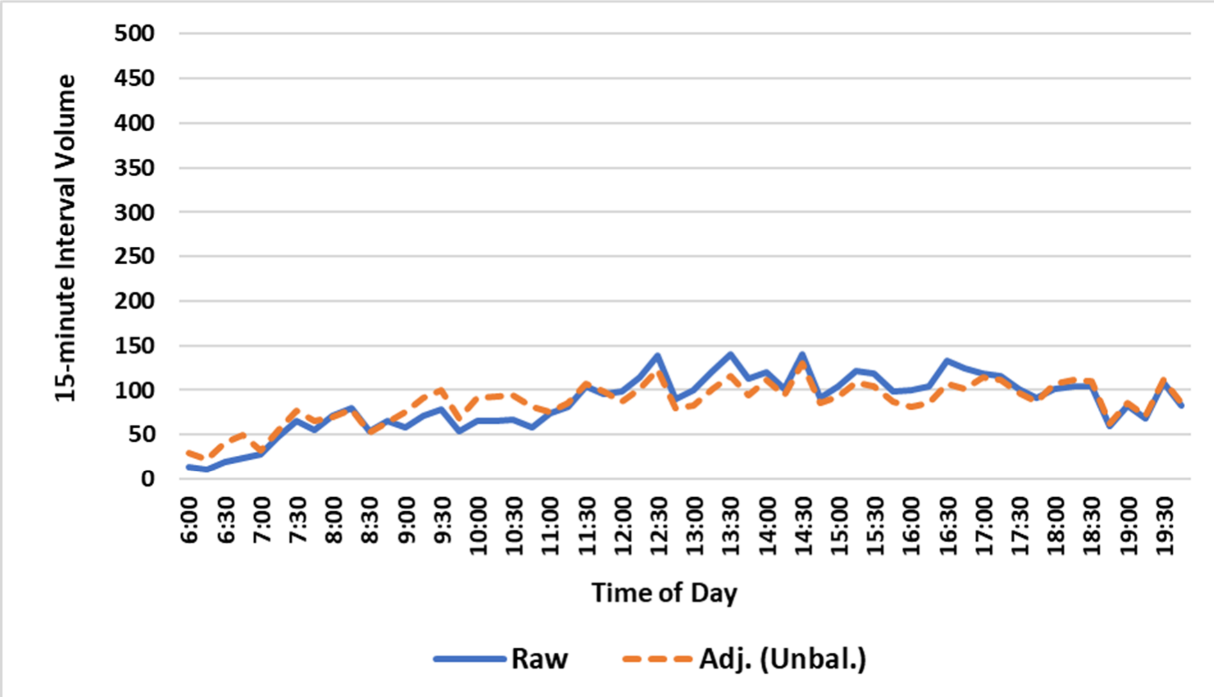
Figure B-33 SR 85 Northbound Off-Ramp at Stevens Creek Boulevard 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

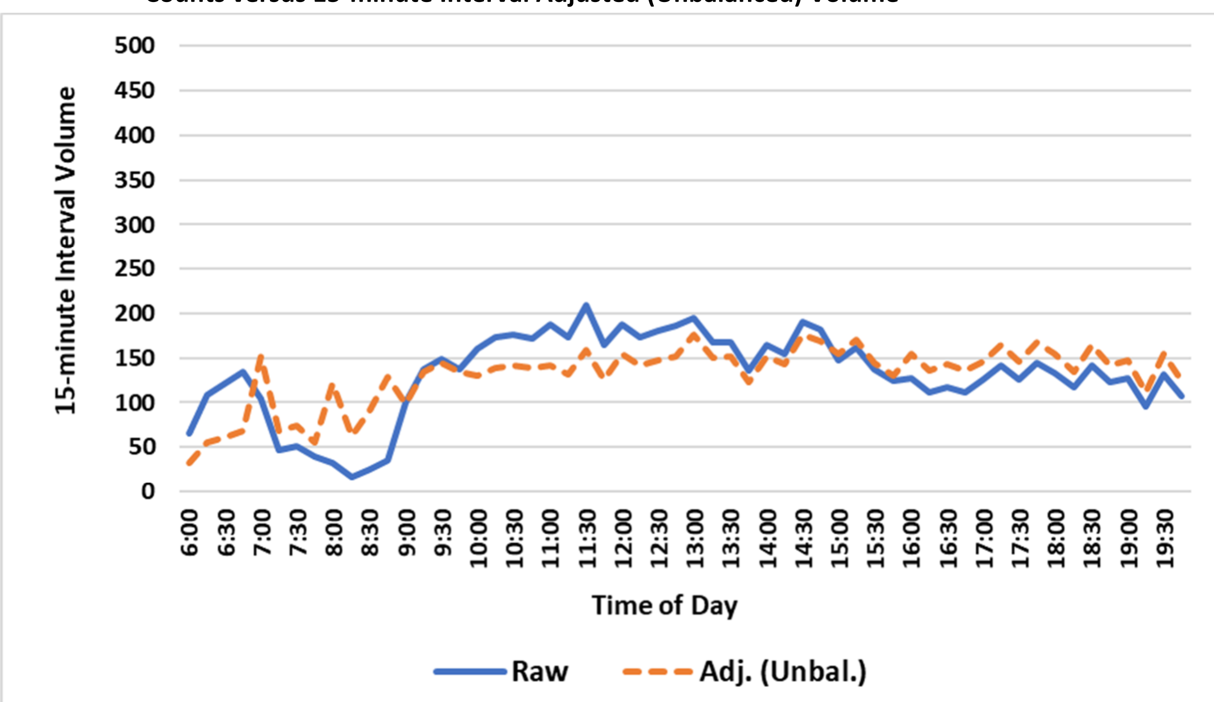
Note: Adj. = Adjusted, Unbal. = Unbalanced.

Figure B-34 SR 85 Southbound On-Ramp at Stevens Creek Boulevard 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



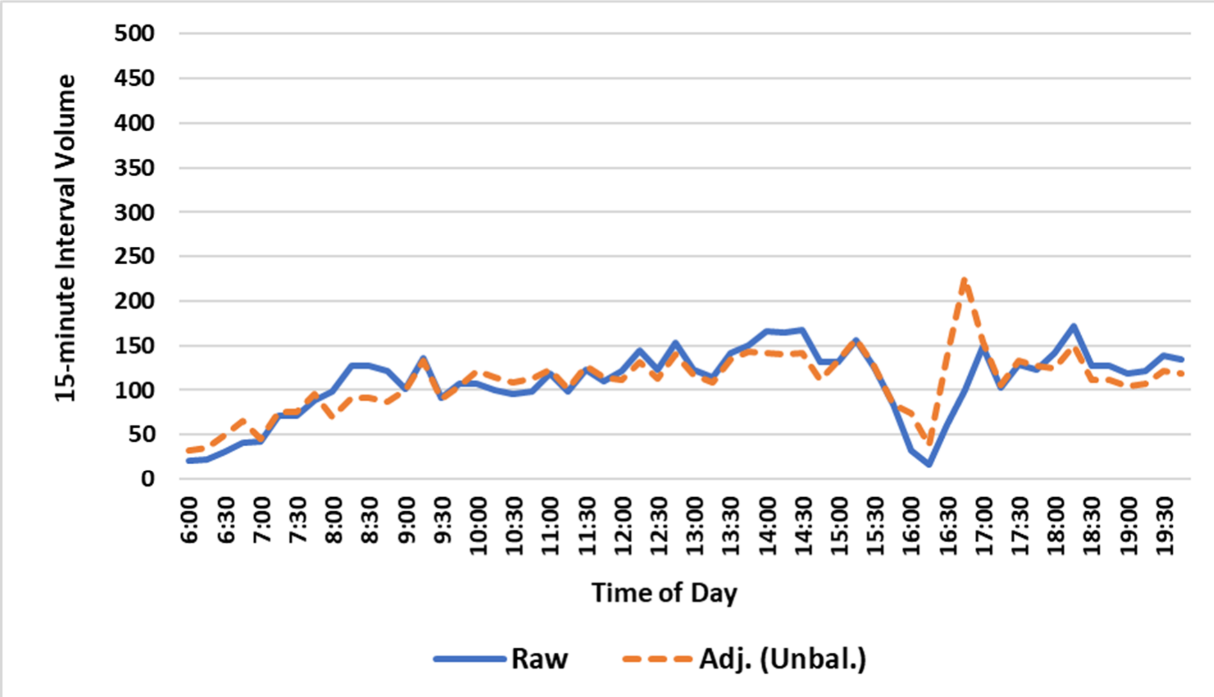
Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.
Note: Adj. = Adjusted, Unbal. = Unbalanced.

Figure B-35 SR 85 Northbound On-Ramp at South De Anza Boulevard 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.
Note: Adj. = Adjusted, Unbal. = Unbalanced.

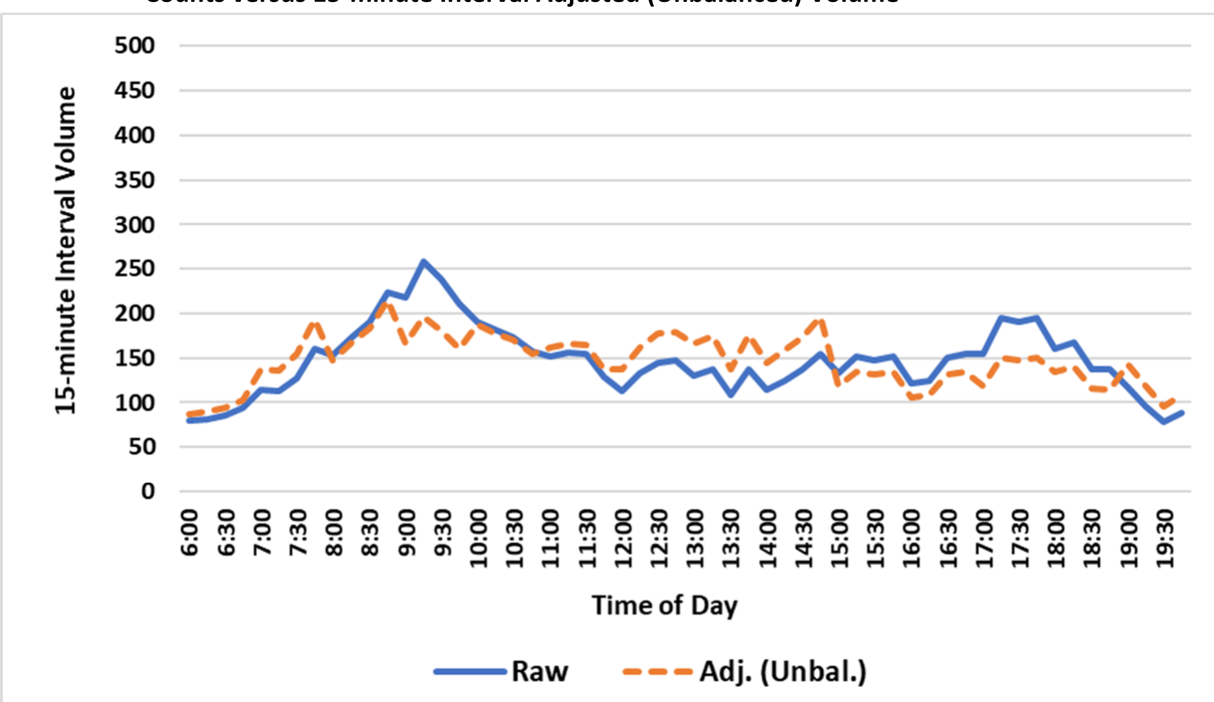
Figure B-36 SR 85 Southbound On-Ramp at South De Anza Boulevard 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

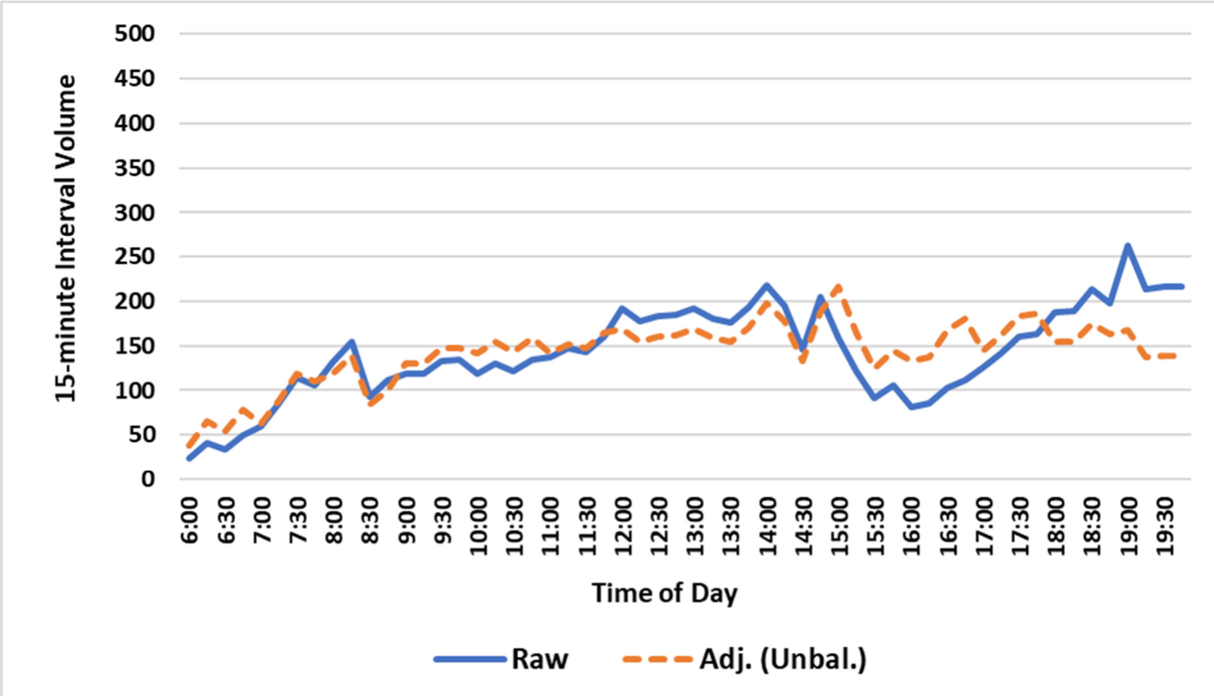
Figure B-37 SR 85 Northbound Off-Ramp at South De Anza Boulevard 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

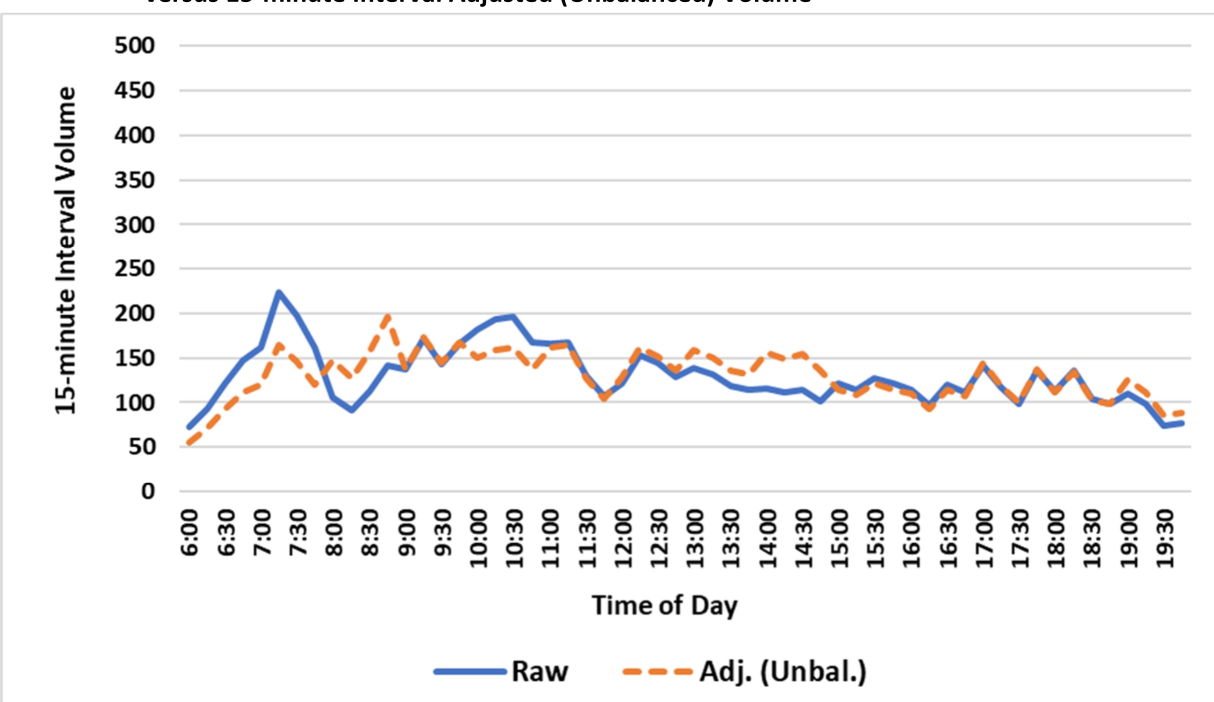
Figure B-38 SR 85 Southbound Off-Ramp at South De Anza Boulevard 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

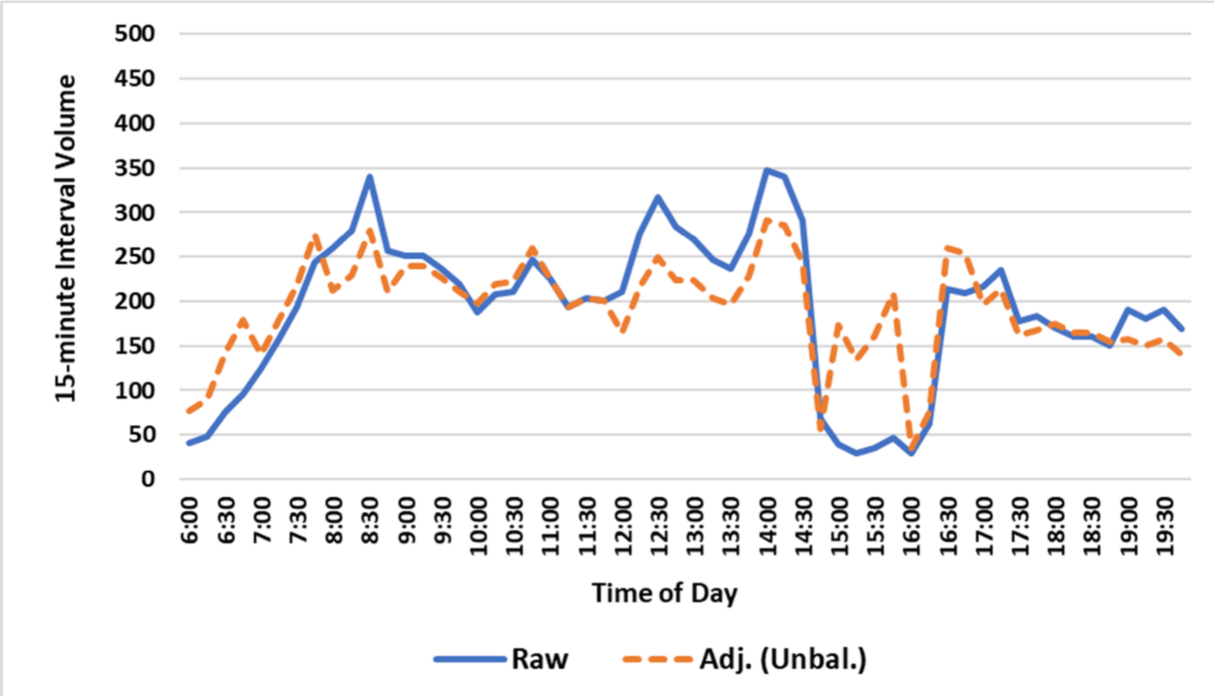
Figure B-39 SR 85 Northbound On-Ramp at Saratoga Avenue 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

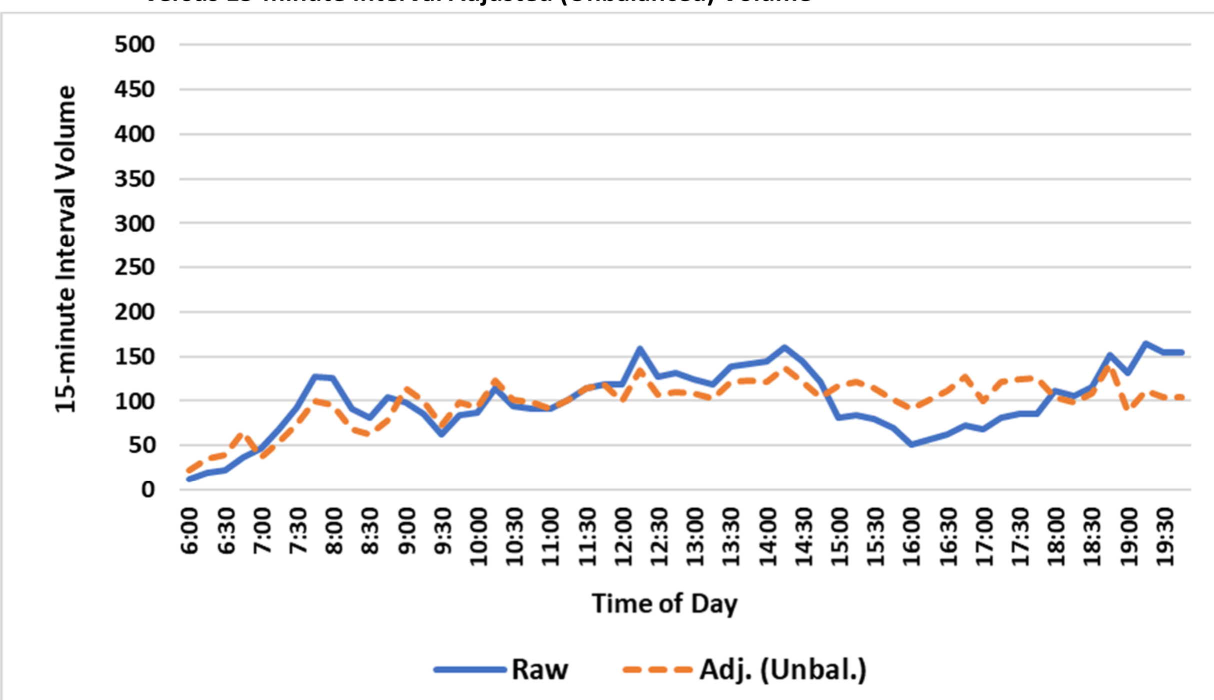
Note: Adj. = Adjusted, Unbal. = Unbalanced.

Figure B-40 SR 85 Southbound On-Ramp at Saratoga Avenue 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



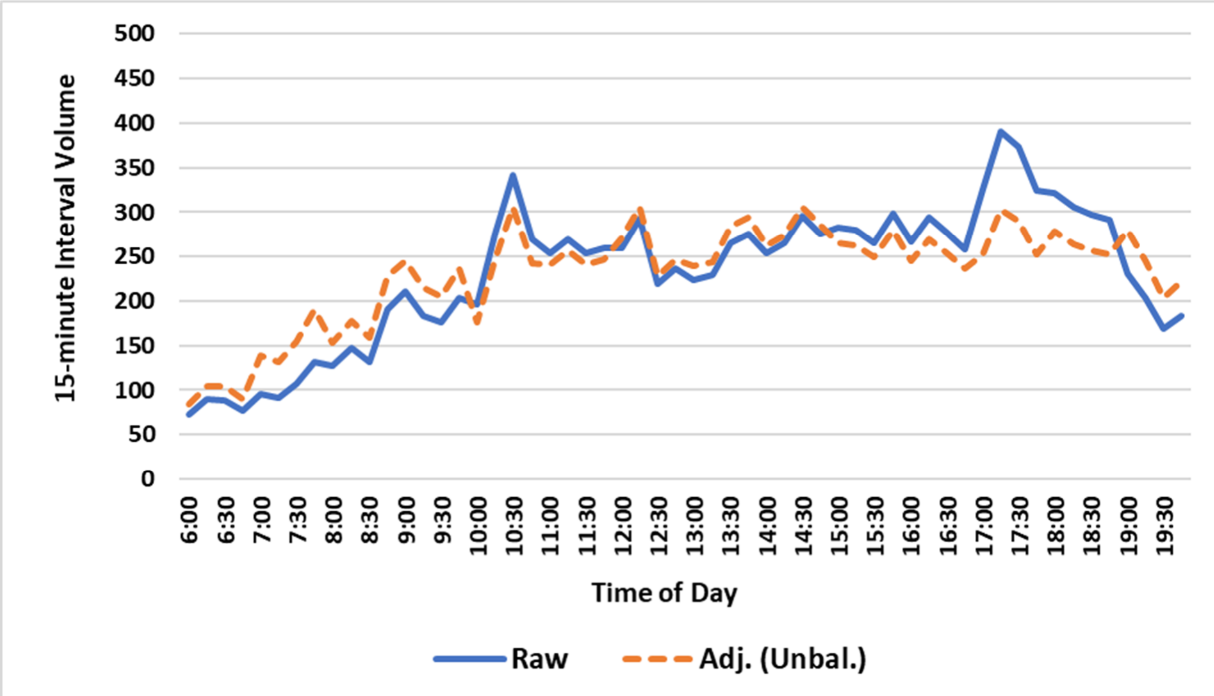
Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.
Note: Adj. = Adjusted, Unbal. = Unbalanced.

Figure B-41 SR 85 Southbound Off-Ramp at Saratoga Avenue 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.
Note: Adj. = Adjusted, Unbal. = Unbalanced.

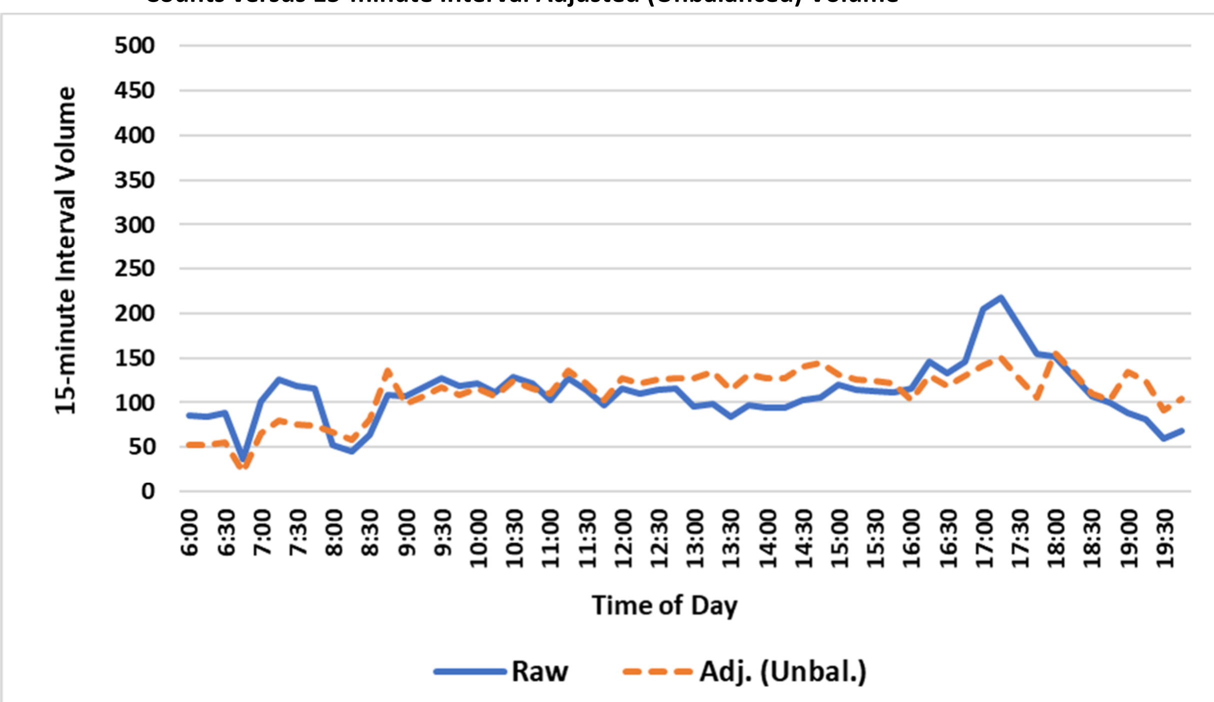
Figure B-42 SR 85 Northbound Off-Ramp at Saratoga Avenue 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

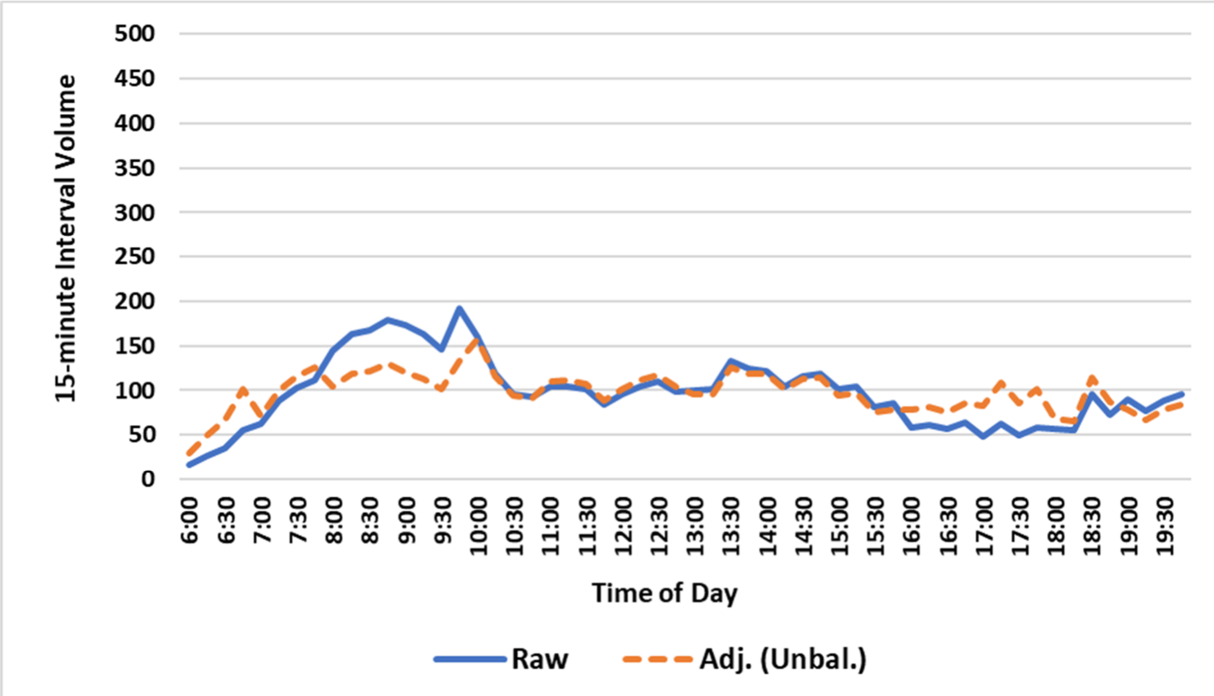
Figure B-43 SR 85 Northbound On-Ramp at Winchester Boulevard 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

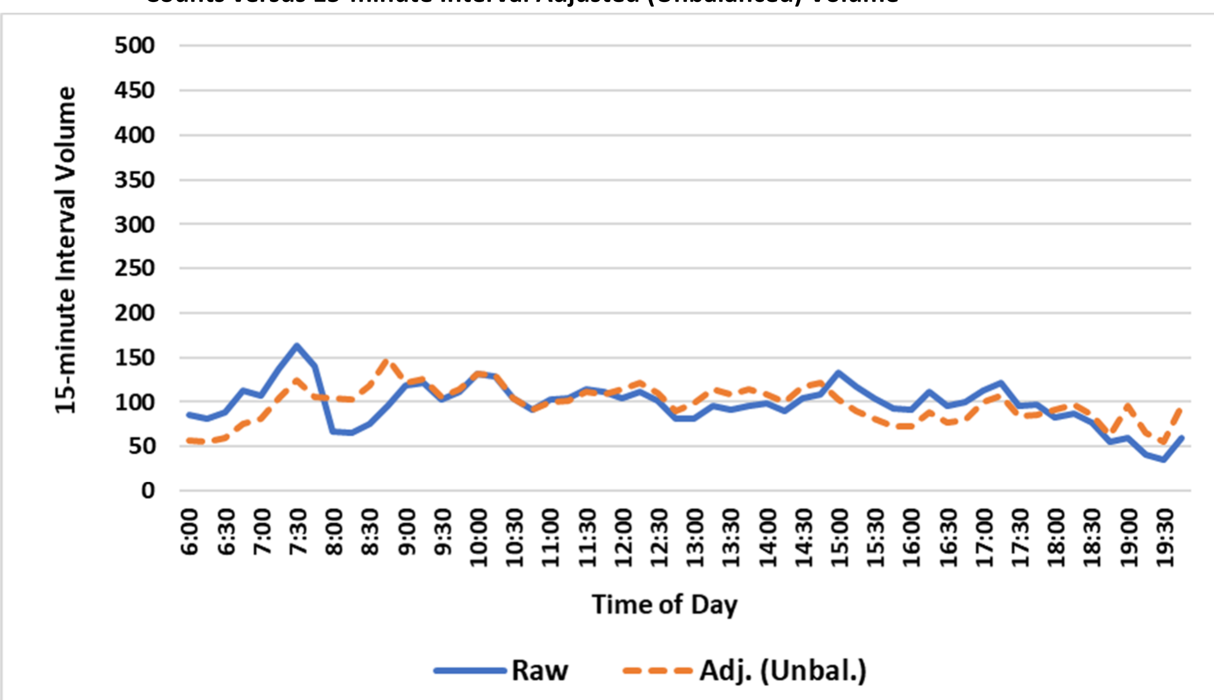
Figure B-44 SR 85 Southbound Off-Ramp at Winchester Boulevard 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

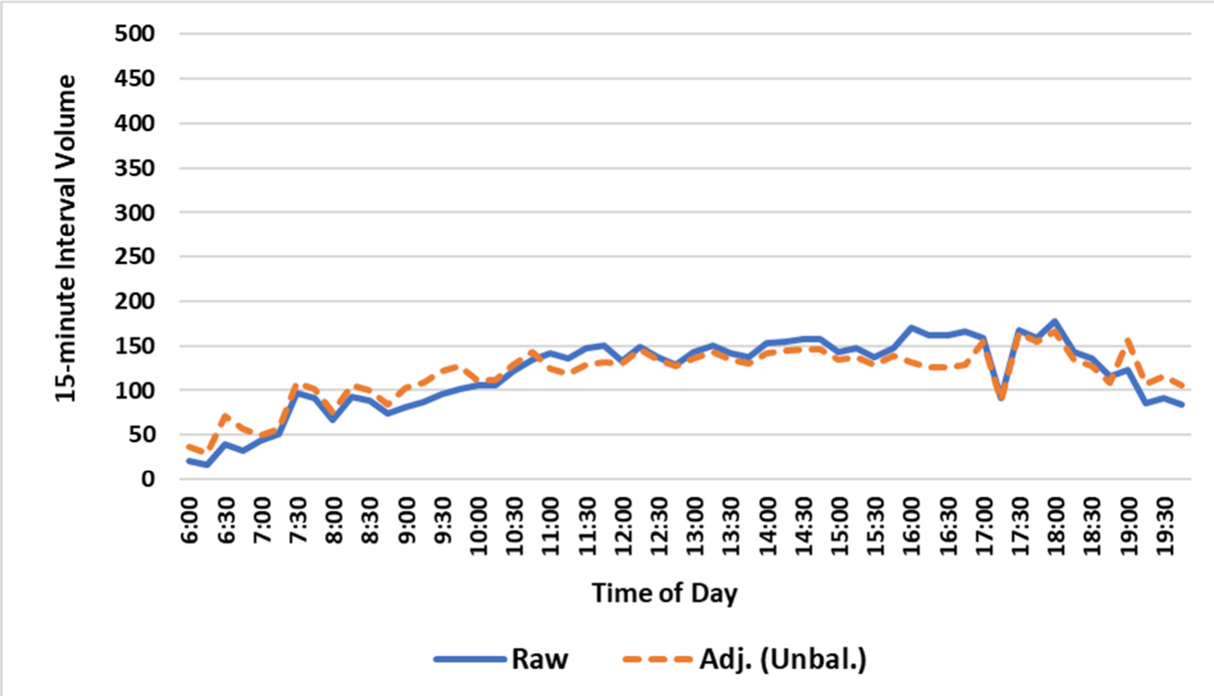
Figure B-45 SR 85 Northbound On-Ramp at South Bascom Avenue 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

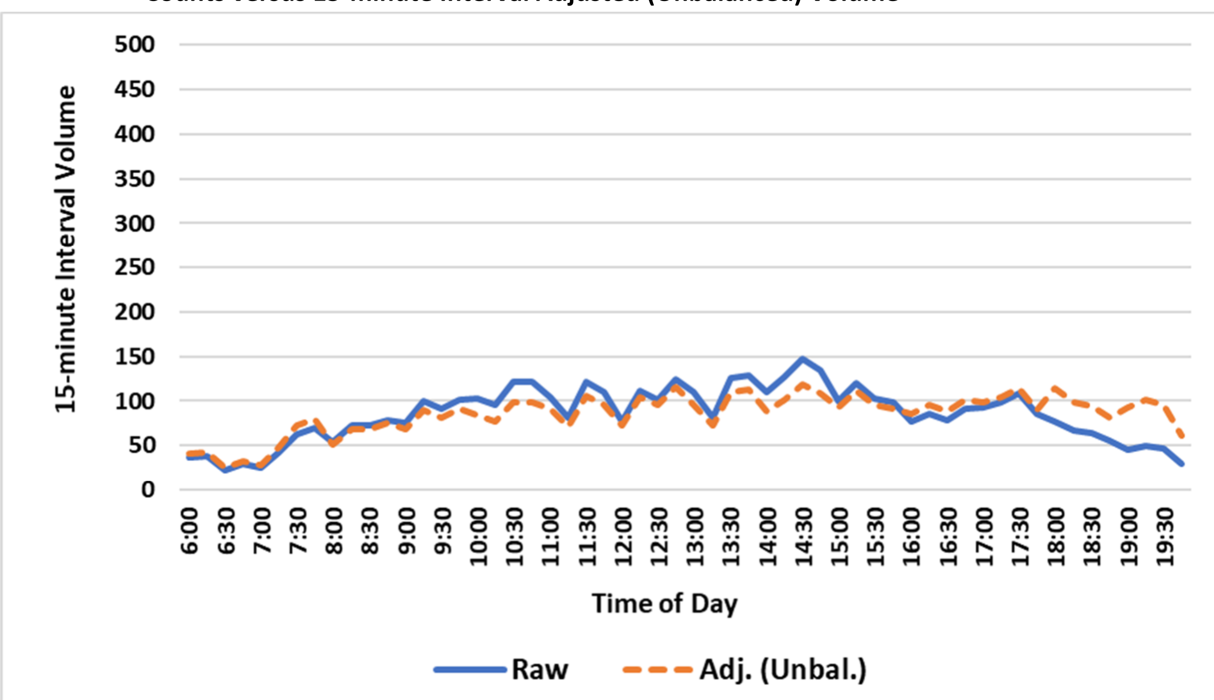
Figure B-46 SR 85 Southbound On-Ramp at South Bascom Avenue 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

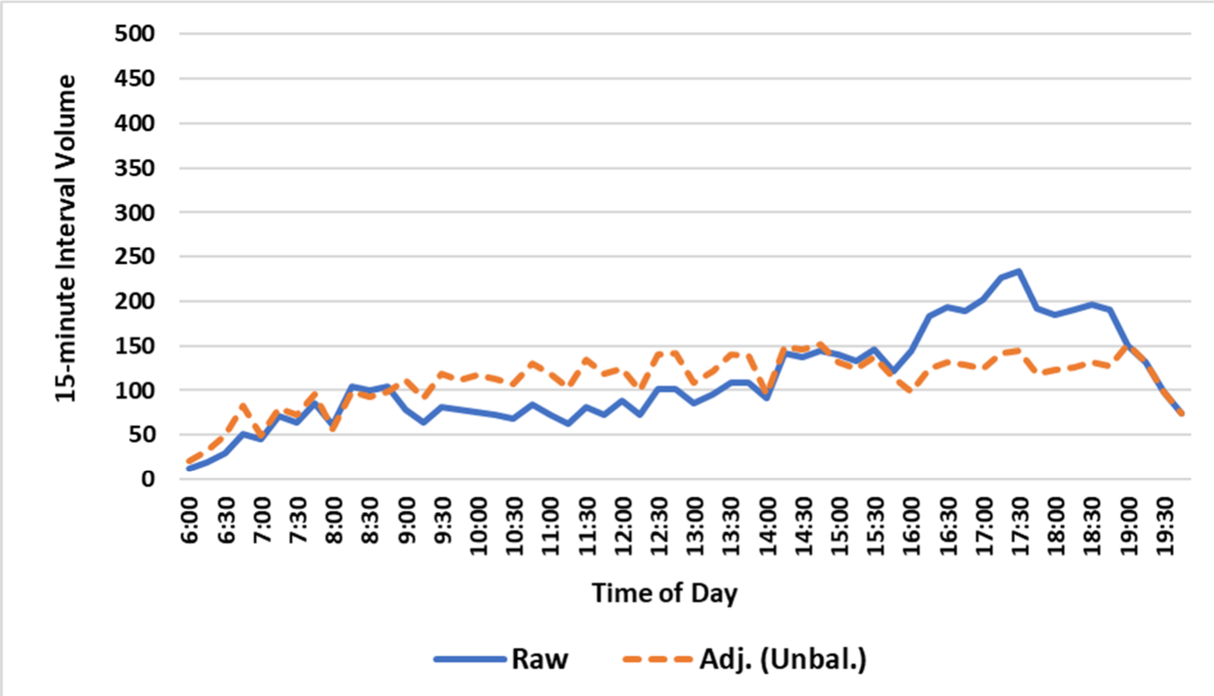
Figure B-47 SR 85 Northbound Off-Ramp at South Bascom Avenue 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

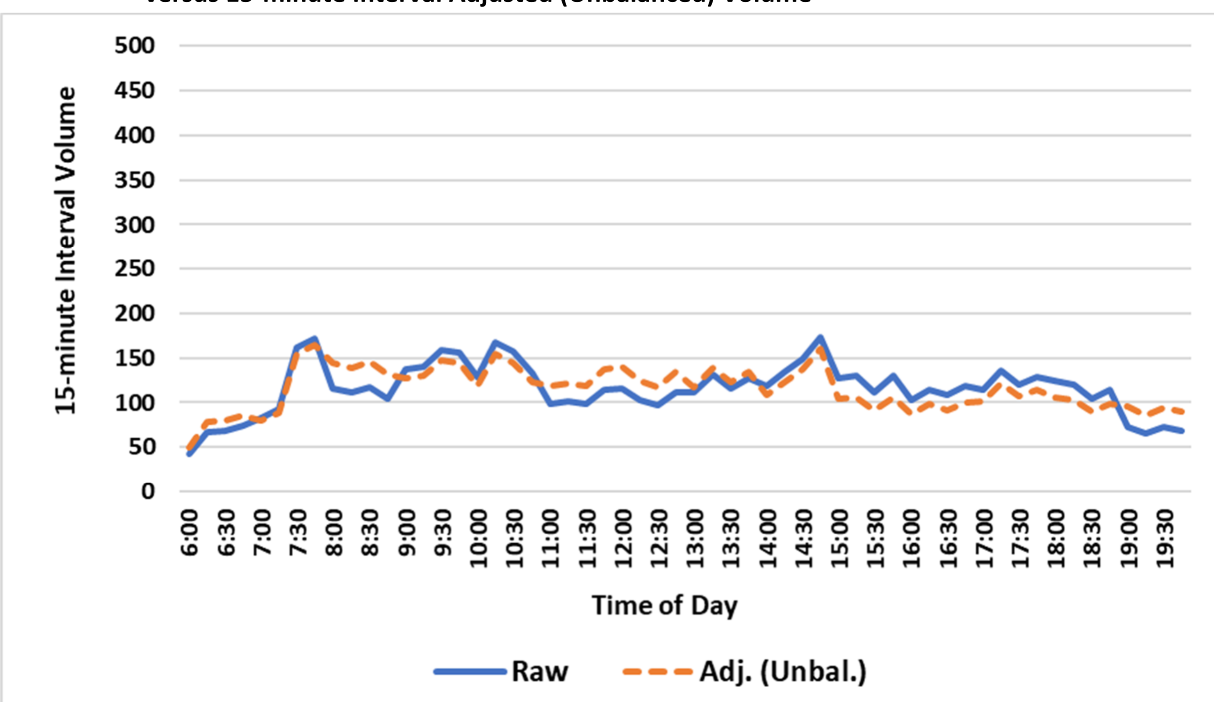
Figure B-48 SR 85 Southbound Off-Ramp at South Bascom Avenue 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

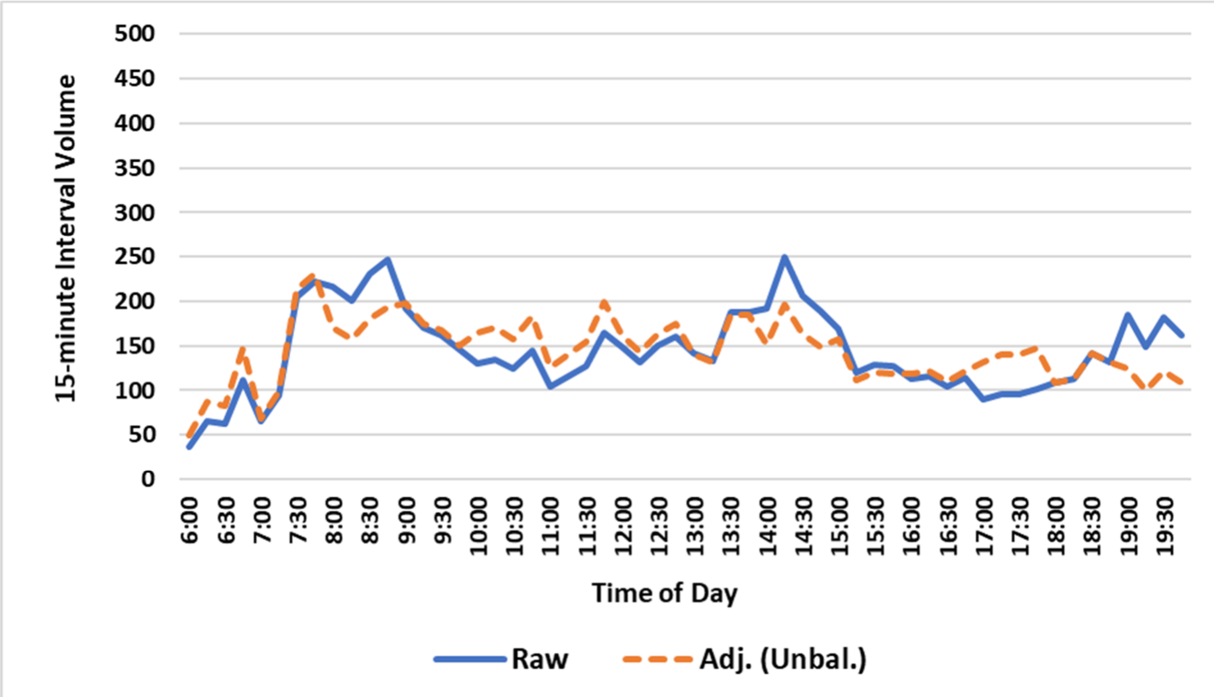
Figure B-49 SR 85 Northbound Off-Ramp at Union Avenue 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

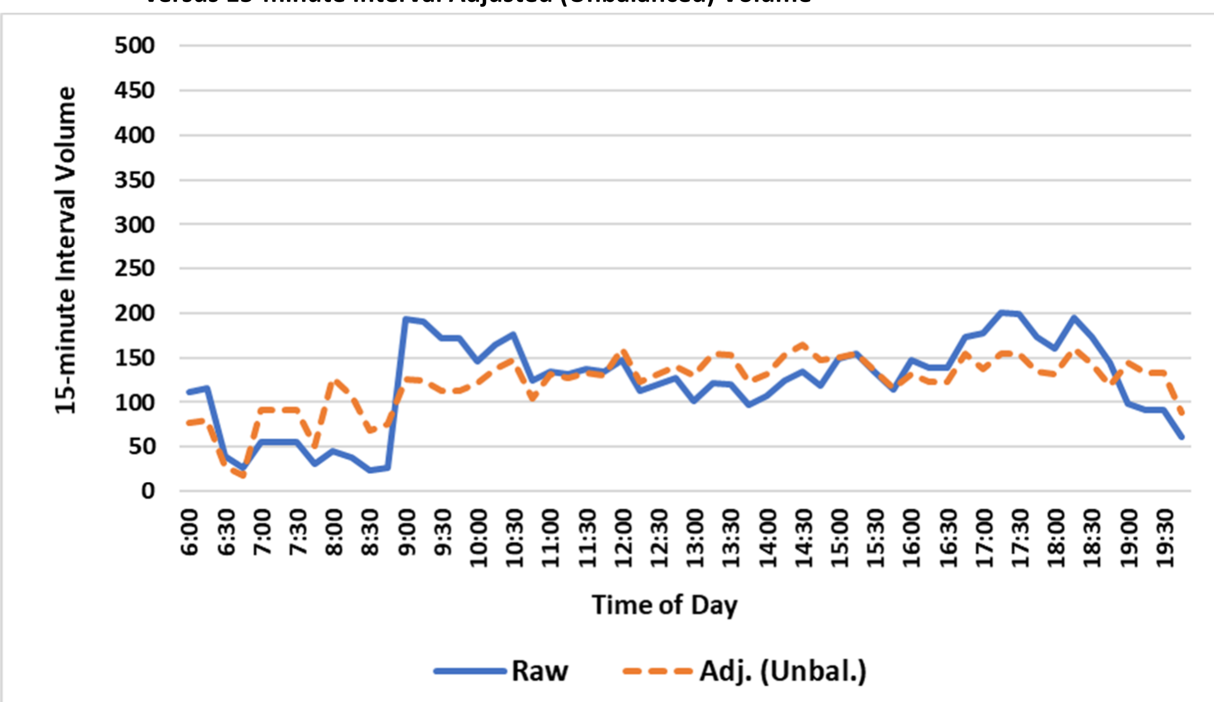
Figure B-50 SR 85 Southbound Off-Ramp at Union Avenue 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

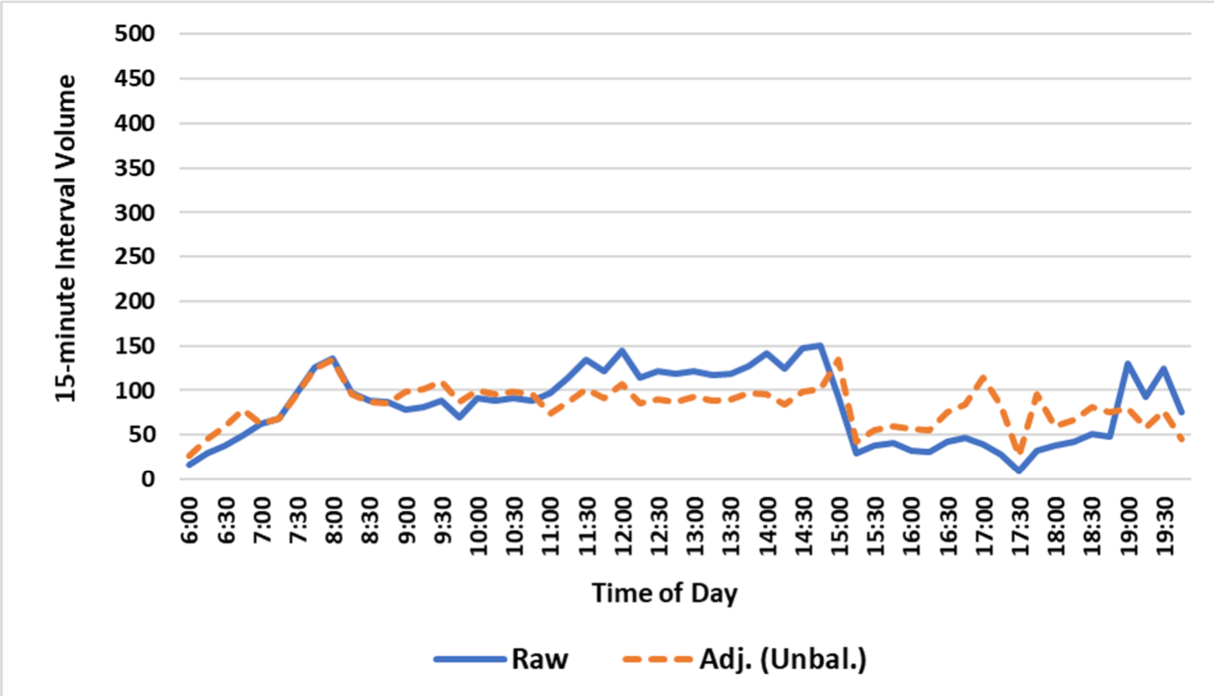
Figure B-51 SR 85 Northbound On-Ramp at Union Avenue 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

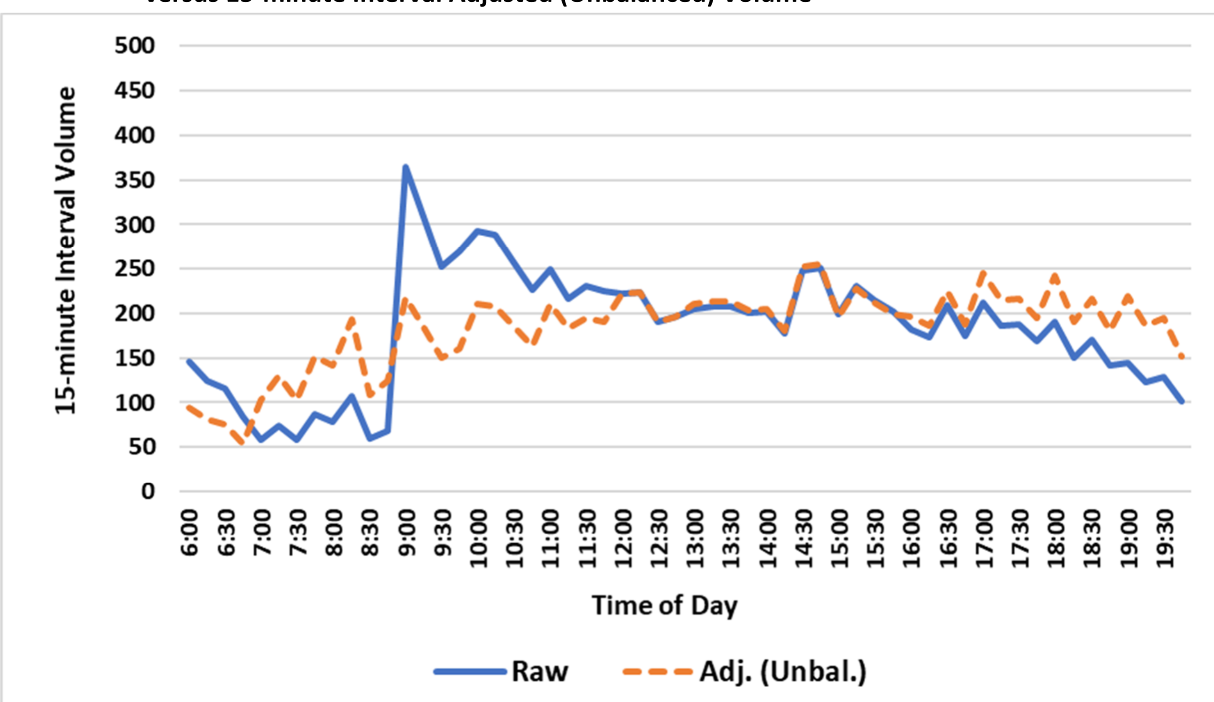
Figure B-52 SR 85 Southbound On-Ramp at Union Avenue 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

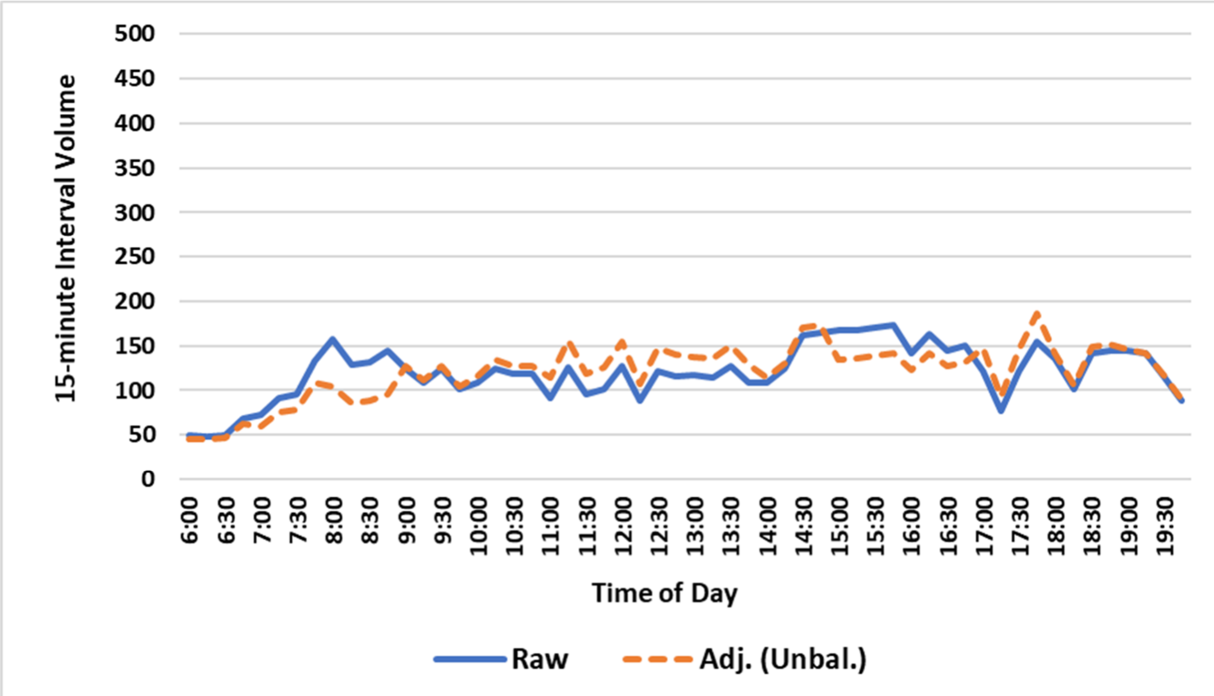
Figure B-53 SR 85 Northbound On-Ramp at Camden Avenue 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

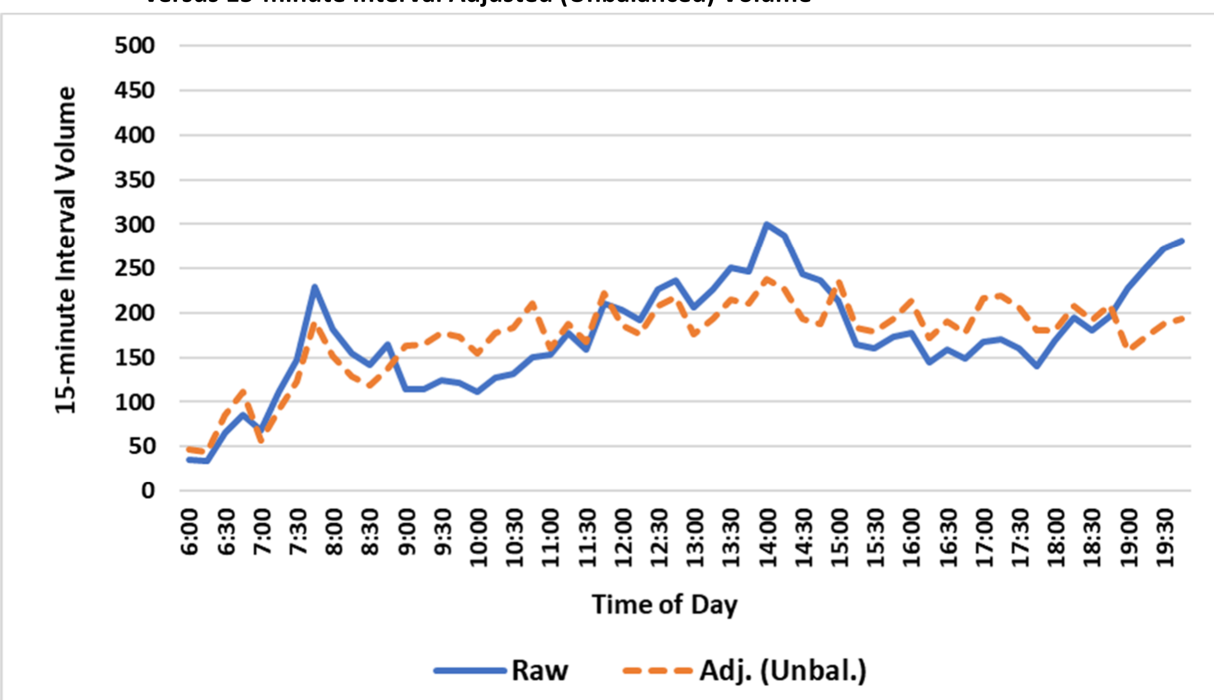
Figure B-54 SR 85 Southbound On-Ramp at Camden Avenue 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

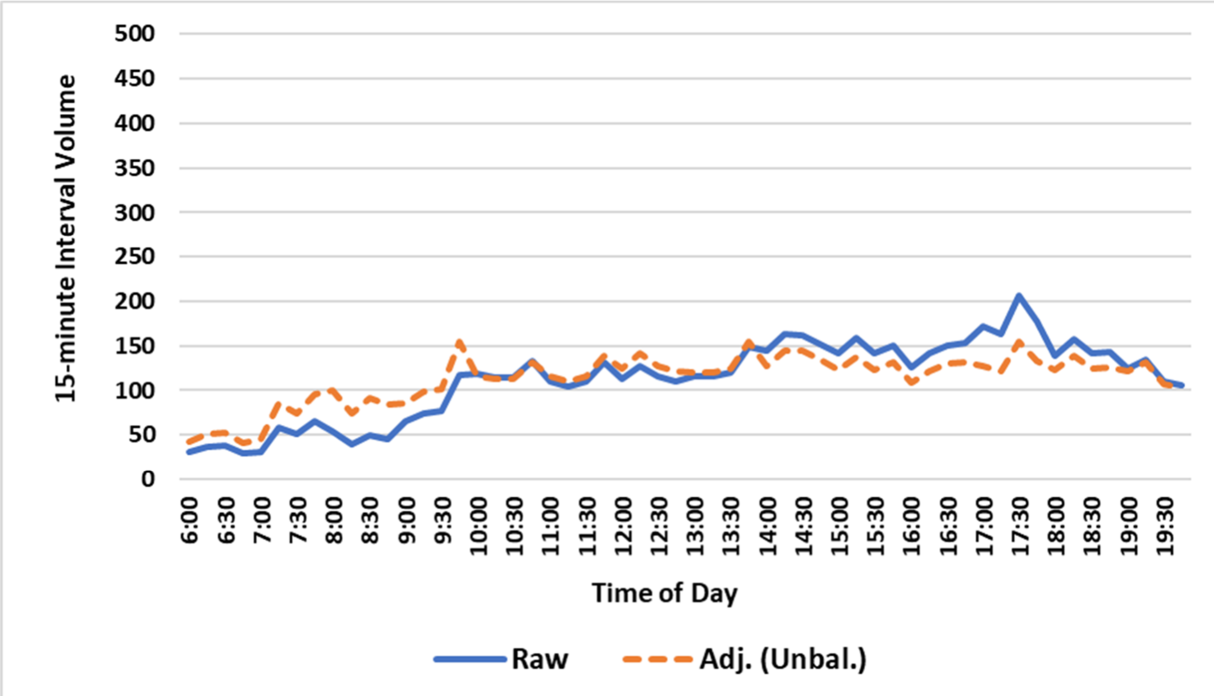
Figure B-55 SR 85 Southbound Off-Ramp at Camden Avenue 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

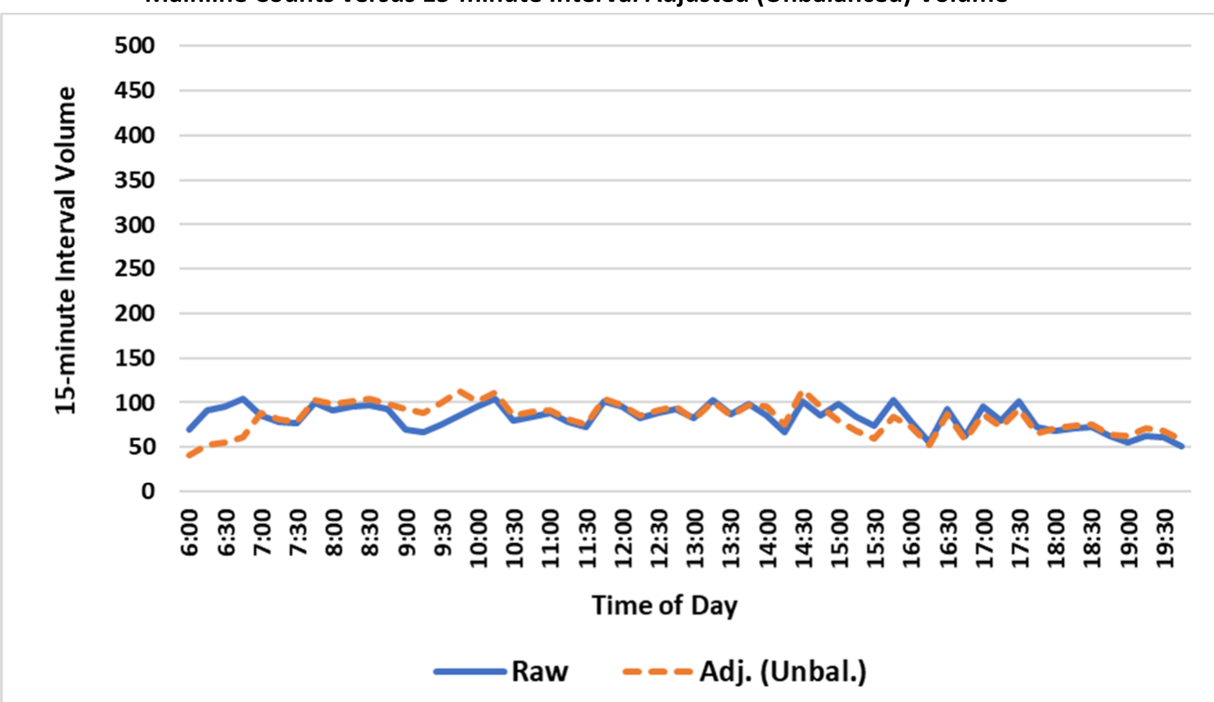
Figure B-56 SR 85 Northbound Off-Ramp at Branham Lane 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

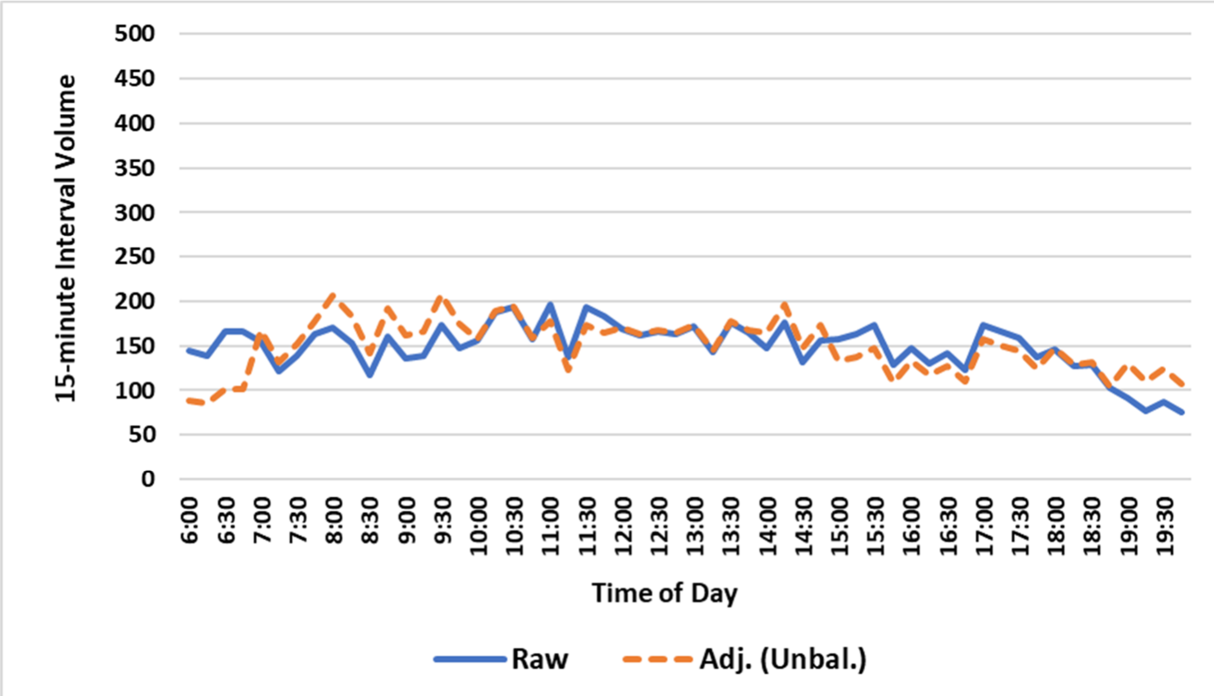
Figure B-57 SR 85 Northbound On-Ramp at Southbound Almaden Expressway 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

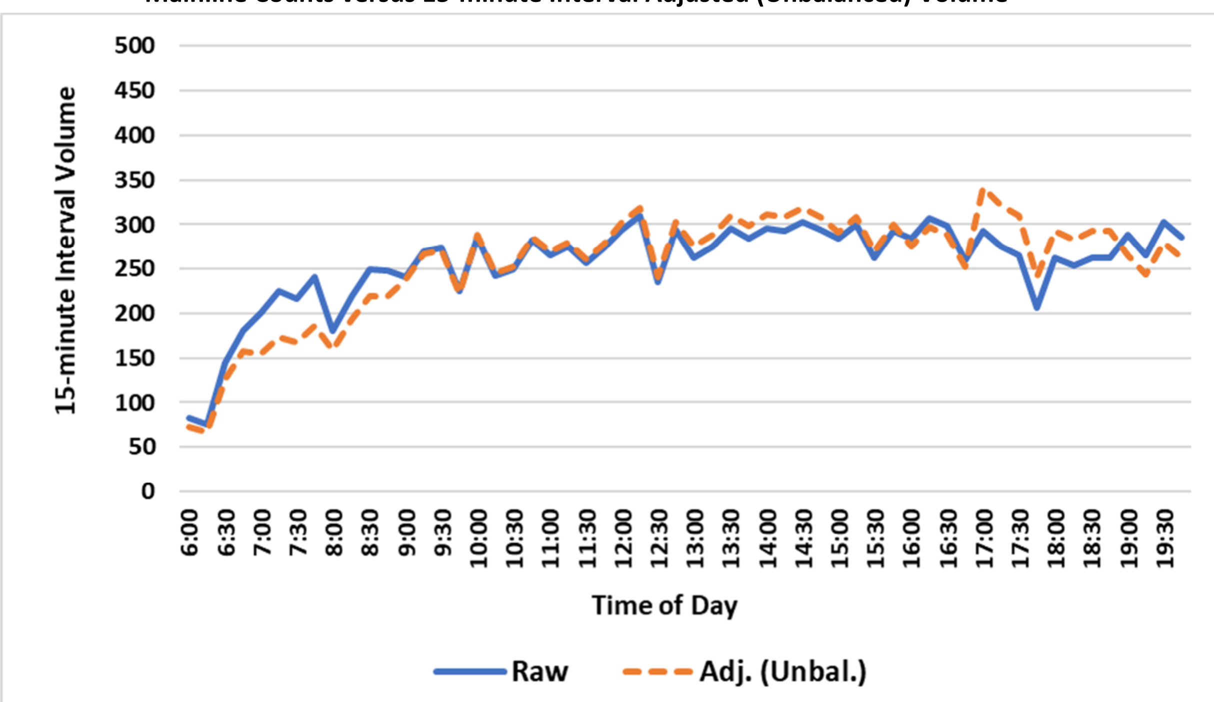
Figure B-58 SR 85 Northbound On-Ramp at Northbound Almaden Expressway 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

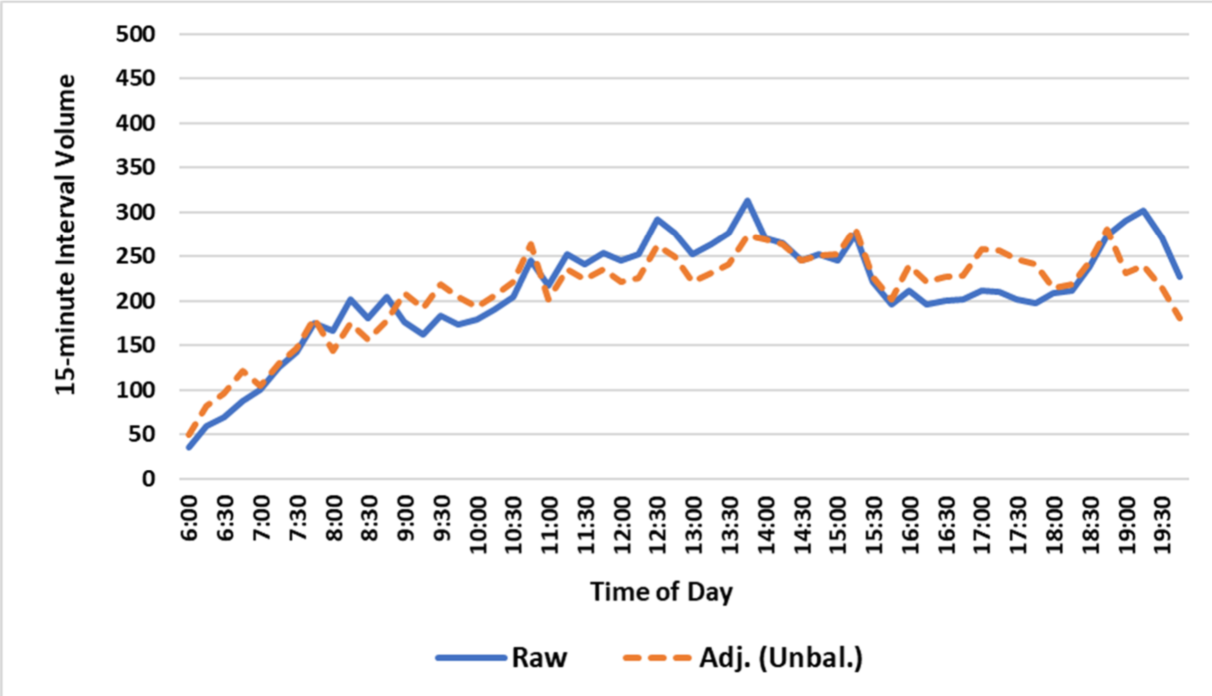
Figure B-59 SR 85 Northbound Off-Ramp at Southbound Almaden Expressway 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

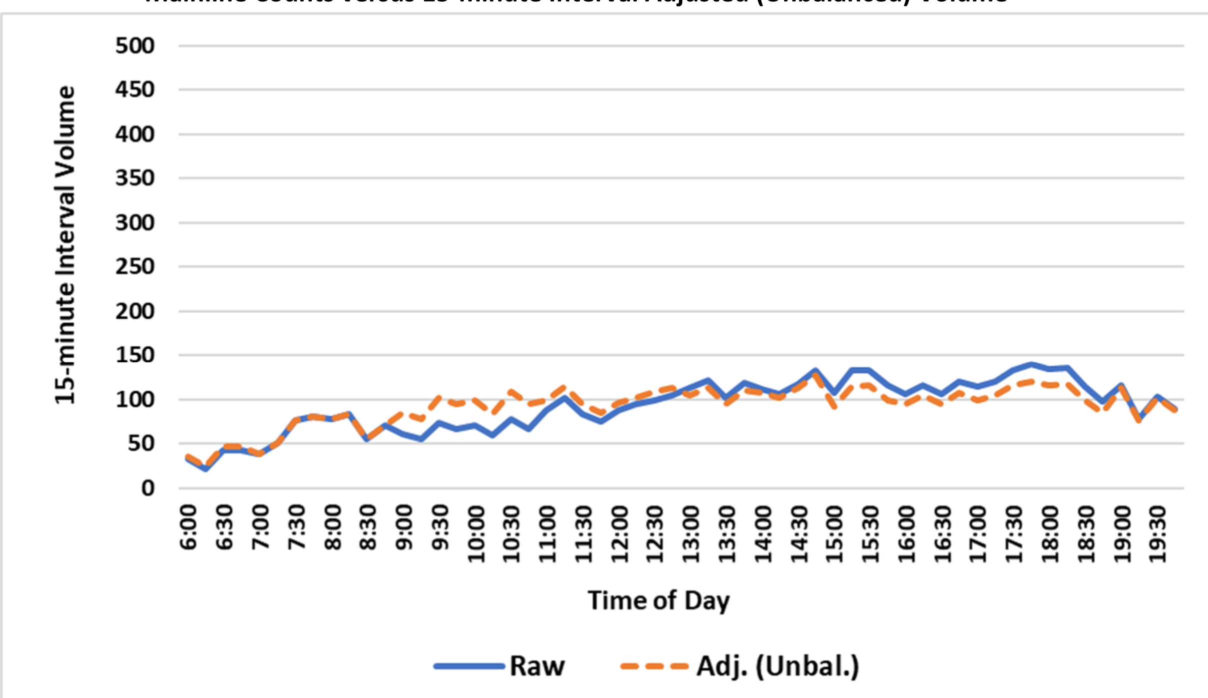
Figure B-60 SR 85 Southbound Off-Ramp at Almaden Plaza Way 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

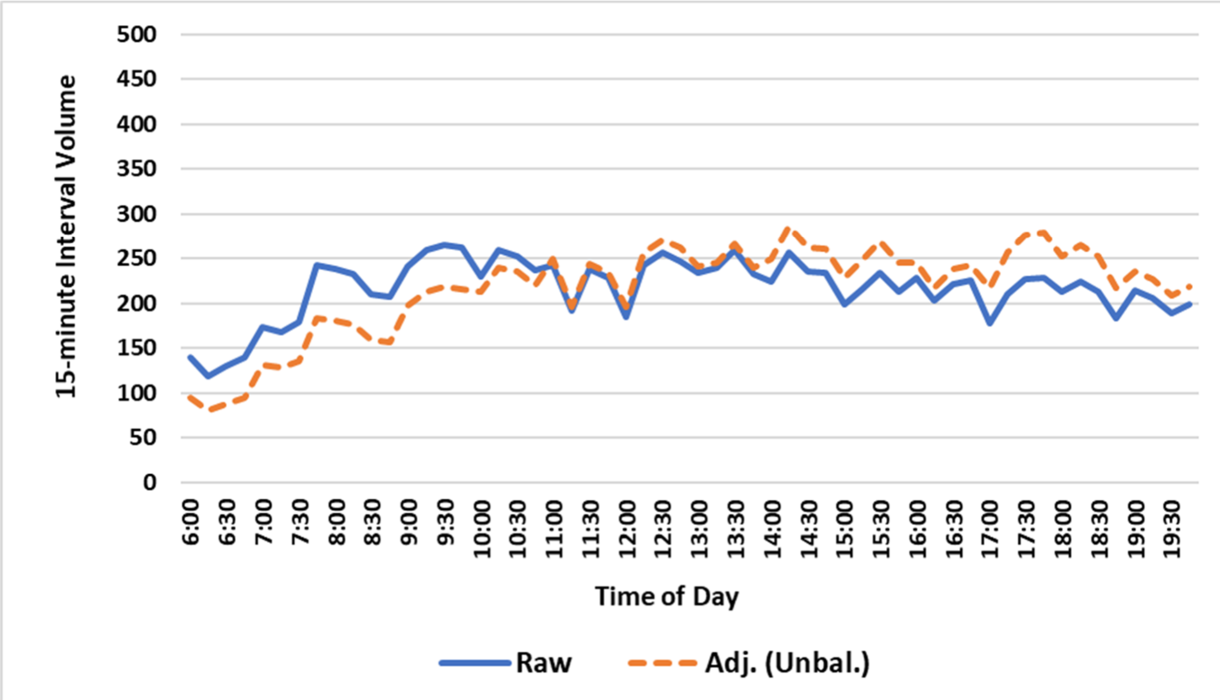
Figure B-61 SR 85 Southbound On-Ramp at Southbound Almaden Expressway 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

Figure B-62 SR 85 Southbound On-Ramp at Northbound Almaden Expressway 15-minute Interval Raw Mainline Counts versus 15-minute Interval Adjusted (Unbalanced) Volume



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; CDM Smith Analysis.

Note: Adj. = Adjusted, Unbal. = Unbalanced.

B.2.3.4 Determining Ramp Volumes for Missing Count Locations

As noted previously, counts were not taken on freeway-to-freeway ramps along SR 85 corridor. However, hourly balanced flow volume estimates dated April 2019 for these ramps were available from the Phase 1 Report of this Study. These volume estimates were scaled up or down using proportionality factors derived from the February 2020 mainline unbalanced volume estimates and the April 2019 mainline balanced volume estimates. **Table B-5** shows the volume estimates made for ramps on the following interchanges: SR 85 at SR 237 (4 ramps in total for both directions); SR 85 at I-280 (6 ramps in total for both directions); and, SR 85 at 17 (4 ramps total for both directions).

Figures B-63 and **B-64** show the peak hour total volume information on ramp locations in the northbound and southbound directions, respectively, in a bar chart format. On SR 85 northbound, the average ramp volume in the AM peak hour is 491 vehicles/hour and in the PM peak hour it is 508 vehicles/hour. The maximum ramp volume in the AM peak hour is 835 vehicles/hour and in the PM peak hour is 1,215 vehicles/hour. On SR 85 southbound, the average ramp volume in the PM peak hour is 472 vehicles/hour and in the PM peak hour it is 545 vehicles/hour. The maximum ramp volume in the AM peak hour is 996 vehicles/hour and in the PM peak hour it is 1,029 vehicles/hour.

Table B-5 SR 85 AM and PM Peak Hour Ramp Volume Estimates for Missing Count Locations

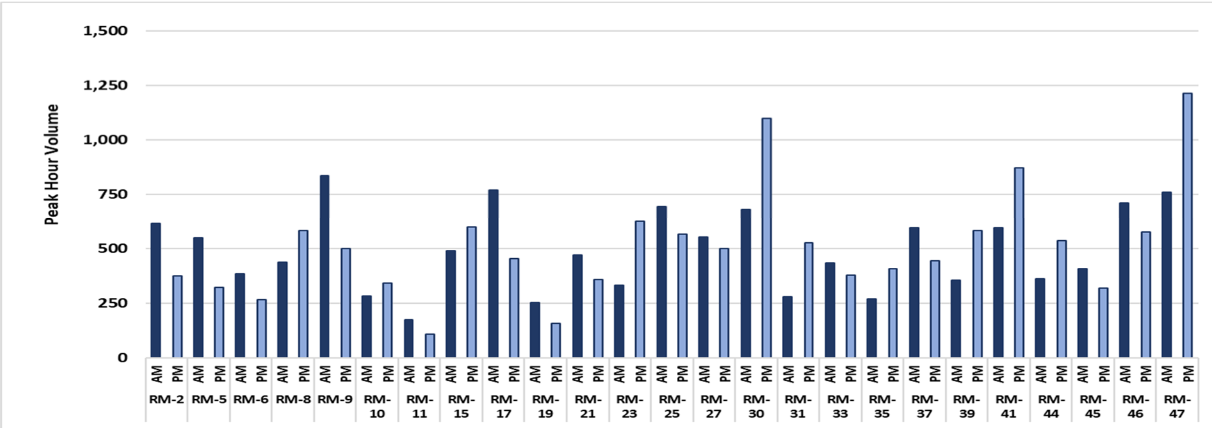
Missing Count Location	Peak Hour	Apr 2019 Ramp Volume Estimate	Mainline Volumes based Adj. Factor	Feb 2020 Ramp Volume Estimate
SR 85 Northbound Off-Ramp at SR 17	AM	1,646	1.19	1,952
	PM	2,425	1.00	2,432
SR 85 Northbound On-Ramp at SR 17	AM	967	1.19	1,147
	PM	1,067	1.00	1,070
SR 85 Northbound Off-Ramp at I-280	AM	1,408	0.95	1,341
	PM	2,073	1.19	2,463
SR 85 Northbound On-Ramp at I-280 Southbound	AM	525	0.95	500
	PM	381	1.19	453
SR 85 Northbound On-Ramp at I-280 Northbound	AM	2,134	0.95	2,032
	PM	1,548	1.19	1,839
SR 85 Northbound Off-Ramp at SR 237	AM	1,362	1.19	1,625
	PM	988	0.74	736
SR 85 Northbound On-Ramp at SR 237	AM	273	1.19	326
	PM	198	0.75	148

Missing Count Location	Peak Hour	Apr 2019 Ramp Volume Estimate	Mainline Volumes based Adj. Factor	Feb 2020 Ramp Volume Estimate
SR 85 Southbound Off-Ramp at SR 237	AM	136	0.74	100
	PM	216	0.74	159
SR 85 Southbound On-Ramp at SR 237	AM	808	0.73	592
	PM	1,282	0.74	943
SR 85 Southbound Off-Ramp at I-280	AM	1,281	1.30	1,668
	PM	2,034	1.01	2,061
SR 85 Southbound On-Ramp at I-280	AM	313	1.30	408
	PM	497	1.01	504
SR 85 Southbound On-Ramp at I-280	AM	799	1.30	1,041
	PM	1,505	1.01	1,525
SR 85 Northbound Off-Ramp at SR 17	AM	591	1.27	748
	PM	938	0.94	885
SR 85 Northbound On-Ramp at SR 17	AM	411	1.27	520
	PM	774	0.94	730

Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; Caltrans Traffic Census Counts; Caltrans PeMS; SR 85 Transit Guideway Study Phase 1 Report; CDM Smith Analysis.

Note: AM Peak Hour = 7:45 am to 8:45 am, PM Peak Hour = 5 pm to 6 pm.

Figure B-63 SR 85 Northbound AM and PM Peak Hour Unbalanced Volumes at Ramp Locations

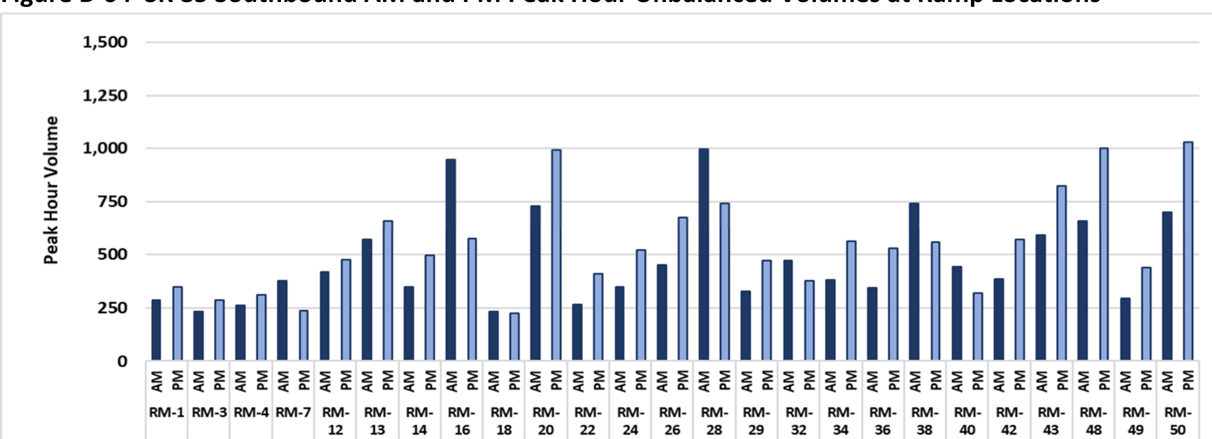


Loc ID	Loc Description	Loc ID	Loc Description	Loc ID	Loc Description	Loc ID	Loc Description
RM-2	SR 85 NB Off Ramp to Moffett Blvd	RM-15	SR 85 NB Off Ramp to W Fremont Ave	RM-30	SR 85 NB Off Ramp to Saratoga Ave	RM-44	SR 85 NB Off Ramp to Branham Ln
RM-5	SR 85 NB On Ramp from Central Expy	RM-17	SR 85 NB On Ramp from W Fremont Ave	RM-31	SR 85 NB On Ramp from Winchester Blvd	RM-45	SR 85 NB On Ramp from SB Almaden Expy
RM-6	SR 85 NB Off Ramp to Central Expy	RM-19	SR 85 NB On Ramp from Homestead Rd	RM-33	SR 85 NB On Ramp from S Bascom Ave	RM-46	SR 85 NB On Ramp from NB Almaden Expy
RM-8	SR 85 NB Off Ramp to WB El Camino Real	RM-21	SR 85 NB Off Ramp to Stevens Creek Blvd	RM-35	SR 85 NB Off Ramp to S Bascom Ave	RM-47	SR 85 NB Off Ramp to Almaden Expy
RM-9	SR 85 NB On Ramp from WB El Camino Real	RM-23	SR 85 NB On Ramp from S De Anza Blvd	RM-37	SR 85 NB Off Ramp to Union Ave		
RM-10	SR 85 NB Off Ramp to EB El Camino Real	RM-25	SR 85 NB Off Ramp to S De Anza Blvd	RM-39	SR 85 NB On Ramp from Union Ave		
RM-11	SR 85 NB On Ramp from EB El Camino Real	RM-27	SR 85 NB On Ramp from Saratoga Ave	RM-41	SR 85 NB On Ramp from Camden Ave		

Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; Caltrans Traffic Census Counts; Caltrans PeMS; SR 85 Transit Guideway Study Phase 1 Report; CDM Smith Analysis.

Note: AM Peak Hour = 7:45 am to 8:45 am, PM Peak Hour = 5 pm to 6 pm.

Figure B-64 SR 85 Southbound AM and PM Peak Hour Unbalanced Volumes at Ramp Locations



Loc ID	Loc Description	Loc ID	Loc Description	Loc ID	Loc Description	Loc ID	Loc Description
RM-1	SR 85 SB On Ramp from Moffett Blvd	RM-16	SR 85 SB On Ramp from W Fremont Ave	RM-29	SR 85 SB Off Ramp to Saratoga Ave	RM-43	SR 85 SB Off Ramp to Camden Ave
RM-3	SR 85 SB Off Ramp to Central Expy	RM-18	SR 85 SB Off Ramp to Homestead Rd	RM-32	SR 85 SB Off Ramp to Winchester Blvd	RM-48	SR 85 SB Off Ramp to Almaden Plaza Way
RM-4	SR 85 SB On Ramp from Central Expy	RM-20	SR 85 SB Off Ramp to Stevens Creek Blvd	RM-34	SR 85 SB On Ramp from S Bascom Ave	RM-49	SR 85 SB On Ramp from SB Almaden Expy
RM-7	SR 85 SB On Ramp from WB El Camino Real	RM-22	SR 85 SB On Ramp from Stevens Creek Blvd	RM-36	SR 85 SB Off Ramp to S Bascom Ave	RM-50	SR 85 SB On Ramp from Almaden Expy
RM-12	SR 85 SB Off Ramp to EB El Camino Real	RM-24	SR 85 SB On Ramp from S De Anza Blvd	RM-38	SR 85 SB Off Ramp to Union Ave		
RM-13	SR 85 SB On Ramp from EB El Camino Real	RM-26	SR 85 SB Off Ramp to S De Anza Blvd	RM-40	SR 85 SB On Ramp from Union Ave		
RM-14	SR 85 SB Off Ramp to W Fremont Ave	RM-28	SR 85 SB On Ramp from Saratoga Ave	RM-42	SR 85 SB On Ramp from Camden Ave		

Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; Caltrans Traffic Census Counts; Caltrans PeMS; SR 85 Transit Guideway Study Phase 1 Report; CDM Smith Analysis.

Note: AM Peak Hour = 7:45 am to 8:45 am, PM Peak Hour = 5 pm to 6 pm.

B.2.3.5 Peak Hour Volume Balancing

Mainline and ramp peak hour volumes were combined by direction and rearranged in the order of traffic flow along the corridor from end to end (for the southbound - starting from north end and travelling to south end; for the northbound - starting from south end and travelling to north end). Starting with a known mainline peak hour volume of a segment, unknown upstream/downstream mainline peak hour volumes of adjacent segments was derived by adding or subtracting adjacent on-/off-ramp peak hour volumes from the known mainline volumes as one proceeds along the corridor in one direction. The known mainline volume was selected in such a manner that the mean square error between the balanced and unbalanced peak hour volumes at mainline count locations minimized. All balanced peak hour volumes are rounded up to the nearest multiple of 5. The volume balancing was conducted separately for SR 85 northbound AM peak hour, northbound PM peak hour, southbound AM peak hour and southbound PM peak hour. **Figure B-65** shows the straight-line diagrams for SR 85 northbound and southbound AM and PM peak hour balanced volumes. Peak hour volume balancing was extended to the vehicle classes (auto, bus and truck) and lane types (non-HOV and HOV) using the mainline and ramp counts as control values for the vehicle class and lane shares. These represented the estimated volumes for the no change alternative (1-1).

B.2.3.6 Peak Period 15-Minute Interval Volume Factors Estimation

For the purposes of traffic operations modeling over the wider AM peak period (6 am to 12 pm) and PM peak period (2 pm to 8 pm), volume factors were determined based on the 15-minute interval combined total volumes at the four mainline data collection sites (see **Table B-6**). The volume factors were used to scale the balanced peak hour volume to the 15-minute intervals within the peak period.

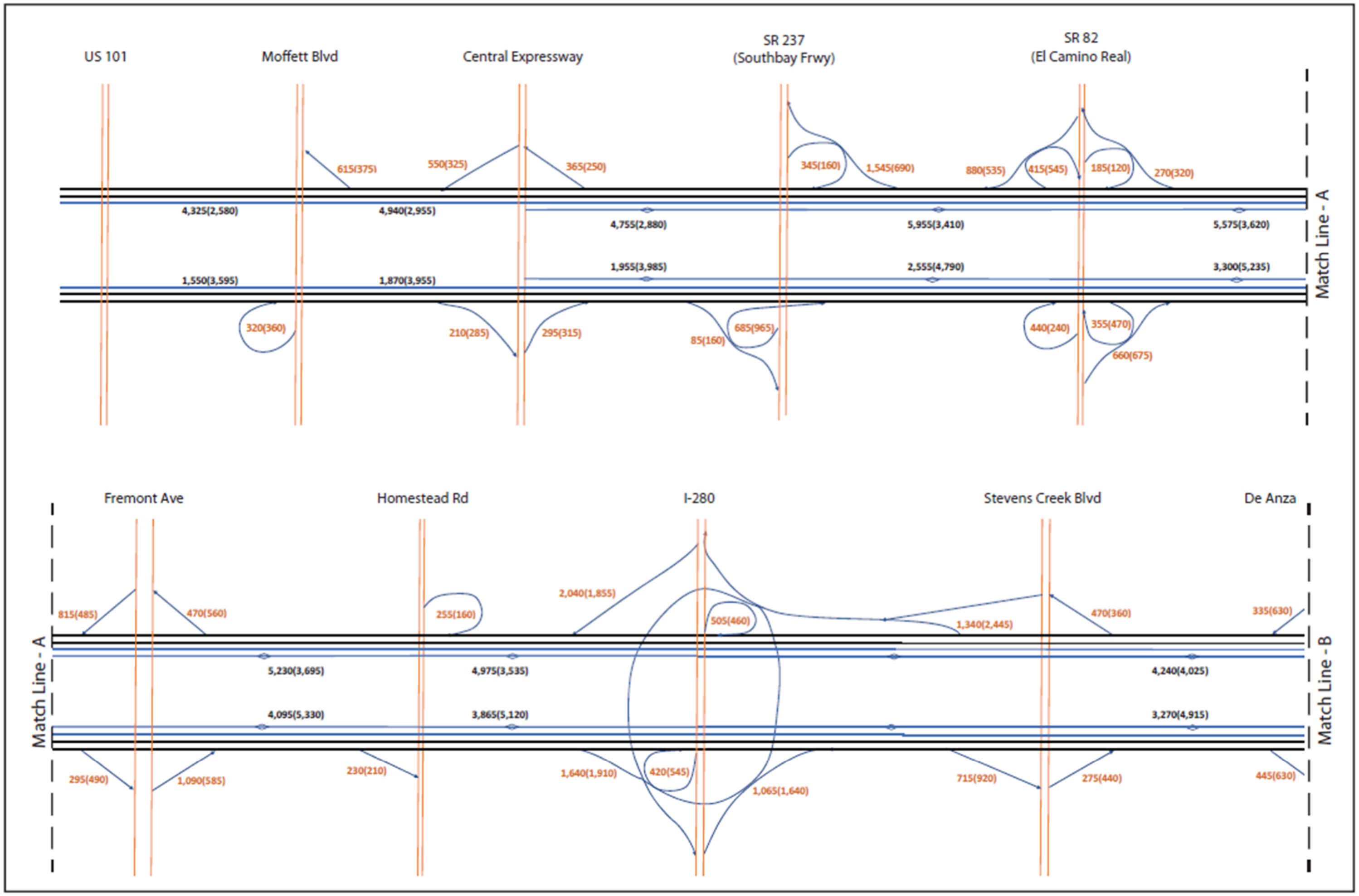
Table B-6 15-minute Interval Volume Factors for the AM and PM Peak Periods

Time Interval	AM Peak Period Volume Factor
6:00 - 6:15 AM	0.67
6:15 - 6:30 AM	0.74
6:30 - 6:45 AM	0.75
6:45 - 7:00 AM	0.81
7:00 - 7:15 AM	0.83
7:15 - 7:30 AM	0.90
7:30 - 7:45 AM	0.93
7:45 - 8:00 AM	1.00
8:00 - 8:15 AM	0.98
8:15 - 8:30 AM	1.00
8:30 - 8:45 AM	1.00
8:45 - 9:00 AM	1.00
9:00 - 9:15 AM	0.97
9:15 - 9:30 AM	0.99
9:30 - 9:45 AM	1.00
9:45 - 10:00 AM	1.00
10:00 - 10:15 AM	0.98
10:15 - 10:30 AM	0.98
10:30 - 10:45 AM	0.93
10:45 - 11:00 AM	0.92
11:00 - 11:15 AM	0.84
11:15 - 11:30 AM	0.84
11:30 - 11:45 AM	0.83
11:45 AM - 12:00 PM	0.83

Time Interval	PM Peak Period Volume Factor
2:00 - 2:15 PM	0.88
2:15 - 2:30 PM	0.96
2:30 - 2:45 PM	0.96
2:45 - 3:00 PM	0.97
3:00 - 3:15 PM	0.93
3:15 - 3:30 PM	0.99
3:30 - 3:45 PM	0.99
3:45 - 4:00 PM	0.98
4:00 - 4:15 PM	0.91
4:15 - 4:30 PM	0.92
4:30 - 4:45 PM	0.94
4:45 - 5:00 PM	0.96
5:00 - 5:15 PM	0.99
5:15 - 5:30 PM	1.00
5:30 - 5:45 PM	1.00
5:45 - 6:00 PM	0.96
6:00 - 6:15 PM	0.94
6:15 - 6:30 PM	0.95
6:30 - 6:45 PM	0.85
6:45 - 7:00 PM	0.88
7:00 - 7:15 PM	0.83
7:15 - 7:30 PM	0.77
7:30 - 7:45 PM	0.76
7:45 - 8:00 PM	0.73

Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts; CDM Smith Analysis

Figure B-65 SR 85 Northbound and Southbound AM and PM Peak Hour Balanced Volume Straight Line Diagrams



LEGEND

Peak Hour Volumes

xxxx(xxxx) AM(PM) Mainline

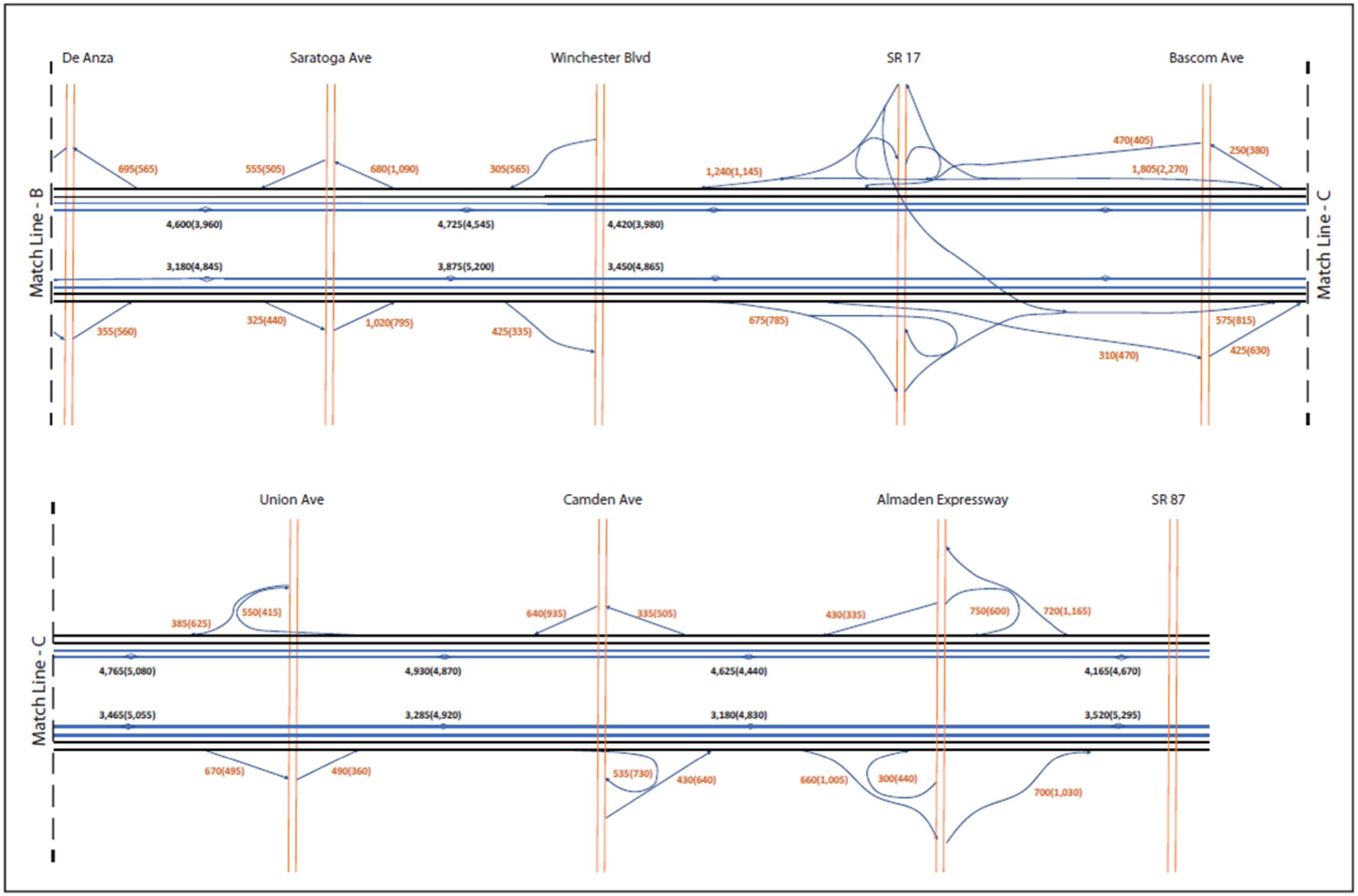
yyy(yyy) AM(PM) Ramp

N

NOT TO SCALE

Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; Caltrans Traffic Census Counts; Caltrans PeMS; SR 85 Transit Guideway Study Phase 1 Report; CDM Smith Analysis.

Figure B-65 SR 85 Northbound and Southbound AM and PM Peak Hour Balanced Volume Straight Line Diagrams (Continued)



LEGEND
Peak Hour Volumes
xxxx(xxxx) AM(PM) Mainline
yyy(yyy) AM(PM) Ramp

N
NOT TO SCALE

Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; Caltrans Traffic Census Counts; Caltrans PeMS; SR 85 Transit Guideway Study Phase 1 Report; CDM Smith Analysis.

B.2.3.7 HOV Occupancy and Clean Air Vehicle Decal (CAV Decal) Surveys Summary

Occupancy counts and clean air vehicle decal[5] (CAV decal) counts were collected through manual observations at two locations along SR 85, these were Homestead Road overcrossing and Meridian Avenue overcrossing over a 2-hour AM peak period (7 am to 9 am) and a 2-hour PM peak period (4 pm to 6 pm).

The occupancy counts suffer from several observer limitations:

- Did not include buses, bikes, or cars in which the observer could not see in due to front windshield tint.
- Counts represent only those persons that were observed. Much of the time it was difficult to see the persons in the back seat due to factors including, tint, speed of the vehicle and angle of the sun.
- Cars that operate as fleet for Transportation Network Companies (TNCs) such as Uber/Lyft likely have people in the back seat but no one except the driver in the front seat. So, double occupancy vehicles also may be higher than that counted.

For the above reasons, the raw counts represent car occupancy alone and should be treated as a survey sample rather than a full count. Also, there are most likely more 2, 3 and 4-person occupancy autos than the raw reported numbers.

There are no reportable data limitations with the CAV decal counts, as the decals are posted on the outside of the vehicle and visible to the observer under most conditions. However, in the case of CAV decal count in the northbound AM peak period on SR 85 at Homestead Road overcrossing, the percentage of CAV decal vehicles was observed to be very low (4.2 percent) compared to other locations, directions and time periods (ranged between 19-29 percent). Hence, the CAV decal survey for the northbound AM peak period on SR 85 at Homestead Road overcrossing was discarded as an outlier.

To overcome the raw occupancy data limitations and issues, the following assumptions and adjustments on occupancy were made:

- Many of the single occupancy vehicles (SOVs) on an HOV lane are likely also vehicles with decals for clean air vehicles (CAVs). So, the actual number of SOV vehicles in violation of the high occupancy rule may be lower than the total raw SOV count.
- According to the Caltrans HOV guidelines[6], the California Highway Patrol (CHP) is responsible for HOV lane enforcement. The goal is to keep HOV violation rates to less than 10 percent (of total HOV count). Once monitor counts detect violation rates above 10 percent, District personnel will notify local area CHP of the need for heightened enforcement in an HOV corridor.

[5] The California Department of Motor Vehicles (DMV) issues Clean Air Vehicle (CAV) decals that allow vehicles meeting specified emissions standards single occupancy use of High Occupancy Vehicle (HOV or carpool) lanes. California Air Resources Board (CARB) establishes the official list of eligible vehicles based upon vehicle emissions.

[6] https://dot.ca.gov/programs/traffic-operations/hov (last accessed on May 11, 2020)

According to the 2017 California HOV Facilities Degradations Report and Action Plan[7], several freeway corridors in the state are noted as having high HOV violation rates but SR 85 is not one of them. For this reason, it is assumed that the HOV violation rates are 10 percent or lower on average on SR 85.

While California Highway Patrol (CHP) staff enforce the HOV occupancy rule, the Metropolitan Transportation Commission (MTC) and the Bay Area Toll Authority (BATA) are seeking a video detection technology-based smartphone application to verify vehicle occupancy in express lanes and/or high-occupancy vehicle (HOV) lanes[8]. Currently, reliable technology to aid enforcement is not available system-wide.

In the particular case of the SR 85 at Homestead Road overcrossing count location, the traffic count was taken on February 4, 2020 (Tuesday) and CAV decal and occupancy counts were taken on February 5, 2020 (Wednesday), consecutive midweek days. The estimation of the percentage share of SOV or the count of vehicles with unknown occupancy by combining the data from the different dates was considered to be reasonable based on an engineering judgment that fluctuations in the total HOV count during AM and PM peak periods between the consecutive midweek days is expected to be small.

Based on all of the above, the percentage share of SOVs was adjusted to percent of decals plus 10 percent. This adjustment resulted in a drop of SOV share of the total HOV count compared to the raw data.

Total vehicle count on the HOV lane over the 2-hour AM and PM peak periods minus the total raw occupancy counts was considered to be the count of vehicles with unknown occupancy.

The difference between total vehicle count and SOV count on the HOV lane was allocated to HOV 2 and HOV 3+ vehicle types as an 80:20 ratio based on engineering judgment.

Tables B-7 shows a summary of the raw and adjusted occupancy and clean air vehicle (CAV or decal) surveys taken on HOV. The adjusted estimates of SOV share are in the range of 29 to 39 percent of the total HOV count. The adjusted estimates of HOV 2 share are in the range of 49 percent to 57 percent, HOV 3+ share are in the range of 12 percent to 14 percent, and the average vehicle occupancy (AVO) is in the range of 1.73 to 1.85 (assuming triple occupancy for HOV 3+, although it could be slightly higher). The existing CAV decal shares are in the range of 19 to 29 percent. These represent the estimated occupancy and CAV decal shares of the estimated HOV volume (see **Section B.2.3.5**) under the no change alternative (1-1).

It is noted that most manual methods for collecting occupancy counts would suffer from similar issues to the HOV lane occupancy surveys conducted in this study. However, comparisons were made between the occupancy raw data/adjusted estimates to that found in operational HOV to Express Lanes conversion projects and proposals.

[7] 2017 California HOV Facilities Degradations Report and Action Plan, available at: https://dot.ca.gov/-/media/dot-media/programs/traffic-operations/documents/f0019528-2017_hov_degradation_report_action_plan-a11y.pdf (last accessed on May 11, 2020)

[8] https://www.mercurynews.com/2019/07/28/how-videos-apps-and-good-ol-fashioned-policing-are-catching-carpool-lane-cheaters-in-the-bay-area/ (last accessed on May 11, 2020)

The results were compared to the before conditions on operational I-580, I-680 and I-110 Express Lane projects[9,10]. On I-580 and I-110, the occupancy prior to Express Lanes were between 1.21 to 1.57; on I-680 before SOV share was in the range of 27 to 35 percent. While I-580 and I-110 before conditions were closer to the raw occupancy estimates, I-680 before conditions were closer to our adjusted occupancy estimates.

The results were also compared with no build data or models on the proposed US 101 and I-105 Express Lane project applications[11,12,13]. The occupancy surveys on US 101 were conducted between South of Whipple Avenue and North of I-380 which does not have existing HOV lanes. The surveys showed HOV 2 share of 15 to 17 percent and HOV 3+ share of 1 to 2 percent in the peak periods. Since, SR 85 has existing HOV lanes, the differences in the vehicle type shares between US 101 data against both SR 85 raw vehicle type shares and adjusted vehicle type shares are reasonable. I-105 in LA Metro region, on the other hand, has similar existing conditions to SR 85. I-105 under no build conditions, which includes a single lane HOV 2+ facility, has a SOV share in the range of 10 to 15 percent, HOV 2 share of 72 to 76 percent and HOV 3+ share 13 percent during AM and PM peak periods. This is close to the adjusted occupancy estimate for SR 85 in terms of HOV 3+ share; but somewhat different in terms of SOV and HOV 2 shares.

Given that SR 85 adjusted occupancy estimates are based on sound engineering judgment and are consistent with at least some of the existing and proposed HOV to Express Lane conversion projects (I-680, I-110 and I-105), the occupancy adjustments were retained.

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[9] https://www.alamedactc.org/wp-content/uploads/2018/12/580_Express_Lanes_After_Study_FINAL.pdf (last accessed on May 11, 2020)

[10] https://www.alamedactc.org/wp-content/uploads/2018/11/AlamedaCTC_I-680_After_Study_20130712-1.pdf (last accessed on May 11, 2020)

[11] https://ccag.ca.gov/wp-content/uploads/2019/07/SM101HOTLane_CTCApplication_TollFacility_V07.pdf (last accessed on May 11, 2020)

[12] https://catc.ca.gov/-/media/ctc-media/documents/ctc-meetings/2019/2019-09/metro-i105-express-lanes-application.pdf

[13] https://ccag.ca.gov/wp-content/uploads/2014/05/US-101-HOV-Hybrid-PSR-PDS-Complete-Signed-Approved-2015-05-04.pdf (last accessed on May 11, 2020)

Table B-7 SR 85 HOV Facility CAV Decal and Occupancy Counts for AM and PM Peak Periods – Raw versus Adjusted

				Raw Data				Adjusted Estimate				Estimated Average Vehicle Occupancy (AVO)
Dir.	Time Period	Count Type	Vehicle Type	SR 85 at Homestead Road (ML-1) Count	SR 85 at Meridian Avenue (ML-2) Count	Aggregate	% Share of TOTAL	SR 85 at Homestead Road (ML-1) Count	SR 85 at Meridian Avenue (ML-2) Count	Aggregate	% Share of TOTAL	
NB	**AM**	**CAV Decal**	Decal	110	700	**810**	**14%**	Not Used	700	**700**	**23%**	
			Non-Decal	2,509	2,356	**4,865**	**86%**	Not Used	2,356	**2,356**	**77%**	
			TOTAL	**2,619**	**3,056**	**5,675**	**100%**	**Not Used**	**3,056**	**3,056**	**100%**	
		Occ.	SOV	1,903	1,441	**3,344**	**59%**	862	1,006	**1,867**	**33%**	
			HOV 2	627	1,147	**1,774**	**31%**	1,406	1,640	**3,046**	**54%**	
			HOV 3+	4	37	**41**	**1%**	351	410	**762**	**13%**	
			Unknown	85	431	**516**	**9%**					
			TOTAL	**2,619**	**3,056**	**5,675**	**100%**	**2,619**	**3,056**	**5,675**	**100%**	**1.81**
NB	**PM**	**CAV Decal**	Decal	149	202	**351**	**19%**	149	202	**351**	**19%**	
			Non-Decal	397	1,123	**1,520**	**81%**	397	1,123	**1,520**	**81%**	
			TOTAL	**546**	**1,325**	**1,871**	**100%**	**546**	**1,325**	**1,871**	**100%**	
		Occ.	SOV	244	320	**564**	**30%**	157	381	**538**	**29%**	
			HOV 2	251	515	**766**	**41%**	311	755	**1,066**	**57%**	
			HOV 3+	13	5	**18**	**1%**	78	189	**267**	**14%**	
			Unknown	38	485	**523**	**28%**					
			TOTAL	**546**	**1,325**	**1,871**	**100%**	**546**	**1,325**	**1,871**	**100%**	**1.85**
SB	**AM**	**CAV Decal**	Decal	195	174	**369**	**29%**	195	174	**369**	**29%**	
			Non-Decal	399	509	**908**	**71%**	399	509	**908**	**71%**	
			TOTAL	**594**	**683**	**1,277**	**100%**	**594**	**683**	**1,277**	**100%**	
		Occ.	SOV	274	401	**675**	**53%**	231	266	**497**	**39%**	
			HOV 2	243	213	**456**	**36%**	290	334	**624**	**49%**	
			HOV 3+	23	6	**29**	**2%**	73	83	**156**	**12%**	
			Unknown	54	63	**117**	**9%**					
			TOTAL	**594**	**683**	**1,277**	**100%**	**594**	**683**	**1,277**	**100%**	**1.73**
SB	**PM**	**CAV Decal**	Decal	621	689	**1,310**	**25%**	621	689	**1,310**	**25%**	
			Non-Decal	1,455	2,444	**3,899**	**75%**	1,455	2,444	**3,899**	**75%**	
			TOTAL	**2,076**	**3,133**	**5,209**	**100%**	**2,076**	**3,133**	**5,209**	**100%**	
		Occ.	SOV	1,122	1,260	**2,382**	**46%**	730	1,101	**1,831**	**35%**	
			HOV 2	689	1,687	**2,376**	**46%**	1,077	1,625	**2,702**	**52%**	
			HOV 3+	6	8	**14**	**0%**	269	406	**676**	**13%**	
			Unknown	259	178	**437**	**8%**					
			TOTAL	**2,076**	**3,133**	**5,209**	**100%**	**2,076**	**3,133**	**5,209**	**100%**	**1.78**

Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts; CDM Smith Analysis

Note: AM Peak Period = 7 am to 9 am, PM Peak Period = 4 pm to 6 pm.

B.3 Traffic Speed Data Collection/Processing

B.3.1 Freeway Mainline Speed Data

Traffic speed data on the mainline along the SR 85 were collected and processed as follows:

Caltrans PeMS Hourly Average Speeds Data were collected for the month of February 2020 on midweek days (Tuesdays, Wednesdays and Thursdays) from 6 am to 8 pm using Caltrans PeMS Detector Station data. Segments were identified based on the SR 85 Transit Guideway Study Phase 1 Report. An average of the hourly average speeds from multiple detector stations over a given segment was used as the average segment speed. Not all data collected at detector stations may be actual observations, data imputation is used in Caltrans PeMS when there is missing observed data. In this data collection, only the detector stations with "percent observed" data greater than or equal to 67 percent were used. As a result, speed data was not used for two segments in SR 85 northbound direction (Saratoga Ave to Winchester Blvd and Union Ave to Camden Ave) and one segment in SR 85 southbound direction (Homestead Rd to I-280). This data was used to calibrate the speeds in the traffic operations model used to assess change in speed.

Google Maps Traffic Model Hourly Average Speed data were collected for a midweek day in 2020[14] from 6 am to 8 pm using Google Maps' "DistanceMatrix" Application Programming Interface (API). Average speed estimates at the start of each hour were derived from Google Maps "best guess" (average) travel time predictions on the same segments as identified in the SR 85 Transit Guideway Study Phase 1 Report.

INRIX 50th Percentile Hourly Average Speeds were collected from the SR 85 Transit Guideway Study Phase 1 Report. These represent the 50th percentile value for each hour from 6 am to 8 pm computed over the average speeds for that hour across all midweek days from September 2016 to August 2017. Average speed for each hour and day were computed by using all INRIX records in that hour and day. The Phase 1Report defined segments over which the speed data was aggregated.

Figures B-66 to **B-68** are showing the hourly speeds information using the above three data sources. The congestion patterns are similar between the different sources. The magnitudes of speeds in the 2016/2017 INRIX data during the congested hours and locations however are higher compared to the 2020 Caltrans PeMS and Google Maps data indicating speed conditions on SR 85 have worsened over time. The data also shows that although congestion starts as isolated bottlenecks, they quickly expand and become compound bottlenecks with overlapping extents on SR 85.

[14] Google Maps "DistanceMatrix" API uses historical travel times to predict travel times for a "future date". The analysis was originally conducted in mid-February 2020 and revised in early April 2020 to meet a corridor segmentation requirement. The April 2020 analysis used as the "future date" of April 29, 2020 (Wednesday) for travel time predictions. However, it is noted that the prediction does not consider the advent of stay home California and SF Bay Area coronavirus / COVID-19 stay home orders of 2020; the speed estimates derived from the Google Maps travel time predictions are comparable to Caltrans PeMS speeds data in February 2020.

In this traffic analysis, the Caltrans PeMS speed data, which was available for most freeway segment locations, was used as a reference speed for model calibration under existing conditions. To fill some holes in the PeMS data between Saratoga Ave to Winchester Blvd and Union Ave to Camden Ave segments in the northbound direction and Homestead Rd to I-280 in the southbound direction, the Google Maps speed data was used in the model calibration.

Figure B-66 SR 85 Hourly Average Speeds based on Caltrans PeMS February 2020 Midweek 6 am to 8 pm Data

Northbound Freeway Segments

Mountain View ← San Jose

Time of Day	US 101 (Mountain View) to Moffett Blvd	Moffett Blvd to Central Expy	Central Expy to SR-237	SR-237 to El Camino Real	El Camino Real to Fremont Ave	Fremont Ave to Homestead Rd	Homestead Rd to I-280	I-280 to Stevens Creek Blvd	Stevens Creek Blvd to De Anza Blvd	De Anza Blvd to Saratoga Ave	Saratoga Ave to Winchester Blvd	Winchester Blvd to SR-17	SR-17 to Union Ave	Union Ave to Camden Ave	Camden Ave to Almaden Expy	Almaden Expy to SR-87
6:00 AM	62	60	61	60	60	61	64	64	50	57	N.A.	41	47	N.A.	40	55
7:00 AM	57	60	57	51	48	53	40	60	30	33	N.A.	23	35	N.A.	21	40
8:00 AM	46	52	50	30	30	39	15	42	37	35	N.A.	27	36	N.A.	20	30
9:00 AM	43	48	48	28	29	39	17	36	47	50	N.A.	26	35	N.A.	26	41
10:00 AM	61	58	56	43	45	52	41	58	57	62	N.A.	40	43	N.A.	57	64
11:00 AM	68	61	63	60	60	61	64	68	65	66	N.A.	65	62	N.A.	64	65
12:00 PM	68	64	64	61	62	63	66	68	66	67	N.A.	67	64	N.A.	64	65
1:00 PM	68	66	65	61	62	64	67	68	66	67	N.A.	67	64	N.A.	64	65
2:00 PM	68	66	66	62	63	63	67	68	66	67	N.A.	67	63	N.A.	64	65
3:00 PM	68	65	65	61	62	63	66	67	66	66	N.A.	66	62	N.A.	64	64
4:00 PM	68	64	64	61	63	63	66	67	66	66	N.A.	66	64	N.A.	64	64
5:00 PM	68	64	63	61	63	62	65	68	66	66	N.A.	66	62	N.A.	58	62
6:00 PM	67	64	61	58	62	62	65	68	65	65	N.A.	65	62	N.A.	63	62
7:00 PM	67	67	66	62	63	64	67	69	67	67	N.A.	67	65	N.A.	66	65

Southbound Freeway Segments

Mountain View → San Jose

Time of Day	US 101 (Mountain View) to Moffett Blvd	Moffett Blvd to Central Expy	Central Expy to SR-237	SR-237 to El Camino Real	El Camino Real to Fremont Ave	Fremont Ave to Homestead Rd	Homestead Rd to I-280	I-280 to Stevens Creek Blvd	Stevens Creek Blvd to De Anza Blvd	De Anza Blvd to Saratoga Ave	Saratoga Ave to Winchester Blvd	Winchester Blvd to SR-17	SR-17 to Union Ave	Union Ave to Camden Ave	Camden Ave to Almaden Expy	Almaden Expy to SR-87
6:00 AM	67	65	67	65	66	65	N.A.	68	68	67	67	69	67	66	67	67
7:00 AM	67	65	67	63	60	58	N.A.	67	68	67	67	68	67	65	66	67
8:00 AM	65	63	67	63	60	56	N.A.	66	69	66	66	66	67	63	64	66
9:00 AM	66	63	67	65	62	58	N.A.	66	68	67	67	66	67	64	65	66
10:00 AM	67	67	68	66	62	59	N.A.	66	68	66	67	67	68	64	65	66
11:00 AM	67	67	67	65	60	58	N.A.	66	68	66	67	67	68	64	65	65
12:00 PM	66	66	67	66	58	58	N.A.	67	68	66	67	67	68	64	65	65
1:00 PM	67	66	64	63	58	57	N.A.	67	68	66	66	66	67	63	62	63
2:00 PM	64	54	42	41	43	45	N.A.	65	56	54	45	65	55	41	56	61
3:00 PM	62	58	44	35	35	37	N.A.	52	13	27	25	63	42	29	43	58
4:00 PM	56	52	40	34	35	36	N.A.	39	9	20	23	51	29	26	31	55
5:00 PM	46	34	25	28	33	36	N.A.	39	9	20	21	33	21	24	29	49
6:00 PM	51	50	35	30	31	34	N.A.	47	17	24	21	35	20	23	31	50
7:00 PM	61	55	53	43	44	45	N.A.	62	45	49	41	60	48	33	54	60

Source: Caltrans PeMS Detector Stations Speed Data; CDM Smith's Analysis

Legend

Green	Greater than 55 mph
Yellow	45 to 55 mph
Orange	35 to 45 mph
Red	Less than 35 mph

Figure B-67 SR 85 "Best Guess" Hourly Speeds based on Google Maps Traffic Model 2020 Midweek 6 am to 8 pm Estimates

Northbound Freeway Segments

Mountain View ← San Jose

Time of Day	US 101 (Mountain View) to Moffett Blvd	Moffett Blvd to Central Expy	Central Expy to SR-237	SR-237 to El Camino Real	El Camino Real to Fremont Ave	Fremont Ave to Homestead Rd	Homestead Rd to I-280	I-280 to Stevens Creek Blvd	Stevens Creek Blvd to De Anza Blvd	De Anza Blvd to Saratoga Ave	Saratoga Ave to Winchester Blvd	Winchester Blvd to SR-17	SR-17 to Union Ave	Union Ave to Camden Ave	Camden Ave to Almaden Expy	Almaden Expy to SR-87
6:00 AM	71	74	72	76	71	74	75	76	68	69	66	74	66	68	69	70
7:00 AM	68	67	66	66	62	55	67	67	39	33	32	20	38	26	24	24
8:00 AM	62	64	58	40	36	26	18	59	45	31	24	13	29	28	25	20
9:00 AM	62	64	54	28	25	18	10	20	35	44	35	26	46	30	30	39
10:00 AM	68	65	58	34	31	26	34	71	65	67	43	28	49	45	60	65
11:00 AM	68	71	66	63	66	67	72	76	68	72	67	75	68	70	71	65
12:00 PM	71	71	66	69	69	70	72	76	70	72	71	75	68	71	71	65
1:00 PM	71	71	66	69	69	70	72	76	70	72	72	75	69	71	71	65
2:00 PM	71	71	69	72	69	70	71	76	70	72	71	75	69	71	71	65
3:00 PM	71	71	66	72	69	69	71	71	69	72	71	75	68	71	70	65
4:00 PM	68	69	66	63	68	69	69	76	69	71	70	75	68	71	69	65
5:00 PM	68	67	66	63	67	66	69	71	68	70	68	74	68	68	68	62
6:00 PM	68	67	63	63	64	54	68	71	66	67	60	71	65	66	67	60
7:00 PM	68	67	63	63	67	66	68	71	68	71	69	74	68	70	69	65

Southbound Freeway Segments

Mountain View → San Jose

Time of Day	US 101 (Mountain View) to Moffett Blvd	Moffett Blvd to Central Expy	Central Expy to SR-237	SR-237 to El Camino Real	El Camino Real to Fremont Ave	Fremont Ave to Homestead Rd	Homestead Rd to I-280	I-280 to Stevens Creek Blvd	Stevens Creek Blvd to De Anza Blvd	De Anza Blvd to Saratoga Ave	Saratoga Ave to Winchester Blvd	Winchester Blvd to SR-17	SR-17 to Union Ave	Union Ave to Camden Ave	Camden Ave to Almaden Expy	Almaden Expy to SR-87
6:00 AM	66	66	64	62	66	68	67	68	74	72	72	77	74	74	74	69
7:00 AM	66	66	66	61	66	67	67	68	73	72	72	77	73	73	71	64
8:00 AM	66	66	64	61	63	65	67	70	73	70	70	77	73	71	71	66
9:00 AM	66	66	64	61	64	65	67	67	72	70	69	73	73	71	71	67
10:00 AM	66	66	66	62	66	67	67	67	73	71	71	77	74	73	72	67
11:00 AM	66	66	66	62	66	67	67	68	73	72	71	77	73	72	71	67
12:00 PM	66	66	66	62	66	67	67	71	73	72	71	77	73	72	71	66
1:00 PM	66	66	66	62	66	66	67	70	73	71	71	77	73	72	71	66
2:00 PM	66	66	66	62	63	66	67	70	73	70	70	77	73	69	69	66
3:00 PM	66	45	24	20	33	34	63	63	30	35	41	68	29	38	65	64
4:00 PM	66	60	47	30	37	38	63	25	15	26	38	65	26	35	53	61
5:00 PM	44	34	22	21	35	38	59	20	13	20	30	29	14	32	49	59
6:00 PM	31	23	17	17	28	37	59	27	13	17	22	21	13	30	43	58
7:00 PM	66	60	58	42	43	46	59	51	25	31	36	46	21	33	58	61

Source: Google Maps "DistanceMatrix" Application Programming Interface; CDM Smith's Analysis

Legend

Green	Greater than 55 mph
Yellow	45 to 55 mph
Orange	35 to 45 mph
Red	Less than 35 mph

Figure B-68 SR 85 50th Percentile Hourly Average Speeds based on INRIX 2016/2017 Midweek 6 am to 8 pm Estimates

Northbound Freeway Segments

Mountain View ← San Jose

Time of Day	US 101 (Mountain View) to Moffett Blvd	Moffett Blvd to Central Expy	Central Expy to SR-237	SR-237 to El Camino Real	El Camino Real to Fremont Ave	Fremont Ave to Homestead Rd	Homestead Rd to I-280	I-280 to Stevens Creek Blvd	Stevens Creek Blvd to De Anza Blvd	De Anza Blvd to Saratoga Ave	Saratoga Ave to Winchester Blvd	Winchester Blvd to SR-17	SR-17 to Union Ave	Union Ave to Camden Ave	Camden Ave to Almaden Expy	Almaden Expy to SR-87
6:00 AM	66	70	70	68	69	70	71	74	68	68	64	64	68	63	64	66
7:00 AM	56	70	69	66	65	64	68	70	58	43	40	22	27	32	28	23
8:00 AM	39	66	66	58	48	34	32	63	55	39	30	16	15	26	28	27
9:00 AM	51	66	65	45	29	20	12	34	50	49	38	17	23	31	34	56
10:00 AM	60	68	68	53	38	34	42	70	65	67	43	25	57	47	64	67
11:00 AM	62	70	70	66	67	68	70	74	69	70	68	72	70	68	69	68
12:00 PM	63	70	70	66	68	69	70	70	70	71	70	72	70	68	69	68
1:00 PM	63	70	70	68	68	68	70	70	70	71	70	72	70	68	69	68
2:00 PM	63	70	70	68	68	68	70	70	70	71	70	72	70	69	69	68
3:00 PM	64	70	69	66	68	68	70	70	69	71	69	72	70	68	68	67
4:00 PM	63	68	68	66	68	68	69	70	69	71	69	72	70	69	68	68
5:00 PM	61	68	69	68	68	68	70	70	69	70	68	72	70	68	68	67
6:00 PM	61	68	69	66	67	66	69	70	69	70	67	72	69	68	67	66
7:00 PM	62	68	68	66	68	68	68	70	69	70	69	72	70	68	69	67

Southbound Freeway Segments

Mountain View → San Jose

Time of Day	US 101 (Mountain View) to Moffett Blvd	Moffett Blvd to Central Expy	Central Expy to SR-237	SR-237 to El Camino Real	El Camino Real to Fremont Ave	Fremont Ave to Homestead Rd	Homestead Rd to I-280	I-280 to Stevens Creek Blvd	Stevens Creek Blvd to De Anza Blvd	De Anza Blvd to Saratoga Ave	Saratoga Ave to Winchester Blvd	Winchester Blvd to SR-17	SR-17 to Union Ave	Union Ave to Camden Ave	Camden Ave to Almaden Expy	Almaden Expy to SR-87
6:00 AM	59	65	65	66	62	65	65	68	69	69	70	67	69	70	69	69
7:00 AM	60	65	65	66	61	66	65	69	71	70	71	70	70	70	70	68
8:00 AM	59	64	65	64	61	64	64	68	71	70	69	71	70	69	69	67
9:00 AM	59	66	68	66	65	67	65	67	72	71	70	72	70	70	69	68
10:00 AM	60	66	66	66	65	68	67	69	71	71	71	71	71	70	70	68
11:00 AM	60	66	66	66	64	67	66	69	71	70	70	71	70	70	70	68
12:00 PM	60	66	66	66	64	67	66	69	71	70	70	71	70	69	69	68
1:00 PM	60	66	66	66	65	67	66	69	71	70	70	71	70	69	69	68
2:00 PM	60	66	66	66	62	65	65	69	71	69	69	71	70	68	69	69
3:00 PM	59	65	62	44	35	37	51	52	37	39	50	48	32	51	65	67
4:00 PM	58	64	61	50	45	43	53	23	24	31	48	45	31	48	59	64
5:00 PM	51	40	30	26	31	37	50	19	19	27	40	25	23	44	56	62
6:00 PM	46	28	24	23	28	32	46	23	20	26	36	20	21	43	54	52
7:00 PM	56	63	60	47	41	43	51	57	39	47	47	51	32	51	64	67

Source: SR 85 Transit Guideway Study Phase 1 Report - September 2016 to August 2017 Midweek INRIX Speeds Data; CDM Smith's Analysis

Legend

Green	Greater than 55 mph
Yellow	45 to 55 mph
Orange	35 to 45 mph
Red	Less than 35 mph

B.3.2 HOV Facility Speed related Degradation Information

The 2017 California HOV Facilities Degradations Report and Action Plan notes that peak period recurrent congestion on SR 85 in all lanes reduces HOV lane performance and speed and the demand exceeds HOV lane capacity on this corridor. In 2017, the SR 85 southbound HOV facility between CA Postmile 9.590 (SR 85 just north of Union Ave) and R 23.800 (SR 85 - US 101 junction in the north) in Santa Clara County was determined as "extremely degraded" while the SR 85 northbound HOV facility between CA Postmile 4.795 (SR 85 just south of SR 87) and R 23.800 (SR 85 - US 101 junction in the north) in Santa Clara County was determined as "very degraded". The SR 85 southbound HOV facility between CA Postmile 4.795 (SR 85 just south of SR 87) and 9.590 (SR 85 just north of Union Ave) in Santa Clara County was also determined as "slightly degraded" in 2017.[15] Based on the freeway mainline speed data, which showed lowering of speeds between 2017 and 2020, the HOV facility speed would have also worsened.

B.4 Traffic Modeling

B.4.1 Model Overview and Purpose

A spreadsheet-based sketch planning traffic operations model was developed to estimate speeds under the Alternative 1-1 No Build and to estimate changes in volumes and speeds due to eight (8) build alternatives including: 2-1 HOV to Express Lane Conversion; 2-2 Short Dual Express Lane; 2-3 Long Dual Express Lane; 3-1 Short Median Transit Lane; 3-2 Long Median Transit Lane; 3-3 Right Side Median Transit Lane; 4-1 Median Bus on Shoulder; and, 4-2 Right Side Bus on Shoulder. In addition to the transit lane alternatives (3-1, 3-2, 3-3) and the bus on shoulder alternatives (4-1 and 4-2) there are also two routing options. These are on-corridor transit stations, and off-corridor existing transit stops. This brings the total count of traffic analysis results evaluated using the model to 14.

The modeling results of the no build alternative (1-1) were used in the transit operations analysis (see **Appendix E**), ridership estimation (see **Appendix A** of this report), as well as, the special case analysis of El Camino Real improvement (see **Section B.5** of this report). The results of the ridership estimation were used as a single feedback loop in the traffic analysis of the transit alternatives (3-1, 3-2, 3-3, 4-1 and 4-2) and two routing options to estimate the traffic impacts of the mode shift from auto to transit.

The output performance measures for the alternatives analysis are discussed in **Section B.6** of this report.

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[15] As per Caltrans:
"Degradation" means either the morning or evening peak hour average speed is less than 45 mph. This is determined using Caltrans PeMS speeds on weekdays during AM peak hour of 8 am to 9 am and PM peak hour of 5 pm to 6 pm on HOV facility segments that are approximately five miles in length.
"Slightly degraded" means degradation occurs from 10 to 49 percent of the time, or three to nine weekdays per month.
"Very Degraded" means degradation occurs from 50 to 74 percent of the time, or ten to 15 weekdays per month.
"Extremely Degraded" means degradation occurs 75 percent or more of the time, or 16 or more weekdays per month.
Further definitions and information can be found in the 2017 California HOV Facilities Degradations Report and Action Plan, available at: https://dot.ca.gov/-/media/dot-media/programs/traffic-operations/documents/f0019528-2017_hov_degradation_report_action_plan-a11y.pdf (last accessed on May 11, 2020)

B.4.2 Model Network and Analysis Time Periods

The model analyzes SR 85 mainline segments between SR 87 in the south and US 101 in the north. The analysis sections are:

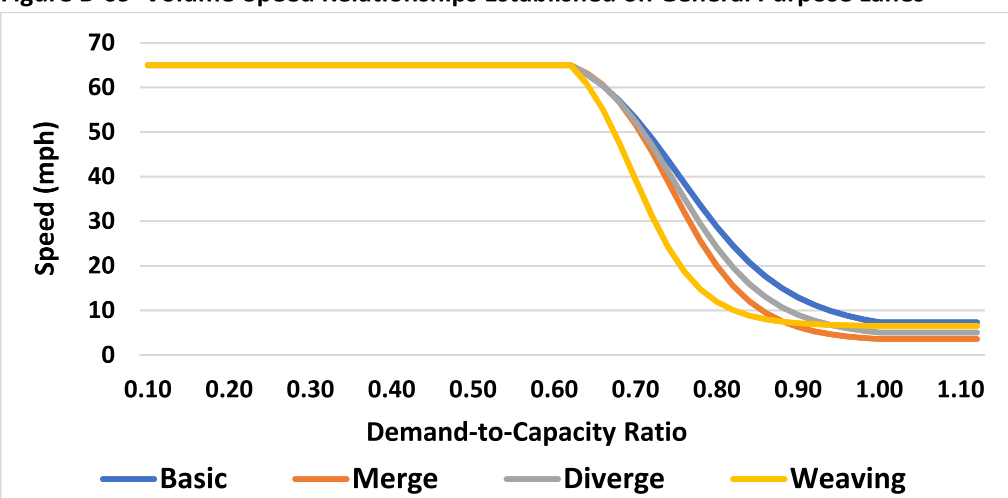
- Section 1 (approximately 5.5 miles): I 280 interchange to US 101 interchange
- Section 2 (approximately 13.5 miles): SR 87 interchange to I 280 interchange

were considered too coarse for traffic operations modeling. The model divides the freeway mainline into the following four segment types: basic, merge, diverge and weaving, as defined by the 2016 Highway Capacity Manual, HCM – the 6th Edition. In the northbound direction, the model defined 53 mainline segments and in the southbound direction, the model defined 54 mainline segments. The model analyzes traffic operations over a 6-hour AM time period (6 am to 12 pm) and a 6-hour PM time period (2 pm to 8 pm) at 15-minute intervals. The spreadsheet model accompanying this report provides more details on the model network coding.

B.4.3 General Purpose Lanes Speeds Estimation

The model defined a set of volume-speed relationships for general-purpose (GP) lanes as shown in **Figure B-69**, one for each freeway segment type, which estimate speed based on the demand to capacity ratio over a freeway segment and a 15-minute interval. As seen in the figure, among the four segment types, a weaving type segment is the most sensitive to increases in demand-to-capacity ratio, and a basic type segment is the least sensitive to increases in demand-to-capacity ratio.

Figure B-69 Volume-Speed Relationships Established on General Purpose Lanes



Source: CDM Smith's SR 85 Traffic Operations Model.

Note: The model structure is: If d/c < 0.62, speed = FFS, else speed = $\gamma + FFS/\left(1 + \alpha \times (v/c)^{\beta}\right)$. α, β and γ for: (a) Basic: (25, 12, 4.85), (b) Merge: (100, 16, 2.96), (c) Diverge: (50, 14, 3.80), and (d) Weaving: (600, 18, 6.44).

The demand on the GP lanes was established using the volumes and capacities in passenger car equivalent units based on the demand-level calculations (Step 1) in Chapter 25 Section 6 – Planning-Level Methodology for Freeway Facilities of the 2016 HCM. According to this, the demand level $d_{i,t}$ on segment i in analysis period t is computed as the demand level in segment

$i-1$, plus the inflow at segment i during analysis period t, minus the outflow at the same segment at analysis period t, plus any carryover demand $d'_{i,t-1}$ in segment i from the previous analysis period $t-1$. The carryover demand $d'_{i,t-1}$ on segment i at analysis period t is the difference between the segment demand and capacity.

The speeds on the GP lanes were estimated and calibrated against the hourly average speed data (see **Section B.2.1**) under the no build alternative (1-1) or existing conditions using both volume and capacity adjustments using a trial and error method. The calibration was aimed to lower the chi-square statistic between the speed estimates and comparison speed data. The general rule followed for the capacity adjustment was to use a minimum and maximum value by freeway segment type: basic: 2,000-2,350 passenger cars per hour per lane (pcphpl); merge or diverge: 1,175-2,000 pcphpl; and, weaving: 1,175-1,800 pcphpl. The limits were established based on Caltrans PeMS estimated capacity ranges at detector stations using February 2020 flow and speed data. A few exceptions violating the general rule for capacity were allowed to improve the match between the estimated speeds and the observed speeds. In addition, volumes were capped (adjusted downward) at a few segments where the estimated speeds without capping were much lower than the observed speeds; and there was no room left to increase the capacity. The adjusted volumes used in the model were kept balanced similar to the unadjusted volumes developed in **Section B.2.3.5**.

The estimated hourly average speeds on the GP lanes using the traffic operations model under the no build alternative (1-1) are shown in **Figure B-70**. The model output speeds are very close to comparable speed data in and around the AM and PM peak hours of 7:45 am to 8:45 am and 5:00 pm to 6:00 pm. However, the differences between the model output speeds and comparable speed data are larger on the shoulders of the peak period.

Figure B-70 SR 85 Hourly Average Speeds on General-Purpose Lanes based on Traffic Operations Model Midweek 6 am to 8 pm Estimates

Northbound Freeway Segments

Mountain View ← San Jose

Time of Day	US 101 (Mountain View) to Moffett Blvd	Moffett Blvd to Central Expy	Central Expy to SR-237	SR-237 to El Camino Real	El Camino Real to Fremont Ave	Fremont Ave to Homestead Rd	Homestead Rd to I-280	I-280 to Stevens Creek Blvd	Stevens Creek Blvd to De Anza Blvd	De Anza Blvd to Saratoga Ave	Saratoga Ave to Winchester Blvd	Winchester Blvd to SR-17	SR-17 to Union Ave	Union Ave to Camden Ave	Camden Ave to Almaden Expy	Almaden Expy to SR-87
6:00 AM	65	65	65	61	62	63	46	65	64	64	62	64	65	64	62	65
7:00 AM	53	55	55	34	36	46	21	52	49	46	37	39	51	43	33	45
8:00 AM	48	51	51	29	31	42	18	40	38	34	26	27	37	30	21	32
9:00 AM	48	51	51	29	31	42	18	41	39	35	27	28	39	31	22	33
10:00 AM	48	51	51	29	31	42	19	49	46	43	32	35	48	39	28	41
11:00 AM	48	51	51	29	31	42	19	64	62	62	54	58	65	60	55	62
12:00 PM																
1:00 PM																
2:00 PM	65	65	65	65	65	65	65	65	64	64	57	64	63	65	56	65
3:00 PM	65	65	65	65	65	65	65	65	64	64	54	64	60	65	52	65
4:00 PM	65	65	65	65	65	65	65	65	64	65	59	65	64	65	58	65
5:00 PM	65	65	65	65	65	65	65	65	63	63	52	63	58	65	49	65
6:00 PM	65	65	65	65	65	65	65	65	65	65	61	65	64	65	60	65
7:00 PM	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65

Southbound Freeway Segments

Mountain View → San Jose

Time of Day	US 101 (Mountain View) to Moffett Blvd	Moffett Blvd to Central Expy	Central Expy to SR-237	SR-237 to El Camino Real	El Camino Real to Fremont Ave	Fremont Ave to Homestead Rd	Homestead Rd to I-280	I-280 to Stevens Creek Blvd	Stevens Creek Blvd to De Anza Blvd	De Anza Blvd to Saratoga Ave	Saratoga Ave to Winchester Blvd	Winchester Blvd to SR-17	SR-17 to Union Ave	Union Ave to Camden Ave	Camden Ave to Almaden Expy	Almaden Expy to SR-87
6:00 AM	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65
7:00 AM	65	65	65	65	65	60	63	59	65	65	65	65	64	65	65	65
8:00 AM	65	65	65	65	65	54	59	51	65	65	64	65	62	65	65	65
9:00 AM	65	65	65	65	65	55	59	53	65	65	64	65	62	65	65	65
10:00 AM	65	65	65	65	65	59	63	58	65	65	65	65	64	65	65	65
11:00 AM	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65
12:00 PM																
1:00 PM																
2:00 PM	55	41	31	34	38	43	61	43	12	20	22	33	21	22	27	51
3:00 PM	51	35	28	28	33	37	59	38	11	20	22	33	21	22	27	51
4:00 PM	57	45	32	38	42	46	63	47	11	20	22	33	21	22	27	51
5:00 PM	48	31	27	25	29	34	57	34	11	20	22	33	21	22	27	51
6:00 PM	59	49	36	43	46	50	63	51	11	20	22	33	21	22	27	51
7:00 PM	65	65	60	64	64	64	65	65	15	20	22	33	21	22	27	51

Source: CDM Smith's SR 85 Traffic Operations Model.

Legend

Green	Greater than 55 mph
Yellow	45 to 55 mph
Orange	35 to 45 mph
Red	Less than 35 mph

Table B-8 shows the estimated chi-squared statistics for comparison of the model estimated speeds with the measured speed data (mostly using Caltrans PeMS with a few segments using Google Maps) by direction and time of day.

Table B-8 Chi-Square Statistics for Goodness of Fit between Model Estimated Speeds and Measured Speeds by Direction and Time of Day

Direction	Chi-Square Statistic			
	6-Hour AM Period	6-Hour PM Period	8 AM – 9 AM	5 PM – 6 PM
Northbound	282.9	25.6	1.8	3.3
Southbound	18.0	377.1	5.7	3.1

Source: CDM Smith's SR 85 Traffic Operations Model; Caltrans PeMS Detector Stations Speed Data; Google Maps "DistanceMatrix" Application Programming Interface

B.4.4 HOV Lane Speeds Estimation

For the HOV lane, the model used a corridor level average HOV lane volume and adjusted the GP lane volume for each segment to the total volume minus this average HOV lane volume. This simplification was done given a limited number of mainline counts (only at four locations) were taken and the ramp counts were not distinguished into vehicles headed to/coming from GP lanes and vehicles headed to/coming from the HOV lane. The HOV lane average volumes in the northbound AM, northbound PM, southbound AM and southbound PM peak hours were calculated as: 1,489 vehicles/hour, 609 vehicles/hour, 324 vehicles/hour and 1,401 vehicles/hour, respectively.

The speed estimation was made using the speed-flow curve formulae for a basic managed lane found in Chapter 12 Section 4 – Extensions to the Methodology to Basic Managed Lane Segments of the 2016 HCM. According to this, the speed on a managed lane is a composite value derived from: speed within the linear portion of the speed–flow curve; speed drop within the curvilinear portion of the speed–flow curve; and, additional speed drop (mi/h) within the curvilinear portion of the speed–flow curve when the density of the adjacent general purpose lane is more than 35 pc/mi/ln (also called the "frictional effect" of the adjacent general purpose lane). The HOV lane was modeled as a "continuous access" type facility throughout the length of the SR 85 corridor and associated parameters in the 2016 HCM were used to estimate speed on the HOV or managed lane.

B.4.5 Infrastructure Changes Coding and Volume Changes Estimation

For the build alternatives, the model performs three types of volume change calculations on general purpose and managed lanes: induced demand due to addition of freeway auxiliary lane-miles or express lane-miles; transit mode shift related auto demand reduction; and, HOV use restrictions and tolling related to auto sub-mode demand shifts.

B.4.5.1 Induced Demand due to Infrastructure Changes

Induced demand was estimated using the induced demand calculator developed by the researchers at the National Center for Sustainable Transportation at the University of California, Davis[16]. The calculator allows users to estimate the VMT induced annually as a result of adding general-purpose or HOV lane-miles to roadways managed by the California Department of Transportation (Caltrans) in one of California's urbanized counties (counties within a metropolitan statistical area (MSA)). The calculator applies only to Caltrans-managed facilities with Federal Highway Administration (FHWA) functional classifications of 1, 2 or 3. That correspond to interstate highways (class 1), other freeways and expressways (class 2), and other principal arterials (class 3). In this analysis, an elasticity value of 0.75 associated with class 3 facilities, representing a ratio of percentage change of vehicle-miles traveled over percentage change of lane-miles was used. The induced demand was added only to the mainline segments from interchange to interchange where lane-miles are added and was assumed to use the upstream on-ramp and downstream off-ramp of the mainline segment to enter and leave the SR 85 corridor. All build alternatives have an addition of 1.1-mile long auxiliary lane in SR 85 northbound direction between S De Anza Boulevard and Stevens Creek Boulevard interchanges. The Short and Long Dual Express Lane alternatives (2-2 and 2-3) add HOV lane-miles in both directions of SR 85. While the alternative 2-2 builds about 12.5 HOV lane-miles in each direction of the freeway between SR 87 and I-280, the alternative 2-3 builds about 18.0 HOV lane-miles in each direction of the freeway between SR 87 and US 101. The maximum induced demand was capped at 1,000 vehicles/hour in this analysis. The cap was active only at the segments with addition of both an auxiliary lane and a second HOV lane.

B.4.5.2 Mode Shift due to Transit Alternatives

Transit mode shift is based on the ridership estimation detailed in **Appendix A** of this report. Using the origin-destination station pair level ridership estimates developed for the AM and PM time periods and the various transit alternatives (3-1, 3-2, 3-3, 4-1 and 4-2) and routing options

[16] https://blinktag.com/induced-travel-calculator/index.html (last accessed on May 11, 2020)

(on-corridor transit stations and off-corridor transit stops) as inputs, the model derives SR 85 mainline segment level ridership estimates. The AM and PM time periods used in the transit analysis and ridership estimation are 6 am to 10 am and 3 pm to 7 pm, respectively. Using traffic volume factors over these hours and a service frequency of one bus every 15-minute interval, number of buses and ridership per bus in each 15-minute interval, traffic analysis was conducted for the various transit alternatives and routing options. El Camino Real to Mountain View LRT Station in the SR 85 northbound direction and Bascom Avenue to Saratoga Avenue in the SR 85 southbound direction are generally the busiest segments in terms of ridership. The ridership per bus estimates are low and even in the peak hour the ridership is less than 10 persons per bus under both routing options, so the transit mode shift has small impact on the SR 85 mainline traffic. The auto trip reduction in vehicle units was computed assuming that the transit ridership gain would come from single occupancy vehicles (SOVs) and the resultant traffic would be distributed among GP and HOV lanes in the same proportion as the No Build traffic.

B.4.5.3 Auto Sub-Mode Shift due to Changes in HOV Use Restrictions and Tolling

Under the build alternatives, HOV use restrictions change and tolling is introduced as described in **Section 2.2.2** of this report. While the exact pricing strategy for tolling is not determined at the time of this analysis, the project proposed HOV use restrictions and tolling rules are known and there are also federal and Caltrans guidance on HOV lane to express lane conversion. There are HOV lane occupancy surveys conducted for SR 85 and empirical data based on other planned or implemented projects and research with similar HOV use restrictions and tolling rules as the SR 85 project. These were used to estimate the auto sub-mode demand shifts between the proposed express lanes and GP lanes. The auto sub-modes include single occupancy vehicles (SOVs), high occupancy vehicle with 2 occupants (HOV2) and high occupancy vehicle with 3 or more occupants (HOV3+).

The information used in the auto sub-mode demand shifts include the following:

- For a HOV facility with a speed limit of 50 miles per hour or greater, federal guidance[17] requires the HOV lane to meet a minimum average operating speed of 45 mph for 90 percent of the time over a 180-day monitoring period during morning and evening weekday peak hours (or both), or else it is degraded.
- According to the Caltrans HOV guidelines[18], for buffered or contiguous HOV facilities, Caltrans considers LOS-C occurs at approximately 1,650 vehicles per hour, less if there is significant bus volume or if there are physical constraints. The SR 85 analysis assumed that the proposed express lanes in the peak direction (northbound AM and southbound PM) would carry 1,650 vehicle per hour per lane under both single and dual express lane configuration. The non-peak directions (northbound PM and southbound AM) would carry about half or 825 vehicles per hour per lane with dual express lane configuration, with no changes in volume with the single express lane configuration.

[17] https://ops.fhwa.dot.gov/freewaymgmt/hovguidance/hovguidance.pdf (last accessed on May 11, 2020)
[18] https://dot.ca.gov/programs/traffic-operations/hov (last accessed on May 11, 2020)

As noted in **Section B.2.3.7** of this report, the HOV violation rates on SR 85 are expected to be 10 percent or lower on average, for the the sub-mode shift calculations, this was assumed at 10 percent both under existing and proposed express lanes conditions.

As per an implemented I-10 Metro Express Lanes project[19] and I-105 Express Lanes Project Application[20], the SOV share after building express lanes is expected to be around 45 percent including violators while the HOV2 share is expected to range as 15 to 25 percent and the remaining 30 to 40 percent being HOV3+.

As part of Texas DOT research[21], a 4,600-respondent survey of freeway users in Houston and Dallas and a simulation modeling of six alternative HOV scenarios at varying toll rates were conducted to identify the tradeoffs associated with HOV toll discounts in new managed lanes. Based on this research, the percent changes in SOV, HOV2 and HOV3+ shares on HOV lane under the toll settings of HOV2 are at 25-50% of SOV Toll and HOV3+ are free. While SOV and HOV3+ shares as percent of HOV lane total are expected to go up by 2.4 percent and 2.3 percent, respectively; the HOV2 share as a percent of HOV lane total is expected to drop by 4.7 percent.

Additional studies relating to implemented projects and performance reports on I-680, I-580 and SR 237 in the San Francisco Bay Area were also reviewed but none of these were similar in HOV use restrictions or tolling to the proposed SR 85 express lanes. While the US 101 HOV to express lane conversion project in San Mateo County has an application that is similar to the proposed SR 85 express lanes, the auto sub-mode shares and vehicle occupancy changes due to the project were not well-documented. Also, no documented "before" and "after" data was found on I-80 HOV3+ lanes in Alameda/Contra Costa Counties.

Existing HOV lane shares of SOV, HOV2 and HOV3+ were estimated as described in **Section B.2.3.7** of this report.

As per the 2017 National Household Travel Survey[22], the average vehicle occupancy (AVO) for non-weekend trips for San Jose-Sunnyvale-Santa Clara, CA Core-Based Statistical Area (CBSA) on average is 1.35 for AM trip start times between 6 am and 11 am and on average is 1.54 for PM trip start times between 2 pm and 7 pm. These AVO values were used as averages for all SR 85 mainline lanes combined to make fine adjustments to the SOV, HOV 2 and HOV3+ shares on the existing HOV lanes and proposed express lanes on SR 85.

Table B-9 shows the auto sub-mode share assumptions under the "before" conditions of HOV lane and "after" conditions of proposed express lanes.

Table B-9 "Before" and "After" HOV lane Auto Sub-Mode Share Assumptions

			"Before" Auto Sub-Mode Share		"After" Auto Sub-Mode Share	
Direction	**Lane Context**	**Sub-Mode**	**AM Period**	**PM Period**	**AM Period**	**PM Period**
Northbound	Managed Lane	SOV (Paying Tolls)	23%	19%	50%	45%
		SOV (Violators)	10%	10%	10%	10%
		HOV2	54%	57%	20%	23%
		HOV3+	13%	14%	20%	23%
		TOTAL	**100%**	**100%**	**100%**	**100%**
	All Lanes	SOV	72%	59%	74%	61%

19 Metro Express Lanes Operational Performance Report, Fiscal Year 2018.

20 https://catc.ca.gov/-/media/ctc-media/documents/ctc-meetings/2019/2019-09/metro-i105-express-lanes-application.pdf (last accessed on May 11, 2020)

21

22 https://nhts.ornl.gov/ (last accessed on May 11, 2020)

Direction	Lane Context	Sub-Mode	"Before" Auto Sub-Mode Share		"After" Auto Sub-Mode Share	
			AM Period	PM Period	AM Period	PM Period
		HOV2	22%	30%	17%	25%
		HOV3+	7%	12%	10%	15%
		TOTAL	**100%**	**100%**	**100%**	**100%**
Southbound	Managed Lane	SOV (Paying Tolls)	29%	25%	50%	45%
		SOV (Violators)	10%	10%	10%	10%
		HOV2	49%	52%	20%	23%
		HOV3+	12%	13%	20%	23%
		TOTAL	**100%**	**100%**	**100%**	**100%**
	All Lanes	SOV	72%	59%	74%	61%
		HOV2	22%	30%	17%	25%
		HOV3+	7%	12%	10%	15%
		TOTAL	**100%**	**100%**	**100%**	**100%**

Source: CDM Smith Assumptions based on Various Sources listed in **Section B.4.5.3** of this Report

B.4.5 Model Limitations

There are some limitations with this spreadsheet-based sketch planning traffic operations model that include:

Although the model accounts for the demand relationships over adjacent time intervals and segments, a key limitation of the model is that queues formed within a segment do not propagate to upstream links instead as HCM 2016 describes the planning-level calculations form "vertical" queues within a segment. By using longer segments that include the bottlenecks and a sufficiently long upstream segment where queuing occurs, this limitation can be overcome. In this analysis, the average length of the segments was almost 1,800 feet.

The model does not directly consider ramp influence area factors such as length of acceleration and deceleration lanes. While McTrans' Highway Capacity Software Version 7 (HCS7) was considered for modeling initially due to its ability to consider these factors, the length of the SR 85 corridor and number of analysis segments made the calibration of the HCS7 model using the measured speed data (mostly using Caltrans PeMS with a few segments using Google Maps) difficult. The sketch planning model in comparison was easier to calibrate due to the independence of performance measures (particularly, speed) on the mainline segments. The ramp influence area factors affect all alternatives and were not considered key to the selection between the alternatives.

The model does not explicitly analyze the impact of tolling on clean air vehicles (CAVs), these vehicle types were grouped with the general single occupant vehicle (SOV) type. The reason for not analyzing CAVs separately is that the empirical data collected was insufficient to model their HOV lane usage impacts. It is noted however that the effects are likely similar to that for HOV2 vehicle type due to a similar level of tolling for CAVs, which is 50 percent of SOV toll. Differences in demographic characteristics (age, income, etc.) of the operators of CAV and HOV2 vehicle types would also play a small role in determining the HOV lane usage impacts of CAVs.

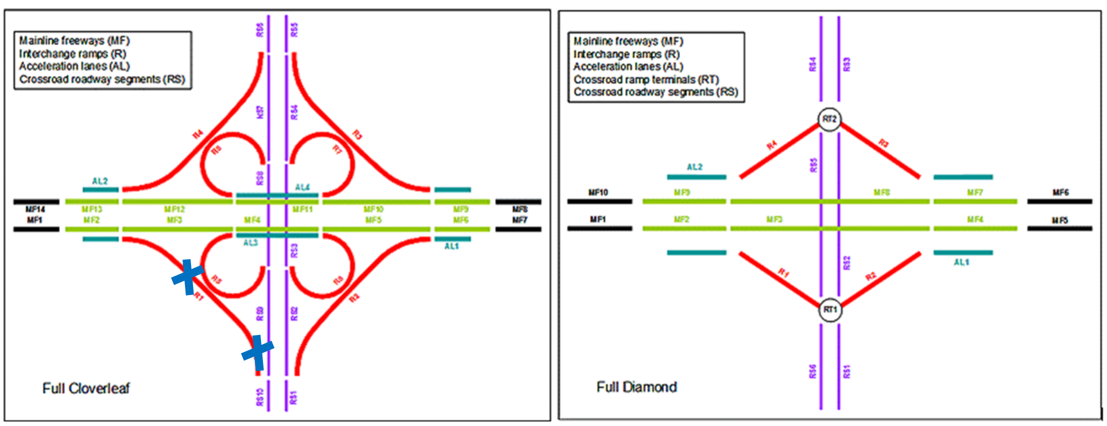
The model is not capable of analyzing the El Camino Real interchange improvement as it relates mainly to ramp reconfiguration. This improvement was separately analyzed as a special case as described in the next section (**Section B.5**) of this report.

B.5 Special Case Analysis – El Camino Real Interchange Improvement

A special case analysis using McTrans' Highway Capacity Software Version 7 (HCS7) was conducted on a proposed El Camino Real interchange reconfiguration from a cloverleaf to a diamond configuration. This project is necessary to accommodate the transit bus stops at the El Camino Real interchange for the right side transit lane or right side bus on shoulder alternatives using the on-corridor transit stations routing option.

Under the no build condition, the cloverleaf interchange has 4 loop ramps and 3 slip ramps. The missing slip ramp that would make it a full cloverleaf interchange is from SR 85 southbound to El Camino Real (SR 82) westbound. Under the build conditions, the diamond interchange has 4 slip ramps. **Figure B-71** is showing the "before" and "after" configurations for illustration purposes.

Figure B-71 Illustrative "Before" and "After" Configurations of SR 85 / El Camino Real (SR 82) Interchange



Source: https://www.fhwa.dot.gov/publications/research/safety/07045/applic.cfm (last accessed on May 11, 2020)

- Roadway link is absent on ground at SR 85 / El Camino Real interchange

The interchange infrastructure and volume inputs "before" and "after" the improvement are coded in HCS7 and over the model network extents as summarized in **Table B-10**. While the SR 85 northbound off-ramp and SR 85 southbound on-ramp for the diamond interchange are assumed to be located 2,500 feet south of the El Camino Real roadway centerline, the ramps north of it, that is, SR 85 northbound on-ramp and SR 85 southbound off-ramp, would be located only 775 feet and 1,100 feet north of the El Camino Real roadway centerline due to the presence of nearby ramps to/from SR 237. The unadjusted and balanced peak hour volumes developed in **Section B.2.3.5** of this report and the 15-minute interval volume factors developed in **Section B.2.3.6** of this report were used in this special case analysis.

The output performance measures for the special case analysis are discussed in the next section (**Section B.6**) of this report.

Table B-10 "Before" and "After" Infrastructure and Volume Inputs at and around SR 85 / El Camino Real (SR 82) Interchange Improvement

Segment	Seg. Type	Seg. Length (ft)	Acc. Lane Length (ft)	Dec. Lane Length (ft)	Num. of GP Lanes	Num. of ML Lanes	AM Peak Hour GP Lane Demand (veh/hr)	AM Peak Hour ML Lane Demand (veh/hr)	PM Peak Hour GP Lane Demand (veh/hr)	PM Peak Hour ML Lane Demand (veh/hr)
Northbound "Before"										
Fremont Ave On-Ramp to El Camino Real/SR 82 EB Off-Ramp – 1	Basic	4,975			2	1	4,086	1,489	3,011	609
Fremont Ave On-Ramp to El Camino Real/SR 82 EB Off-Ramp – 2	Diverge	1,500		150	2	1	4,086	1,489	3,011	609
El Camino Real/SR 82 EB Off-Ramp to EB Loop On-Ramp	Basic	845			2	1	3,816	1,489	2,691	609
El Camino Real/SR 82 EB Loop On-Ramp to WB Loop Off-Ramp	Weaving	280			3	1	4,001	1,489	2,811	609
El Camino Real/SR 82 WB Loop Off-Ramp to WB On-Ramp	Basic	635			2	1	3,586	1,489	2,266	609
El Camino Real/SR 82 WB On-Ramp to SR 237 EB Off-Ramp	Weaving	460			3	1	4,466	1,489	2,801	609
SR 237 EB Off-Ramp to EB On-Ramp	Basic	960			2	1	2,921	1,489	2,111	609
Northbound "After"										
Fremont Ave On-Ramp to El Camino Real/SR 82 EB Off-Ramp – 1	Basic	3,460			2	1	4,086	1,489	3,011	609
Fremont Ave On-Ramp to El Camino Real/SR 82 EB Off-Ramp – 2	Diverge	1,500		750	2	1	4,086	1,489	3,011	609
El Camino Real/SR 82 EB Off-Ramp to WB On-Ramp	Basic	3,275			2	1	3,401	1,489	2,146	609
El Camino Real/SR 82 WB On-Ramp to SR 237 EB Off-Ramp	Weaving	460			3	1	4,466	1,489	2,801	609
SR 237 EB Off-Ramp to EB On-Ramp	Basic	960			2	1	2,921	1,489	2,111	609
Southbound "Before"										
SR 237 WB Off-Ramp to On-Ramp	Basic	950			2	1	1,546	324	2,424	1,401
SR 237 WB On-Ramp to El Camino Real/SR 82 WB Loop On-Ramp - 1	Merge	1,500	1,100		2	1	2,231	324	3,389	1,401
SR 237 WB On-Ramp to El Camino Real/SR 82 WB Loop On-Ramp - 2	Basic	565			2	1	2,231	324	3,389	1,401
El Camino Real/SR 82 WB Loop On-Ramp to EB Loop Off-Ramp	Weaving	310			3	1	2,671	324	3,629	1,401
El Camino Real/SR 82 EB Loop Off-Ramp to EB On-Ramp	Basic	785			2	1	2,316	324	3,159	1,401
El Camino Real/SR 82 EB On-Ramp to Fremont Ave Off-Ramp - 1	Merge	1,500	420		2	1	2,976	324	3,834	1,401
El Camino Real/SR 82 EB On-Ramp to Fremont Ave Off-Ramp - 2	Basic	5,050			2	1	2,976	324	3,834	1,401
Southbound "After"										
SR 237 WB Off-Ramp to On-Ramp	Basic	950			2	1	1,546	324	2,424	1,401
SR 237 WB On-Ramp to El Camino Real/SR 82 WB Off-Ramp	Weaving	1,110			3	1	2,231	324	3,389	1,401
El Camino Real/SR 82 WB Loop Off-Ramp to EB On-Ramp	Basic	3,610			2	1	1,876	324	2,919	1,401
El Camino Real/SR 82 EB On-Ramp to Fremont Ave Off-Ramp – 1	Merge	1,500	750		2	1	2,976	324	3,834	1,401
El Camino Real/SR 82 EB On-Ramp to Fremont Ave Off-Ramp – 2	Basic	3,490			2	1	2,976	324	3,834	1,401

Source: Google Earth for SR 85 / El Camino Real (SR 82) Interchange No Build conditions; Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; Caltrans Traffic Census Counts; Caltrans PeMS; SR 85 Transit Guideway Study Phase 1 Report; CDM Smith Analysis and Assumptions for SR 85 / El Camino Real (SR 82) Interchange Build conditions.

Note: Seg. = Segment, Acc. = Acceleration, Dec. = Deceleration, AM Peak Hour = 7:45 am to 8:45 am, PM Peak Hour = 5 pm to 6 pm.

B.6 Traffic Performance Measures

The traffic performance on SR 85 was evaluated for the alternatives and the special case of El Camino Real improvement in terms of vehicle miles of travel and miles of congestion (on general purpose lanes). Other traffic performance measures were also computed for information purposes and include the following: vehicle hours of travel, vehicle hours of delay at threshold speedof 45 mph, average speed, percent miles with freeway level of service (LOS) of E or F[23] (on general purpose lanes), and percent ramp influence areas congested. The key performance measures are discussed followed by a summary of the results for the alternatives and the special case analysis. A qualitative discussion of the traffic impacts of the alternatives on local streets is also presented.

B.6.1 Vehicle Miles of Travel

The SR 85 corridor vehicle miles of travel (VMT) varies between the alternatives due to the same factors that affect the volume changes, namely: induced demand due to addition of freeway auxiliary lane-miles or express lane-miles; transit mode shift related auto demand reduction; and HOV use restrictions and tolling related auto sub-mode demand shifts. All build alternatives have a change in VMT due to induced demand. The transit lane alternatives (3-1, 3-2, 3-3) and the bus on shoulder alternatives (4-1 and 4-2) have a change in VMT due to transit mode shift. All build alternatives (2-1, 2-2, 2-3, 3-1, 3-2, 3-3, 4-1 and 4-2) have a change in VMT due to auto sub-mode deman shifts related to HOV use restrictions and tolling. In this analysis, the volume and VMT changes were localized to the segments where the changes in lane-miles and modal or sub-modal use changes occurred.

A one percent increase in lane-miles results in a 0.75 percent increase in VMT. When no lane-miles of general purpose or managed lanes are added it is assumed there will be no change in person throughput. In other words, induced demand due only to speed changes was not estimated. A substantial increase in lane-miles and VMT comes from the development of dual express lanes under Express Lane Alternatives 2-2 and 2-3. Auxiliary lanes added to northbound SR 85 between S De Anza Boulevard and Stevens Creek Boulevard interchanges under all build alternatives also contribute to a small increase in VMT.

The higher the ridership estimate under a transit service alternative, the higher is the auto VMT reduction. The analysis found that the ridership per bus estimates are low and even in the peak hour the ridership is less than 10 persons per bus on all SR 85 mainline segments. The transit mode shift has a very small impact on VMT.

Due to the changes in the HOV use restrictions and tolling, the auto sub-modes using the HOV lane would undergo a compositional change. While SOV and HOV3+ shares as percent of HOV lane total

[23] According to the HCM 2016, level of service or LOS on freeway segments is defined by density measured in passenger cars per mile per lane (pcpmpl). The HCM defines six LOS service thresholds. LOS A (free-flow conditions): less than 11 pcpmpl, LOS B (reasonably free-flow conditions): > 11-18 pcpmpl, LOS C (speeds near free flow speed but freedom to maneuver within the traffic stream is noticeably restricted): > 18-26 pcpmpl, LOS D (speeds begin to decline below free flow speed and freedom to maneuver within the traffic stream is seriously limited): > 26-35 pcpmpl, LOS E (flow at or near capacity and little room to maneuver within the traffic stream): > 35-45 pcpmpl, and LOS F (unstable flow and traffic breakdowns): > demand exceeds capacity or density > 45 pcpmpl.

are expected to go up by 2.4 percent and 2.3 percent, respectively, the HOV2 share as percent of HOV lane total is expected to drop by 4.7 percent. The added SOV and HOV3+ vehicles would come from the GP lanes, while the removed HOV2 vehicles (and also possibly some CAVs) would travel on the GP lanes. A net decrease in VMT due to an overall increase in average vehicle occupancy on SR 85 corridor is expected and is associated with the change in HOV use restrictions and tolling.

Under the special case analysis for El Camino Real conversion from a cloverleaf to diamond interchange, the change in VMT is attributed to changes in throughput at ramp influence areas associated with the re-configured freeway-to-ramp and ramp-to-freeway flows as well as ramp capacity.

B.6.2 Miles of Congestion

A sketch planning traffic operations model was used to estimate 15-minute interval speeds by freeway mainline segment for the alternatives analysis and HCS7 was used for the special case analysis for the proposed El Camino Real improvement. Using the speed threshold of 45 mph on each SR 85 mainline segment, the peak 15-minute interval speeds in the AM and PM peak hours (by direction) were analyzed to evaluate congestion by freeway mainline segment. The length of all congested freeway segments is reported as miles of congestion. Queuing was not studied in this analysis due to model limitations and miles of congestion cannot be interpreted as queue lengths.

B.6.3 Other Performance Measures

Similar to the miles of congestion, a sketch planning traffic operations model was used to estimate other performance measures in the AM and PM peak hour for the alternatives analysis. HCS7 was used for the special case analysis of the proposed El Camino Real improvement. Average speed is a direct output of the models. Vehicle hours of travel were estimated using 15-minute interval volumes and average travel time (segment length divided by average speed) by freeway mainline segment. Vehicle hours of delay was estimated using 15-minute interval volumes and average travel time in excess of travel time at a threshold speed of 45 mph. Delay is zero when the travel time is below the travel time at the threshold speed, and increases as speed drops below 45 mph. Freeway density was computed on GP lanes as GP lane volume served in passenger cars per hour divided by GP lane speed and number of GP lanes. LOS was identified for freeway segments based on the estimated density and LOS criteria in the 2016 HCM as shown in **Figure B-72**. Based on the network coding, the ramp influence areas (merge, diverge or weaving type mainline segments) were identified. The segments with average speed below the threshold speed of 45 mph were counted.

Figure B-72 2016 HCM's Level of Service (LOS) Criteria for Basic Freeway Segment

LOS	Density (pc/mi/ln)
A	≤11
B	>11–18
C	>18–26
D	>26–35
E	>35–45
F	Demand exceeds capacity OR density > 45

Source: Exhibit 12-15 of 2016 HCM

B.6.4 Local Streets

The impacts of induced traffic due to addition of lane-miles or the benefits of mode shifts on local streets is expected to be minimal compared to the impacts/benefits on the SR 85 mainline. No data was collected directly on the local streets for this analysis. However, the on-ramp and off-ramp volumes were estimated. By inspecting the speeds at the mainline merge and diverge segments under the alternatives, the impacts on local streets were indirectly evaluated. Low speeds in merge area could result in queue spillbacks from on-ramps to local streets, while low speeds in diverge area could result in delays to the traffic exiting SR 85 via off-ramps. The total number of merge, diverge and weaving areas with speeds below 45 mph by alternative in the AM and PM peak 15-minute interval by direction of movement were estimated. There are 28 ramp influence areas in each direction.

Local street traffic can also have impacts on transit operations. The off-corridor routing option includes three offline stations located at De Anza College, West Valley College, and Good Samaritan Hospital. The access to these stations would incur travel time delays due to traffic congestion on local streets. The transit operations analysis in **Appendix E** includes estimates of access times to the offline stations via local streets.

B.6.5 Results for Alternatives Analysis

Table B-11 is showing the year 2020 traffic performance measures estimated on SR 85 corridor between SR 87 and I-280 in the AM and PM peak hours by direction of movement for the 14 alternatives defined for the SR 85 Transit Guideway Project. Note that the results are based on the travel conditions prior to the advent of California and SF Bay Area coronavirus/COVID-19 stay home orders of 2020.

Under the No Change Alternative 1-1, the northbound VMT in the AM peak hour is 1.2 times that of PM peak hour. The southbound VMT in PM peak hour is 1.5 times that of AM peak hour. The SR 85 southbound PM peak hour VMT is 5 percent higher than the SR 85 northbound AM peak hour VMT. In terms of miles of congestion, SR 85 northbound is congested over 7.2 miles of the 18.0 miles in the AM peak hour. SR 85 southbound is congested over 7.7 miles of the 18.0 miles in the PM peak hour, which is about 7 percent higher than the SR 85 northbound AM peak hour.

Comparing the alternatives, VMT is estimated to increase as high as 23 percent in both the northbound and southbound directions under Alternative 2-3, long dual express lane compared to the no Alternative 1-1 No Change. Under Alternative 2-2 short duel express lane, VMT is slightly lower but reaches 17 percent increase over the no change alternative. Alternative 2-1, a conversion of HOV to express lane would result in about a 1 percent increase in VMT over the no change alternative. Transit alternatives (3-1, 3-2, 3-3 Transit Lanes, 4-1 and 4-2 Bus on Shoulder) and their routing options would be marginally lower than Alternative 2-1 due to a mode shift from transit to auto.

Comparing the alternatives, the miles of congestion would decrease by 94 percent in the northbound AM peak direction and by 88 percent in the southbound PM peak direction under the long dual express lane Alternative 2-3 compared to the no change alternative. Under the short dual express lane Alternative 2-2, the miles of congestion would decrease by 81 percent in the northbound AM peak direction and by 60 percent in the southbound PM peak direction. HOV to express lane conversion, Alternative 2-2 would reduce the miles of congestion by 40 percent in the northbound AM peak direction and by 33 percent in the southbound PM peak direction. Transit alternatives (3-1, 3-2, 3-3 Transit Lanes and 4-1 and 4-2 Bus on Shoulder) and their routing options would be similar to Alternative 2-2 in terms of miles of congestion reduced in the northbound AM peak direction, and slightly better in the southbound PM peak direction, where the reduction would be 44 percent.

The number of ramp influence areas congested is indicative of local street impacts. Under the no change alternative, almost 76 percent of the ramp influence areas are congested in the peak hours and directions. The percentage can be reduced to 52 percent or more by implementing any of the build alternatives. The most benefits come from Alternative 2-3, followed by Alternative 2-2. Other performance results are also shown in **Table B-11** for information purposes.

Table B-11 2020 Traffic Performance Measures by SR 85 Transit Guideway Alternative

Alt. #	Alternative Description	Route Option	Alternative Short Description	VMT (veh-mi) AM Peak Hour	VMT (veh-mi) PM Peak Hour	VHT (veh-hrs) AM Peak Hour	VHT (veh-hrs) PM Peak Hour	VHD (veh-hours) AM Peak Hour	VHD (veh-hours) PM Peak Hour	Av Spd (mph) AM Peak Hour	Av Spd (mph) PM Peak Hour	% Miles of Freeway LOS E or F AM Peak Hour	% Miles of Freeway LOS E or F PM Peak Hour	Miles of Congestion* AM Peak Hour	Miles of Congestion* PM Peak Hour	Number of Ramp Influence Areas Congested* AM Peak Hour	Number of Ramp Influence Areas Congested* PM Peak Hour
SR 85 Northbound Mainline Segments (N/O of SR 87 to S/O of US 101)																	
1-1	No Changes	N.A.	1-1	79,825	66,782	2,410	1,115	1,567	107	33	60	34%	5%	7.2	0.9	22	3
2-1	HOV to Express Lane Conversion	N.A.	2-1	80,703	67,546	1,899	1,113	840	101	42	61	19%	5%	4.3	0.9	14	3
2-2	Short Dual Express Lane	N.A.	2-2	91,439	78,329	1,801	1,307	377	124	51	60	8%	5%	1.4	0.9	5	3
2-3	Long Dual Express Lane	N.A.	2-3	96,926	81,984	1,739	1,364	124	124	56	60	2%	5%	0.4	0.9	2	3
3-1	Short Median Transit Lane	In-Corr.	3-1 - RteOpt 1	80,449	67,357	1,871	1,106	818	98	43	61	19%	5%	4.3	0.9	14	3
		Off-Corr.	3-1 - RteOpt 2	80,453	67,369	1,870	1,108	817	99	43	61	19%	5%	4.3	0.9	14	3
3-2	Long Median Transit Lane	In-Corr.	3-2 - RteOpt 1	80,431	67,239	1,869	1,103	816	98	43	61	19%	5%	4.3	0.9	14	3
		Off-Corr.	3-2 - RteOpt 2	80,448	67,248	1,870	1,104	817	98	43	61	19%	5%	4.3	0.9	14	3
3-3	Right Side Median Transit Lane	In-Corr.	3-3 - RteOpt 1	80,438	67,239	1,869	1,103	816	98	43	61	19%	5%	4.3	0.9	14	3
		Off-Corr.	3-3 - RteOpt 2	80,453	67,257	1,870	1,105	817	98	43	61	19%	5%	4.3	0.9	14	3
4-1	Median Bus on Shoulder	In-Corr.	4-1 - RteOpt 1	80,434	67,263	1,869	1,104	816	98	43	61	19%	5%	4.3	0.9	14	3
		Off-Corr.	4-1 - RteOpt 2	80,448	67,248	1,870	1,104	817	98	43	61	19%	5%	4.3	0.9	14	3
4-2	Right Side Bus on Shoulder	In-Corr.	4-2 - RteOpt 1	80,466	67,295	1,873	1,105	819	98	43	61	19%	5%	4.3	0.9	14	3
		Off-Corr.	4-2 - RteOpt 2	80,469	67,257	1,872	1,105	818	98	43	61	19%	5%	4.3	0.9	14	3
SR 85 Southbound Mainline Segments (S/O of US 101 to N/O of SR 87)																	
1-1	No Changes	N.A.	1-1	55,406	83,444	884	3,181	27	2,176	63	26	0%	38%	0.3	7.7	1	21
2-1	HOV to Express Lane Conversion	N.A.	2-1	55,109	82,905	875	2,347	25	1,331	63	35	0%	30%	0.3	5.2	1	15
2-2	Short Dual Express Lane	N.A.	2-2	64,338	96,690	1,003	2,115	0	703	64	46	0%	18%	0.0	3.1	0	8
2-3	Long Dual Express Lane	N.A.	2-3	67,298	102,418	1,039	2,114	0	464	65	48	0%	5%	0.0	0.9	0	3
3-1	Short Median Transit Lane	In-Corr.	3-1 - RteOpt 1	54,985	82,781	872	2,329	25	1,279	63	36	0%	30%	0.3	4.3	1	15
		Off-Corr.	3-1 - RteOpt 2	54,984	82,750	872	2,323	25	1,274	63	36	0%	30%	0.3	4.3	1	15
3-2	Long Median Transit Lane	In-Corr.	3-2 - RteOpt 1	54,919	82,758	869	2,323	24	1,261	63	36	0%	29%	0.3	4.3	1	15
		Off-Corr.	3-2 - RteOpt 2	54,894	82,772	869	2,328	24	1,277	63	36	0%	29%	0.3	4.3	1	15
3-3	Right Side Median Transit Lane	In-Corr.	3-3 - RteOpt 1	54,919	82,758	869	2,323	24	1,261	63	36	0%	29%	0.3	4.3	1	15
		Off-Corr.	3-3 - RteOpt 2	54,909	82,772	869	2,328	24	1,277	63	36	0%	29%	0.3	4.3	1	15
4-1	Median Bus on Shoulder	In-Corr.	4-1 - RteOpt 1	54,919	82,758	869	2,323	24	1,261	63	36	0%	29%	0.3	4.3	1	15
		Off-Corr.	4-1 - RteOpt 2	54,894	82,772	869	2,328	24	1,277	63	36	0%	29%	0.3	4.3	1	15
4-2	Right Side Bus on Shoulder	In-Corr.	4-2 - RteOpt 1	54,919	82,771	869	2,328	24	1,277	63	36	0%	29%	0.3	4.3	1	15
		Off-Corr.	4-2 - RteOpt 2	54,918	82,772	870	2,328	24	1,277	63	36	0%	29%	0.3	4.3	1	15

*Based on GP Lanes - Peak Hour Peak 15-Minute Interval

AM Peak Hour: 7:45 am to 8:45 am; PM Peak Hour: 5 pm to 6 pm.

NOTE: Delay or congestion is assumed when speed on a segment falls below 45 mph (Caltrans threshold)

Source: Google Earth for SR 85 / El Camino Real (SR 82) Interchange No Build conditions; Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; Caltrans Traffic Census Counts; Caltrans PeMS; SR 85 Transit Guideway Study Phase 1 Report; CDM Smith Analysis and Assumptions for SR 85 / El Camino Real (SR 82) Interchange Build conditions.

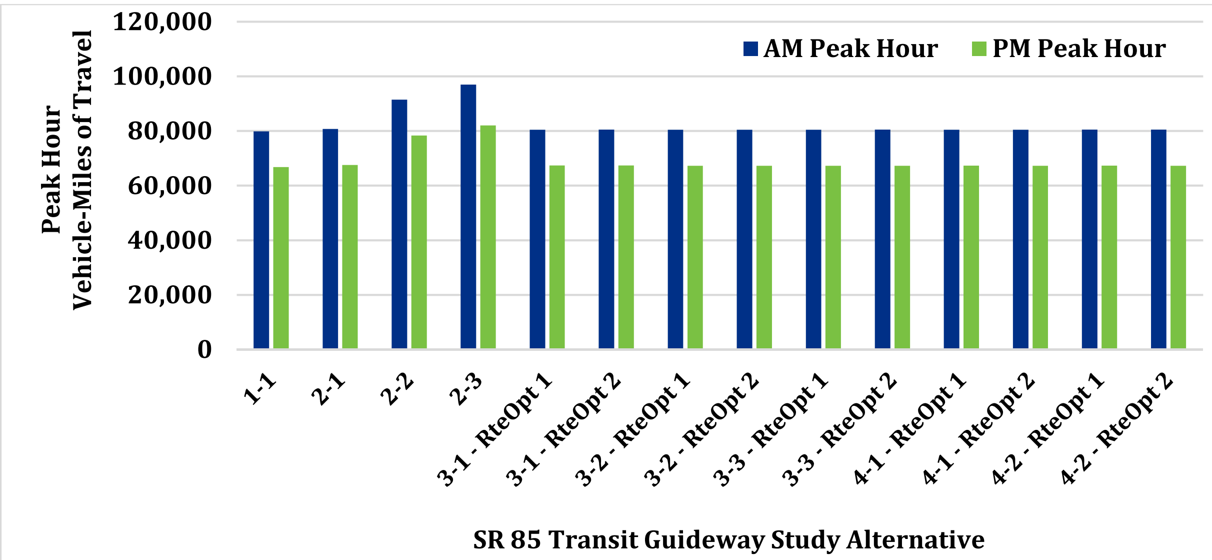
Note: Seg. = Segment, Acc. = Acceleration, Dec. = Deceleration, AM Peak Hour = 7:45 am to 8:45 am, PM Peak Hour = 5 pm to 6 pm.

Figures B-73 through **B-75**

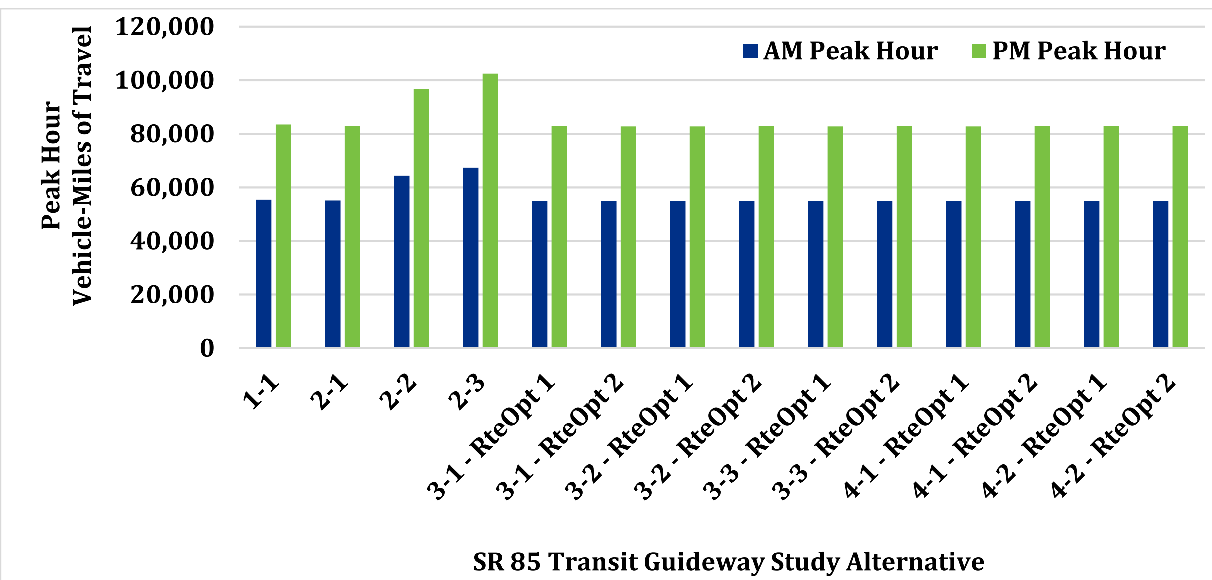
are graphical comparisons of the alternatives in terms of 2020 VMT, VHT and VHD by direction. Despite the increased VMT under the dual express lane alternatives (2-2 and 2-3), there is a 65 to 90 percent reduction in VHD due to improvements in travel time compared to the no change alternative. All other build alternatives result in small increases in VMT and around a 40 percent reduction in VHD over the no change alternative. VHT is also reduced under all build alternatives.

Figure B-73 SR 85 Corridor (SR 87 to I-280) 2020 Vehicle-Miles of Travel (VMT) by Alternative

Northbound Direction



Southbound Direction

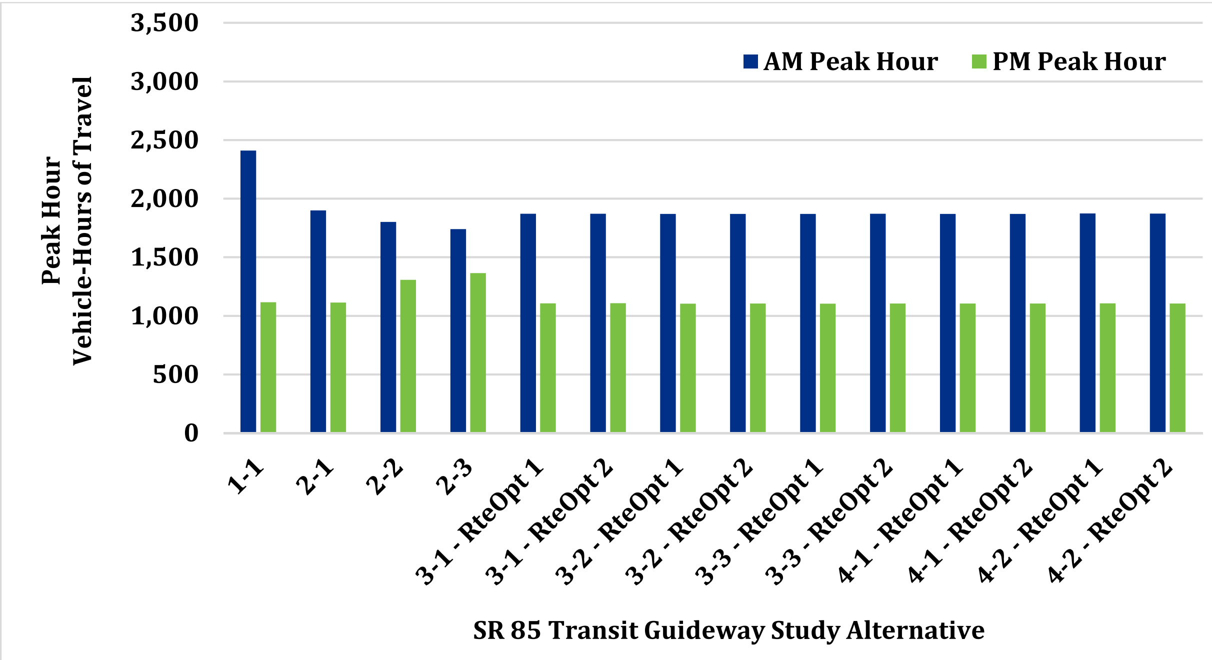


Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; Caltrans Traffic Census Counts; Caltrans PeMS; SR 85 Transit Guideway Study Phase 1 Report; CDM Smith's SR 85 Traffic Operations Model.

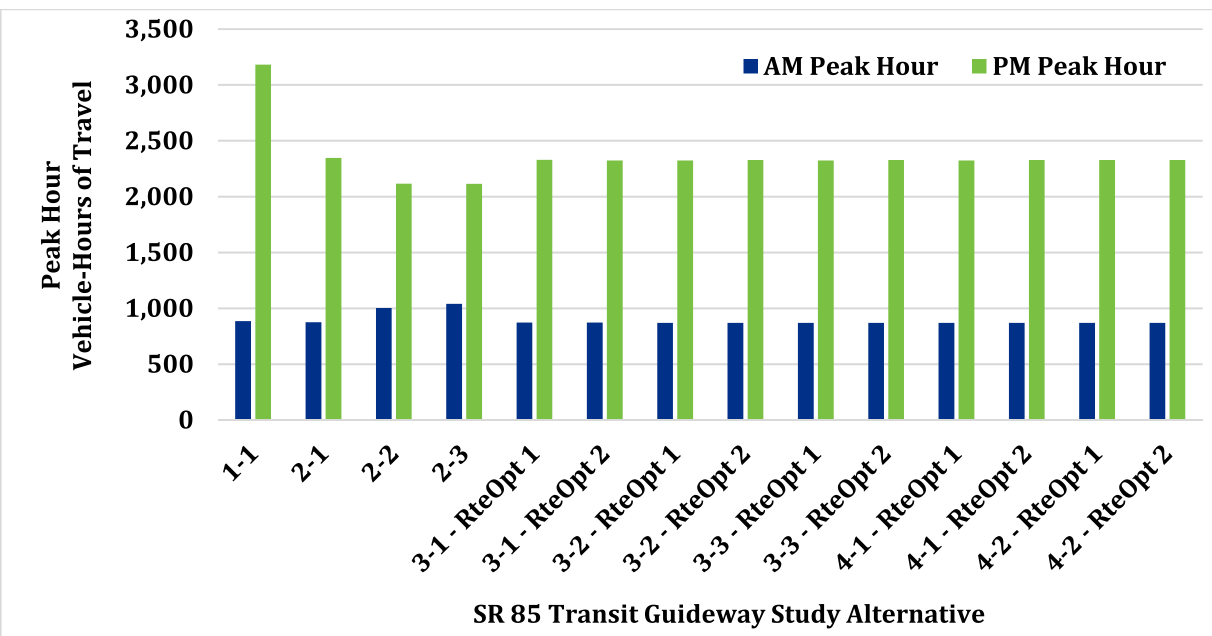
Note: Seg. = Segment, Acc. = Acceleration, Dec. = Deceleration, AM Peak Hour = 7:45 am to 8:45 am, PM Peak Hour = 5 pm to 6 pm.

Figure B-74 SR 85 Corridor (SR 87 to I-280) 2020 Vehicle-Hours of Travel (VHT) by Alternative

Northbound Direction



Southbound Direction

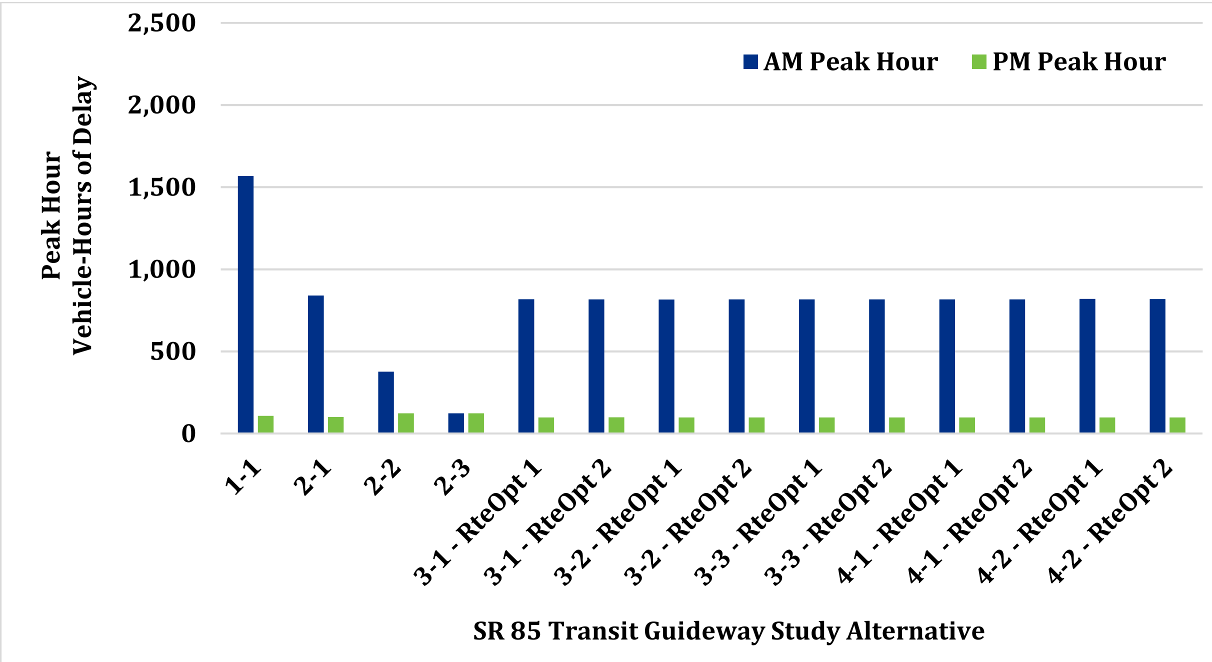


Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; Caltrans Traffic Census Counts; Caltrans PeMS; SR 85 Transit Guideway Study Phase 1 Report; CDM Smith's SR 85 Traffic Operations Model.

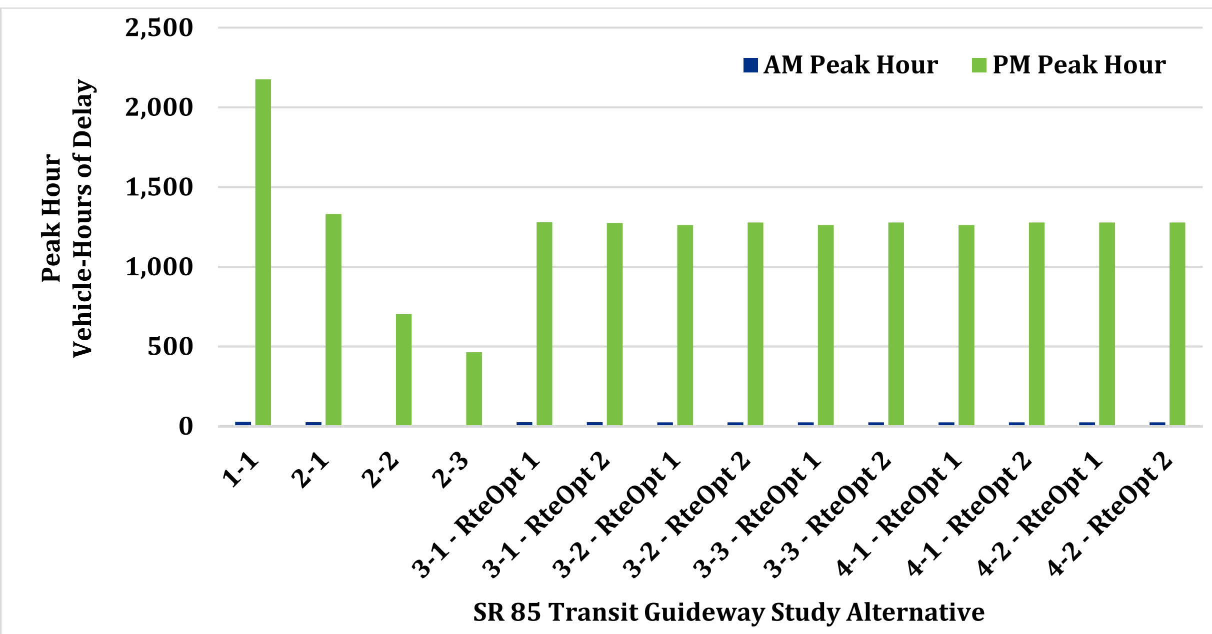
Note: Seg. = Segment, Acc. = Acceleration, Dec. = Deceleration, AM Peak Hour = 7:45 am to 8:45 am, PM Peak Hour = 5 pm to 6 pm.

Figure B-75 SR 85 Corridor (SR 87 to I-280) 2020 Vehicle-Hours of Delay (VHD) by Alternative

Northbound Direction



Southbound Direction



Source: Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; Caltrans Traffic Census Counts; Caltrans PeMS; SR 85 Transit Guideway Study Phase 1 Report; CDM Smith's SR 85 Traffic Operations Model.

Note: Seg. = Segment, Acc. = Acceleration, Dec. = Deceleration, AM Peak Hour = 7:45 am to 8:45 am, PM Peak Hour = 5 pm to 6 pm.

B.6.6 Results for Special Case Analysis

Table B-12

shows the year 2020 traffic performance measures estimated in the AM and PM peak hours by direction of movement for scenarios with and without the El Camino Real improvement and with background traffic conditions based on the no change alternative. Note that the results are based on the travel conditions prior to the advent of California and SF Bay Area coronavirus / COVID-19 stay home orders of 2020.

Under existing traffic conditions, congestion and delays are seen on SR 85 segments in the northbound direction only in the AM peak hour. Converting the El Camino Real interchange from a cloverleaf to a diamond would result in the elimination of weaving delays within the El Camino Real interchange area, however it would also result in consolidating the off- and on-ramp volumes at this interchange to fewer ramps. The diverge area delay at the SR 85 northbound off-ramp for the diamond interchange can be mitigated by an increase in deceleration lane length. In this analysis an increase was assumed from 150 feet to 750 feet. Similarly, the merge area delay at SR 85 southbound on-ramp for the diamond interchange can be controlled by an increase in acceleration lane length. In this analysis an increase was assumed from 420 feet to 750 feet. Both these ramps are located south of the El Camino Real centerline.

There are limited opportunities to control the ramp delay added due to the traffic consolidation effect of the interchange conversion on the ramps north of the El Camino Real centerline. In the northbound direction, where traffic congestion is an issue, there are additional ramp traffic conflicts with large SR 85 northbound off-ramp traffic to SR 237 eastbound (over 1,500 vehicles in AM peak hour). The weaving area available for traffic entering via the SR 85 northbound on-ramp from El Camino Real and traffic exiting via the SR 85 northbound off-ramp to SR 237 eastbound is 460 feet. The VHD in SR 85 northbound directions increase by 54 percent, while the throughput and speed decrease by 8 percent and 19 percent, respectively.

Based on the geometric setting, a possible solution to reducing these traffic impacts would be to retain the SR 85 northbound loop on-ramp from El Camino Real while removing the SR 85 northbound loop off-ramp to El Camino Real. This will reduce the traffic consolidation effect and also eliminate weaving. This solution would result in a one leaf partial cloverleaf interchange instead of a diamond only interchange. Further analysis that is beyond the scope of this study would be needed to confirm the benefits.

Table B-12 2020 Traffic Performance Measures for El Camino Real Improvement under SR 85 Transit Guideway No Change Alternative (1-1)

Alt. #	Alternative Description	VMT (veh-mi) AM Peak Hour	VMT (veh-mi) PM Peak Hour	VHT (veh-hrs) AM Peak Hour	VHT (veh-hrs) PM Peak Hour	VHD (veh-hours) AM Peak Hour	VHD (veh-hours) PM Peak Hour	Av Spd (mph) AM Peak Hour	Av Spd (mph) PM Peak Hour	% Miles of Freeway LOS E or F AM Peak Hour	% Miles of Freeway LOS E or F PM Peak Hour	Miles of Congestion* AM Peak Hour	Miles of Congestion* PM Peak Hour
SR 85 Northbound Segments near SR 85 / El Camino Real Interchange													
1-1	Without El Camino Real Interchange Improvement	9,201	6,536	285	105	102	0	32.3	62.2	85%	0%	0.7	0.0
1-1	With El Camino Real Interchange Improvement	8,502	5,929	325	96	157	0	26.2	62.0	85%	0%	0.9	0.0
Change		-700	-608	40	-9	55	0	-6.1	-0.2	0%	0%	0.2	0.0
SR 85 Southbound Segments near SR 85 / El Camino Real Interchange													
1-1	Without El Camino Real Interchange Improvement	6,489	9,879	104	164	0	0	62.1	60.3	0%	0%	0.0	0.0
1-1	With El Camino Real Interchange Improvement	5,487	9,467	88	158	0	0	62.0	60.0	0%	0%	0.0	0.0
Change		-1,003	-412	-16	-6	0	0	-0.1	-0.3	0%	0%	0.0	0.0

*Based on GP Lanes - Peak Hour Peak 15-Minute Interval Estimates
AM Peak Hour: 7:45 am to 8:45 am; PM Peak Hour: 5 pm to 6 pm.
NOTE: Delay or congestion is assumed when speed on a segment falls below 45 mph (Caltrans threshold)

Source: Google Earth for SR 85 / El Camino Real (SR 82) Interchange No Build conditions; Traffic Counts by CDM Smith Sub-Consultant – Quality Counts, February 2020; Caltrans Traffic Census Counts; Caltrans PeMS; SR 85 Transit Guideway Study Phase 1 Report; HCS7 Software; CDM Smith Analysis and Assumptions for SR 85 / El Camino Real (SR 82) Interchange Build conditions.

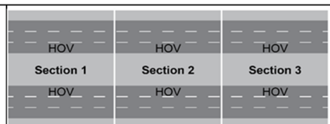
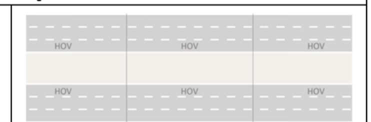
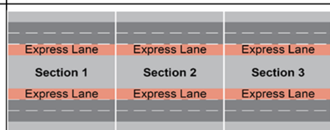
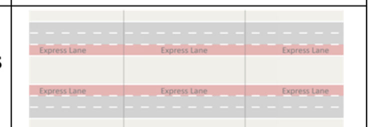
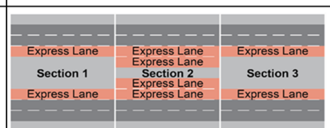
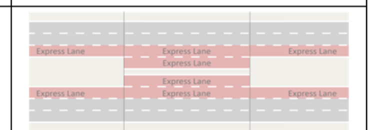
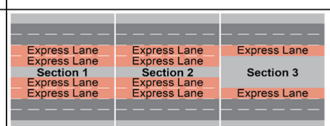
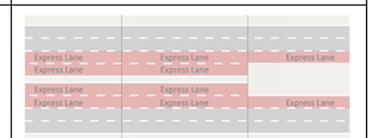
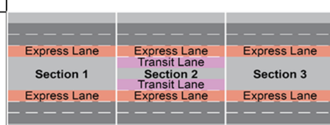
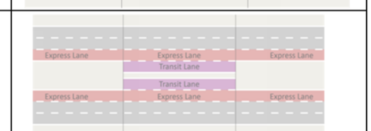
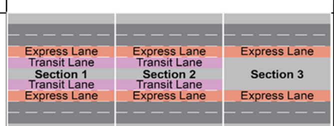
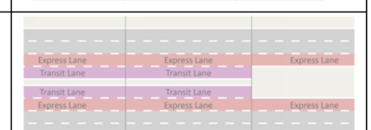
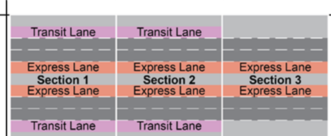
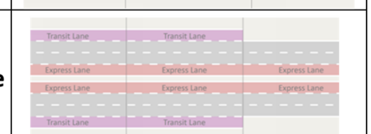
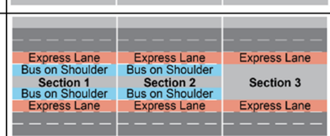
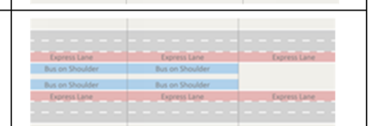
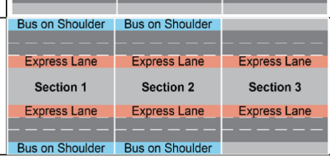
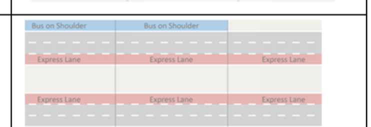
Note: Seg. = Segment, Acc. = Acceleration, Dec. = Deceleration, AM Peak Hour = 7:45 am to 8:45 am, PM Peak Hour = 5 pm to 6 pm.

APPENDIX C

CONSTRUCTION COSTS

Appendix C – Construction Costs

For Appendix C please use the following equivalency table to compare the alternatives in this report and the alternatives in the three Parsons reports.

SR 85 Transit Alternatives Matrix							
Overall Alternative					Parsons Report Alternative		
Existing	1-1	No Change		equals	1-1	No Build	
Express Lanes	2-1	HOV to Express Lane		equals	1-2	HOV to Express Lane	
	2-2	Short Dual Express Lane		equals	2-1	Express Lane	
	2-3	Long Dual Express Lane		equals	2-2	Long Express Lane	
Transit Lanes	3-1	Short Median Transit Lane		equals	3-4	Short Transit Lane	
	3-2	Long Median Transit Lane		equals	3-1	Long Transit Lane (Median Adjacent Lane)	
	3-3	Right Side Transit Lane		equals	3-2	Long Transit Lane (Right-side Lane)	
Bus On Shoulder	4-1	Median Bus On Shoulder		equals	3-5	Long Shoulder (Median)	
	4-2	Right Side Bus On Shoulder		equals	3.6	Long Shoulder (Right-side)	

Basis of Design Report

STATE ROUTE 85 TRANSIT GUIDEWAY STUDY

Part 1: Proposed Engineering Features

October 9, 2019
November 8, 2019

PARSONS

100 West San Fernando Street, Suite 375

San Jose, CA 95113-2233

Valley Transportation Authority

Solutions that move you

MEASURE B

Revision History

Revision	Date	Description
1.0	October 9, 2019	Initial Draft Submission
2.0	November 8, 2019	Revised Draft Submission

Table of Contents

Introduction

The Santa Clara Valley Transportation Authority (VTA), in cooperation with the California Department of Transportation (Caltrans), proposes transit and managed lane improvements along 24 miles of State Route (SR) 85 between U.S. 101 in south San Jose and U.S. 101 in Mountain View, California (see Figure 1). These improvements are intended to enhance trip reliability, increase person throughput, encourage mode shift to transit and carpools, and provide long-term congestion management of the corridor.

Within the project limits, SR 85 is generally a six-lane, divided, controlled-access freeway with two general-purpose lanes in each direction plus one high-occupancy vehicle (HOV) lane in each direction. At the southern end of the route, from postmile (PM) 1.33 to PM 5.27, VTA additionally provides a light rail transit (LRT) line with two tracks and stations in the median of the divided freeway. Some parts of SR 85 also have auxiliary lanes that extend from on-ramps to off-ramps.

The existing travel lane width is generally 12 feet throughout the corridor. The inside shoulder has a standard width of 10 feet throughout the corridor with the exception of one overcrossing (northbound at Homestead Road). The outside shoulder has the standard width of 10 feet in the portion of the corridor from its southern junction with U.S. 101 to the separation with I-280, 18.4 miles to the north. From I-280 to the northern junction with U.S. 101, the outside shoulders range in width from 4 feet to 10 feet.

The width of the median varies considerably from end to end. Table 1 lists the approximate width of the median from inside edge of travelway to inside edge of travelway. This measurement includes paved shoulders, barriers, columns supporting overhead structures, and the width between bridges. South of Santa Teresa Boulevard, the listed median width does not include VTA's LRT trackway.

The pavement is generally in excellent condition. From U.S. 101 at the south end of SR 85 to the Guadalupe River Bridge (PM 5.59), the mainline lanes are full depth asphalt concrete (AC). From that point north, the mainline pavement is Portland cement concrete (PCC). Shoulders, both inside and outside, are partial depth AC. Heavy trucks, those in excess of 4.5 tons, are prohibited from utilizing SR 85 between I-280 and U.S. 101 in southern San Jose.

The freeway generally lies on level original ground, but alternates between segments on embankments and in depressed sections. The northbound and southbound roadbeds are typically at the same elevation and separated by a median concrete barrier(s) south of Almaden Expressway (PM 6.00) and north of McClellan Road (PM 17.17). Between these points, a thrie metal beam barrier separates the roadbeds.

For the purpose of defining managed lane investments, the corridor is segmented into three parts:

- Segment 1 from U.S. 101 in South San Jose to SR 87. This segment includes a VTA light rail line in the median of SR 85.
- Segment 2 from SR 87 to I-280. This segment for the most part includes a wide unpaved median.
- Segment 3 from I-280 to U.S. 101 in Mountain View. This segment includes a narrow median.

In all three segments, SR 85 passes through predominately residential neighborhoods. Sound walls line both sides of the freeway. The PCC pavement is grooved and microplaned. A SR 85 Noise Reduction Study is underway and five locations have been identified to test alternative noise reduction strategies. Balancing the noise concerns of residents and the mobility aspirations of commuters is an important aspect of VTA's Route 85 Transit Guideway Study.

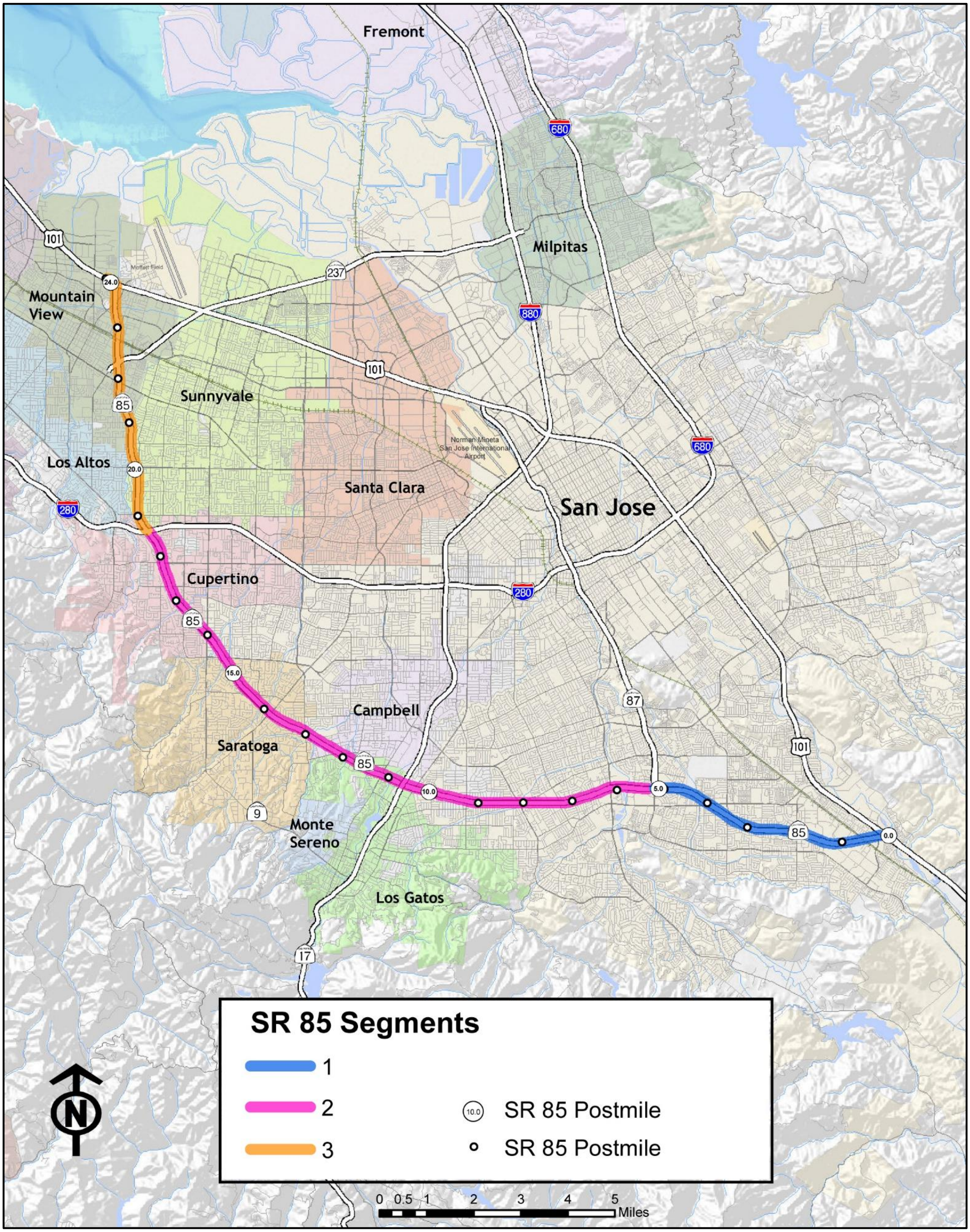


Figure 1 Vicinity Map

Table 1 Median Width along State Route 85

Structure No.	Postmile	Structure Name	Type*	Median Width (feet)
1	0.20	Bernal Road	Undercrossing	33
2	0.29	Monterey Road/Union Pacific/Great Oaks Boulevard	Undercrossing/overpass	46
3	1.22	Via Del Oro	Undercrossing	60
4	1.33	VTA Light Rail	Overpass	68
5	1.97	Cottle Road	Overcrossing	20
6	2.73	Lean Avenue	Overcrossing	18
7	3.48	Snell Avenue	Overcrossing	18
8	3.93	Blossom Hill Road	Overcrossing	16
9	4.28	Canoas Creek	Bridge	18
10	4.50	Cahalan Avenue	Pedestrian undercrossing	20
11	4.84	Southbound SR 87 to southbound SR 85	Separation	19
12	5.20	Santa Teresa Boulevard	Undercrossing	68
13	5.27	VTA Light Rail	Overpass	18
14	5.31	Southbound SR 85 to northbound SR 87	Separation	68
15	5.59	Winfred Blvd/Guadalupe River/Sanchez Drive	Bridge	68
16	6.00	Almaden Expressway	Undercrossing	70
17	6.46	Russo Drive	Pedestrian overcrossing	48
18	7.30	Meridian Avenue	Overcrossing	48
19	7.50	Dent Avenue	Pedestrian overcrossing	48
20	8.11	Camden Avenue	Undercrossing	66
21	8.77	Leigh Avenue	Overcrossing	48
22	9.28	Union Avenue	Overcrossing	68
23	9.93	Samaritan Place	Pedestrian overcrossing	50
24	10.23	Bascom Avenue	Overcrossing	66
25	10.40	Southbound SR 17 to southbound SR 85	Separation	56
26	10.48	SR 17	Separation	50
27	10.60	Oka Road	Undercrossing	50
28	10.80	Los Gatos Creek	Bridge	48
29	10.90	Winchester Boulevard	Underpass	48
30	11.00	Winchester Boulevard	Overcrossing	48
31	11.97	Pollard Road	Undercrossing	44
32	12.45	More Avenue	Pedestrian overcrossing	44
33	12.68	San Tomas Aquino Creek	Bridge	44
34	12.91	Quito Road	Overcrossing	44
35	13.73	Saratoga Avenue	Undercrossing	44
36	13.91	Saratoga Creek	Bridge	44
37	14.28	Cox Avenue	Overcrossing	44
38	14.31	Cox Avenue utility	Overcrossing	44
39	14.73	Scully Avenue utility	Overcrossing	44
40	14.84	Blue Hills	Pedestrian overcrossing	44
41	15.27	Prospect Road	Overcrossing	45
42	15.40	Calabazas Creek	Bridge	44
43	15.87	South De Anza Boulevard	Overcrossing	44
44	16.61	South Stelling Road	Overcrossing	44
45	17.17	McClellan Road	Overcrossing	30
46	17.70	Stevens Creek Boulevard	Overcrossing	24
47	18.35	Southbound/eastbound I-280	Separation	20
48	18.41	SR 85/I-280	Separation	20
49	18.43	Northbound/westbound I-280	Separation	20
50	18.86	Homestead Road	Overcrossing	18
51	19.39	The Dalles	Pedestrian overcrossing	22

Table 1 Median Width along State Route 85

Structure No.	Postmile	Structure Name	Type*	Median Width (feet)
52	19.86	Fremont Avenue	Undercrossing	20
53	20.02	Stevens Creek	Bridge	20
54	20.37	Hawkins Drive	Right-of-way	20
55	20.69	Permanente Creek Diversion Channel	Culvert	20
56	21.10	Stevens Creek Trail/Dale Avenue	Pedestrian overcrossing	22
57	21.75	SR 82/SR 85/El Camino Real	Separation	20
58	22.13	SR 85/SR 237	Separation	22
59	22.43	Dana Street	Overcrossing	20
60	22.63	Evelyn Avenue/Caltrain/Light Rail/Central Expressway	Undercrossing/overpass	20
61	22.95	Stevens Creek	Bridge	22
62	23.19	Middlefield Road	Overcrossing	22
63	23.44	Moffett Boulevard	Undercrossing	22

*Type:
- Undercrossing = local road under State highway
- Overcrossing = local road over State highway
- Pedestrian overcrossing = Pedestrian crossing over State highway
- Separation = State highway crossing
- Underpass = State highway under railroad
- Overpass = State highway over railroad
- Right-of-way = right-of-way required

Basis of Design

To enhance trip reliability, increase person throughput, encourage mode shift to transit and carpools, and provide long-term congestion management of the corridor, VTA and its State Route 85 Policy Advisory Board (PAB) are considering the installation of express lanes and/or transit lanes along SR 85. Earlier phases of this study considered, but eventually ruled out other investment options such as light rail transit, or reversible lanes using movable barriers.

The purpose of this document is to provide a physical definition of the alternatives advanced for further study, based on conceptual engineering considerations. As such, this documentation of “Proposed Engineering Features” provides scoping information for subsequent capital cost estimating, preliminary environmental assessment, and stakeholder/community outreach.

As SR 85 is owned and maintained by the State of California, alterations or expansions of the facility must be approved by Caltrans, no matter the source of funding. Documents which guide and govern the design of the proposed investments include:

- Caltrans Transportation Planning Manual
- Caltrans Project Development Procedures Manual
- Caltrans Highway Design Manual
- Manual on Uniform Traffic Control Devices (MUTCD) and the California Supplement to the MUTCD
- Caltrans Traffic Operations Policy Directives.

As the installation of express lanes and/or transit lanes are frequently retrofits of existing facilities, Caltrans has also published *High-Occupancy Vehicle Guidelines for Planning, Design and Operations.* The guidelines acknowledge, “For most situations, retrofitting an HOV [high occupancy vehicle] lane [includes express and transit lanes] on an existing freeway requires some compromises in design standards.” The guidelines go on to emphasize the following:

> “The Guidelines are advisory in nature and are to be <u>used only when every effort to conform to established standards has been exhausted.</u> When conformance is not possible, the deviation must be documented by a sound and defensible analysis and an approved design exception fact sheet.”

Collectively, the guidance covering the alteration of State Route 85 covers literally hundreds, if not thousands, of topics. For the purpose of this physical definition and conceptual design investigation, select guidance covering the geometric cross section of the proposed investments are summarized in Table 2.

Guidance provided in Caltrans Highway Design Manual is extremely important. Deviations from this guidance typically requires approval of a Design Standards Decision Document by the Chief, Division of Design. Caltrans recognizes that retrofitting state facilities to include managed lane elements will typically require design exceptions and they have issued *High Occupancy Vehicle Guidelines* to indicate the department’s priorities for the reduction of lane widths. Neither of these resources address part-time use of shoulders for bus use. The Federal Highway Administration (FHWA) recognizes this option as a valuable resource potential and has issued planning and design guidelines to advise State and local transportation agencies such as Caltrans. Lastly, Table 2 presents SR 85 project specific guidelines the design team has followed, in addition to those provided by Caltrans and FHWA.

Table 2 SR 85 Transit Corridor Design Guidance

Source	Topic	Horizontal Geometric Standard/Guidance Applicable to SR 85
Caltrans Highway Design Manual	108.3—Commuter and Light Rail Facilities within State Right of Way (3) Parallel Rail Facilities	As necessary, rail facilities may be located within the median upon approval from the District Director.
	108.5—Bus Rapid Transit	Bus rapid transit (BRT) is to be considered the same as commuter and light rail facilities with regard to approvals and design guidance.

Table 2 SR 85 Transit Corridor Design Guidance

Source	Topic	Horizontal Geometric Standard/Guidance Applicable to SR 85
		BRT located on freeways should be designed in accordance with the HOV Guidelines and per standards contained in the HDM (Highway Design Manual).
	108.6—High-occupancy Toll and Express Lanes	High-occupancy vehicle guidelines are to be consulted. High-occupancy toll (HOT) and express toll lane facilities are to comply with HDM design standards.
	301.1—Lane Width	12 feet
	302.1—Highway Shoulder Width	On freeways with six or more lanes, 10 feet left and 10 feet right paved shoulders. Ramps—4 feet left and 8 feet right. For single or two-lane branch connections, 5 feet left and 10 feet right.
	305.1—Median Width for (3) Facilities under Restrictive Conditions	22 feet minimum
	305.5—Paved Medians	On freeways of six or more lanes, medians 30 feet wide or less should be paved. Where medians are paved, each half should be paved in the same plane as the adjacent traveled way.
	307.5—Multilane All Paved Cross Sections with Special (Narrow) Median Widths	May be used for widening of existing facilities.
	309.1—Horizontal Clearances (3) a. Minimum to objects b. Minimum to walls (including noise barriers)	 Equal to standard shoulder width, but not less than 4 feet. 10 feet
	(5) Parallel BRT facilities on freeways	4-foot separation between (mainline) lanes—see HOV Guidelines
High-occupancy Vehicle Guidelines[1]	3.10—Relative Priority of Cross-Sectional Elements (0) General	 A reduction in standards for cross-sectional elements may be necessary for most retrofit HOV projects and will require approved Design Standards Decision Documents.
	(3) Buffer-Separated HOV Facilities	First, reduce the median shoulder from 14 feet (the width to accommodate continuous enforcement areas) to 10 feet. Any reduction of the median shoulders should be accompanied by the addition of California Highway Patrol (CHP) enforcement areas. Second, reduce the buffer to 2 feet. Third, reduce the median shoulders to a minimum of 8 feet. Fourth, reduce the HOV lane to 11 feet. Fifth, reduce the number one general purpose lane to 11 feet. Sixth, reduce the remaining general-purpose lanes to 11 feet, starting with the number two lane and moving to the right as needed. The outside general-purpose lane should remain at 12 feet unless truck volume is less than 3 percent. Seventh, reduce the median shoulders to a minimum of 2 feet. Shoulders less than 8 feet, but greater than 5 feet, are not recommended. Any excess width resulting from a reduction of median shoulder width from 8 feet to 5 feet or less should be used to restore the general-purpose lane widths to 12 feet starting from the outside and moving left. The reduction of median shoulders from 14 feet to either 8 feet or 2 feet should be combined with the construction of enforcement areas.
	(4) Contiguous HOV Facilities	First, reduce the median shoulders from 14 feet (the width to accommodate continuous enforcement areas) to 10 feet. Any reduction of the median shoulders should be accompanied by the addition of CHP enforcement areas. Second, reduce the median shoulders to a minimum of 8 feet. Third, reduce the HOV lane to 11 feet. Fourth, reduce the general-purpose lanes to 11 feet, starting with the left lane and moving to the right as needed. The outside general-purpose lane should remain at 12 feet unless truck volumes are less than 3 percent.

[1] January 2018

Table 2 SR 85 Transit Corridor Design Guidance

Source	Topic	Horizontal Geometric Standard/Guidance Applicable to SR 85
		Fifth, reduce the median shoulders to a minimum of 2 feet. Shoulders less than 8 feet, but greater than 5 feet are not recommended. Any excess width from 8 feet to 5 feet or less should be used to restore the general-purpose lane widths to 12 feet starting from the outside and moving to the left.
FHWA[2]	Part-time Shoulder Use	Used for travel only during those times of day when the adjoining lanes are likely to be heavily congested. When not needed as an additional travel lane, the shoulder is restored to its original purpose.
	Bus-only Use of Shoulders (Bus on Shoulder—BOS)	To improve bus travel time and reliability.
	Lane Width	12 feet or more preferred.
	Shoulder Width	“Several” feet beyond BOS lane.
	Bridge Width	The minimum shoulder width on bridges is 11.5 feet (10 foot BOS lane plus 1.5 foot lateral offset to obstruction).
	Signage	Typically static, ground mounted.
	Pavement Markings	Solid edge line typically used between the shoulder and the adjacent travel lane remains in place. A second solid line is used on the outside of the shoulder beside the edge of pavement. The two solid lines should be the same color: white for part-time use of the right shoulder and yellow for part-time use of the left (median) shoulder.
Parsons	Preliminary Pavement Widths	Vary at interchange ramps, lane/shoulder transition areas, bridge columns and other roadway elements. Widths also vary where additional shoulder width is needed to improve stopping sight distance to obstructions (e.g., left shoulder along outside of horizontal curve with a median concrete barrier or right shoulder along outside of horizontal curves adjacent to a soundwall).
	Existing Bridges and Overcrossing Structures	Avoid replacement wherever possible.
	Restrictive Right of Way (R/W)	The R/W is particularly narrow in the northern/western segment of the project between I-280 and US 101. The surrounding area is fully developed with residential and commercial land uses. Reduced cross sections will be necessary where significant R/W acquisition and community impacts would otherwise be required.
	Existing Soundwalls	Reduced cross sections will be necessary to avoid reconstruction of soundwalls which would result in significant R/W acquisitions, park land and community impacts.
	Heavy Truck Volumes	Trucks in excess of 4.5 tons are prohibited from utilizing SR 85 south of I-280. Outside lanes may be reduced from 12 feet to 11 feet where necessary. A Design Standards Decision Document (DSDD) will need to be prepared for approval by the Chief, Division of Design.
	Proposed Lane Widths	Should be reasonably consistent throughout each segment of the corridor, without excessive variations (narrowing or widening) within short distances. The standard lane width of 12 feet may be reduced to 11 feet per Caltrans High-occupancy Vehicle Guidelines Topic 3.10. A design exception will need to be prepared for approval by the Chief, Division of Design.
	Buffer	No buffer is proposed between express lanes and general-purpose lanes as contiguous lane striping is assumed. A buffer width of 2 feet is proposed to separate transit lanes from adjacent HOV, express lane, and/or general-purpose lanes.
	Right Shoulder Width	The standard right shoulder width of 10 feet should be provided throughout the corridor. In restrictive conditions (e.g., existing bridges, overcrossings, soundwalls), the right shoulder may be reduced to below 10 feet, but no less than 8 feet. The transit lane buffer may need to be

[2] Use of Freeway Shoulders for Travel—Guide for Planning, Evaluating, and Designing Part-time Shoulder Use as a Traffic Management Strategy, Federal Highway Administration (FHWA), February 2016.

Table 2 SR 85 Transit Corridor Design Guidance

Source	Topic	Horizontal Geometric Standard/Guidance Applicable to SR 85
		removed to achieve the 8-foot right shoulder width minimum. An approved DSDD will be required.
	Left Shoulder Width	The standard left shoulder width of 10 feet may be reduced per Caltrans High-occupancy Vehicle Guidelines Topic 3.10. An approved DSDD will be required.
	Median Width	The standard median width of 22 feet may be reduced to 10 feet between structures to accommodate a concrete Type 60 median barrier with left shoulder widths of 4 feet or left shoulder widths of 2 feet at locations with overhead signs or bridge columns. An approved DSDD will be required.

A Concept of Operations Report, prepared by CDM Smith, will additionally set forth proposals for tolling the express lanes and managing the use of the transit lanes where provided. This Concept of Operations Report will additionally match the types of transit services which are compatible with the physical design options which are presented in this Proposed Engineering Features document.

Alternatives

ALTERNATIVES CONSIDERED

Ten alternatives are being considered. These are briefly described below and are illustrated on Figure 2.

Alternative 1-1: No Build

This alternative would not make any changes to SR 85. Metrics for this alternative can serve as a point of comparison for other alternatives.

Alternative 1-2: HOV to Express Lane Conversion

In this alternative, the existing HOV lane on SR 85 would be converted to an express lane, but the unused space in the median between I-280 and SR 87 would not be changed, leaving it available for a future transportation investment.

Alternative 2-1: Express Lanes Project

This alternative would convert the existing HOV lane on SR 85 to an express lane and would construct a new express lane between I-280 and SR 87 in accordance with the design in VTA's Silicon Valley Express Lane Program.

Alternative 2-2: Long Express Lanes

This alternative would convert the existing HOV lanes into express lanes and construct a new express lane between U.S. 101 in Mountain View and SR 87.

Alternative 3-1: Long Transit Lane (Median Adjacent Lane)

This alternative would construct a new, median-adjacent transit lane between U.S. 101 in Mountain View and SR 87 in San Jose. Access to the lane would be limited to large, space-efficient vehicles like public transit and private shuttles.

Stations would be located at El Camino Real, Stevens Creek Boulevard, Saratoga Avenue, Bascom Avenue, and the Ohlone-Chynoweth Light Rail Station at Santa Teresa Boulevard. Except for the Ohlone-Chynoweth Light Rail Station at Santa Teresa Boulevard, which already exists, buses would serve stations located in the median of SR 85.

In this alternative, VTA transit buses would travel in a direct path along the corridor, serving median stations. This would permit the fastest, most reliable travel time for the transit lane since the buses would not need to leave the freeway to pick up and drop off riders nor interact with other vehicles.

Alternative 3-2: Long Transit Lane (Right-side Lane)

This alternative would install a transit lane between U.S. 101 in Mountain View and SR 87 that would be located along the right side of the roadway. Access to the lane would be limited to large, space-efficient vehicles like public transit buses and private shuttles and vehicles merging across the lane to enter/exit the freeway at on-ramps/off-ramps.

Stations would be located at on-ramps and off-ramps at El Camino Real, Stevens Creek Boulevard, Saratoga Avenue, Bascom Avenue and the existing Oholone-Chynoweth Light Rail Station at Santa Teresa Boulevard. Routing deviations from the corridor to access high-demand locations or transit connections would be easily made since the buses are traveling in the right lane.

Figure 2 State Route 85 Transit Guideway Study Alternatives

Alternative 3-3: Long Transit Lane (Hybrid Median and Right-side Lanes)

This alternative is a combination of Alternatives 3-1 and 3-2, 3-1 and 3-5, or 3-2 and 3-6. Where the transit lane is median-adjacent, stations would be in the median. Where the transit lane is on the right side, stations would be on on-ramps or off-ramps. Among the Long Transit Lane alternatives, this alternative would strike a balance between capital cost, travel speeds and access. (Note: This alternative will be defined once the other alternatives are evaluated insofar as traffic and transit operations.)

Alternative 3-4: Short Transit Lane

This alternative would build a new transit lane in the unused space adjacent to the SR 85 median between I-280 and SR 87. Median stations would be located at Stevens Creek Boulevard, Saratoga Avenue and Bascom Avenue. An on-ramp/off-ramp station would be located at El Camino Real. Public transit buses are also envisioned to serve the existing Ohlone-Chynoweth Light Rail Station.

Alternative 3-5: Long Shoulder (Median)

This alternative would widen the median shoulder to provide enough space to accommodate bus operations. Physical changes would include building a more durable shoulder to support the increased use and weight of buses and restriping lanes.

Stations would be located at El Camino Real, Stevens Creek Boulevard, Saratoga Avenue, Bascom Avenue, and the existing Ohlone-Chynoweth Light Rail Station at Santa Teresa Boulevard.

Alternative 3-6: Long Shoulder (Right-side)

This alternative would widen the right-side shoulder to provide enough space to accommodate bus operations. Physical changes would include building a more durable shoulder to support the increased use and weight of buses and restriping lanes.

On-ramp/off-ramp stations would be located at El Camino Real, Stevens Creek Boulevard, Saratoga Avenue and Bascom Avenue. Public transit buses are also envisioned to serve the existing Ohlone-Chynoweth Light Rail Station at Santa Teresa Boulevard.

ALTERNATIVES REMOVED FROM FURTHER CONSIDERATION

During the course of this SR 85 Transit Guideway Study and presentations to the State Route 85 Corridor Policy Advisory Board, which preceded the current study, several additional alternatives were considered, but ultimately removed from further consideration. These included:

- Adding one new transit lane (in each direction) in the median without stations and retaining the HOV lanes.
- Adding one new transit lane (in each direction) in the median without stations and replacing the HOV lane with one express lane in each direction.
- Adding one new transit lane in the median (in each direction) with stations and park-and-ride lots and retaining the HOV lanes.
- Adding a new LRT line in the median and retaining the HOV lanes.
- Adding a new LRT line in the median and replacing the HOV lane with one express lane (in each direction).
- Constructing reversible lanes in the median of SR 85 using movable barriers to separate the directional traffic or retractable gates to regulate how vehicles enter and exit a dedicated reversible roadway.

CDM Smith PARSONS

Physical Construction Scenarios

From an engineering design perspective, the 10 alternatives can be grouped into four physical construction scenarios.

- Scenario A—Limited Physical Change
  - Alternative 1-1: No Build
  - Alternative 1-2: HOV to Express Lane Conversion

No freeway widening occurs with either alternative. Investment is limited to the addition of tolling infrastructure including toll gantries with transponder readers and high-speed digital cameras, directional and informational signage, dynamic message signs, closed circuit television coverage of the entire corridor, and duct bank installation for power supply and fiber optic communications.

- Scenario B—Freeway Widening without Transit Stations
  - Alternative 2-1: Express Lane Project
  - Alternative 2-2: Long Express Lanes

Alternative 2-1, Dual Express Lanes, between I-280 and SR 87 is a subset of Alternative 2-2. Tolling infrastructure identified for Alternative 1-2 applies to both Scenario B alternatives.

- Scenario C—Freeway Widening with Transit Stations
  - Alternative 3-1: Long Transit Lane (Median Adjacent Lane)
  - Alternative 3-2: Long Transit Lane (Right-side Lane)
  - Alternative 3-4: Short Transit Lane

The footprint of the freeway widening is similar to Scenario B. With median stations, the freeway mainline is bowed to create space for the stations depending on station design. For right-side running, stations can be constructed on line, or along off- or on-ramps. Commuter buses which do not stop at the stations are provided with a bypass lane. Alternative 3-4 is a subset of Alternative 3-1 or 3-2.

- Scenario D—Part-time Shoulder Use (Bus on Shoulder)
  - Alternative 3-5: Long Shoulder (Median)
  - Alternative 3-6: Long Shoulder (Right-side)

These alternatives include the installation of HOV to Express Lane Conversion (Alternative 1-2) tolling infrastructure plus the reconstruction and widening of the median shoulder or the right-side shoulder with full depth PCC or AC pavement. Stations, similar to those considered under the Transit Lane Alternatives, would also be included.

Alternative 3-3, Long Transit Lane Hybrid, is a mix and match by freeway segment option of Scenarios C and D elements. This alternative will be further defined once the other alternatives are evaluated insofar as traffic and transit operations.

SCENARIO A—LIMITED PHYSICAL CHANGE

Alternative 1-2: HOV to Express Lane Conversion

Mainline Improvements

- Convert existing HOV lane in each direction from Bernal Road, near U.S. 101 in south San Jose to Moffett Boulevard, near U.S. 101 in Mountain View, a distance of 23.2 miles.
- Provide continuous access to express lane from the adjacent general-purpose lanes.
- Install toll infrastructure in median to support express lanes.
- Reconstruct concrete median barrier south of Santa Teresa Boulevard and north of Stelling Road to accommodate toll gantries and dynamic message signs.
- Widen paved median shoulder to 14 feet in both directions from Santa Teresa Boulevard to South Stelling Road (excepting structures) to provide continuous CHP enforcement area.

- Widen right-side shoulders to meet Highway Design Manual standards (10 feet). Relocate drainage inlets as needed to the outside edge of shoulder.
- Install high mast lighting at SR 17 and I-280 interchanges as needed to supplement existing (optional improvement).

Interchange Improvements

No ramp improvements are required to implement this alternative. Conversion of the SR 85 interchange at SR 82/El Camino Real from a cloverleaf Type L-10 ramp configuration to a spread diamond Type L-2 ramp configuration is an optional improvement for consideration.

Local Street Improvements

No streets crossing under or over SR 85 would be reconstructed to accommodate the HOV to express lane conversion. Conversion of the SR 85 interchange at SR 82/El Camino Real from a Type L-10 to a Type L-2, as an optional improvement, would require reconstruction of the ramp terminal intersections, installation of traffic signals, removal of a portion of the raised median and landscaping, and pavement signing and striping to accommodate dual left-turn lanes to the northbound and southbound on-ramps. No widening of El Camino Real would be required.

Conversion of the HOV lane to an express lane would allow for improved enforcement, a reduction in the proportion of HOV2+ “cheaters,” and improved managed use to achieve speeds of 45 mph or higher in the express lane.

The HOV to Express Lane Conversion alternative would not yield additional vehicle throughput, however. The HOV and general-purpose lanes each accommodate roughly 1,500 vehicles per hour per lane (vphpl) during peak hours in the peak direction. The capacity of the express lane at level of service (LOS) C is 1,600 vphpl. While the volume of vehicles will likely remain unchanged, the speed of the vehicles using the express lane will likely increase, encouraging more single occupant vehicle (SOV) drivers to carpool and/or utilize commuter buses, if available.

With mainline traffic volumes expected to remain unchanged from no build conditions, no impacts to local streets would be expected.

Railroad Involvement

Six (6) railroad crossings over or under SR 85 occur within the project limits.

1. VTA light rail tracks (Guadalupe Corridor) under southbound SR 85 at PM 1.33.
2. VTA light rail tracks (Guadalupe Corridor) under northbound SR 85 at PM 5.27, just west of Santa Teresa Boulevard.
3. VTA light rail track under SR 85 adjacent to Winfred Boulevard at PM 5.59.
4. Union Pacific track over SR 85 adjacent to Winchester Boulevard at PM 10.98.
5. Caltrain Peninsula Commuter tracks under SR 85 adjacent to Evelyn Avenue at PM 22.63.
6. VTA light rail tracks under SR 85 adjacent to Central Expressway at PM 22.63.

None of these crossings would require bridge work to accommodate the proposed HOV to Express Lane Conversion.

Structure Improvements

Including the Bernal Road and Moffett Boulevard undercrossings at the two ends of the corridor, there are 63 structures which could be affected by the build alternatives. None of these structures would require widening or replacing as a result of implementing the HOV to Express Lane Conversion alternative.

Drainage Improvements

Storm runoff is collected by inlets located along the outside edge of the right-side shoulders and in the center of the median. North of I-280, the right side-shoulders range in width from 4 to 10 feet. To meet the HDM standards for shoulder width, the AC paved shoulders would need to be widened, generally to 10 feet, and drainage inlets relocated to the outside edge of the shoulder.

Utilities

The project area contains overhead electric and communications lines and underground electric, gas, sanitary sewer, water, reclaimed water, communications, and fiber optic lines. Utility providers in the project area are listed below by category.

- Gas and electric—PG&E
- Communications—AT&T, Comcast, Level 3, Verizon, Nextlink, and MCI
- Water—San Jose Water Company, Santa Clara Valley Water District, California Water Service Company, Great Oaks Water Company, City of Sunnyvale Water Division, and City of Mountain View Water Division
- Sanitary—City of San Jose, West Valley Sanitation District, City of Cupertino, and City of Mountain View.

The project would not require utility relocations. Utility impacts would be limited to the extension of casings (protective pipes or channels) for existing underground facilities whose casings do not extend through the right-of-way. All other existing utilities would be protected in place.

Express Lane Begin/End Transitions

The SR 85 express lanes would extend from U.S. 101 in south San Jose to U.S. 101 in Mountain View. The existing HOV direct-connector ramps at both ends of SR 85 would be converted to express lane connectors.

Express Lane Buffer

No buffer is proposed between the express lane and the adjacent general-purpose lanes. A single, white-striped lane line would separate the lanes and continuous access between the lanes would be permitted.

California Highway Patrol Observation/Enforcement Areas and Emergency Refuge Areas

State-of-the-art toll infrastructure will be installed to reduce the need for CHP observation areas given the right-of-way constraints north of South Stelling Road.

Pending future agreements, it is anticipated that the CHP will be contracted to provide toll enforcement including express lane eligibility violations.

Inside median shoulders will be widened south of Stelling Road to Santa Teresa Boulevard to 14 feet in both directions to provide a continuous CHP enforcement area. At structures such as bridges and undercrossings, existing shoulders will be maintained and structures will not be widened for this purpose.

Emergency refuge areas (pullouts for stopped vehicles) along the outside shoulders would be unaffected by the HOV to express lane conversion alternatives.

Toll Infrastructure

The express lane facility would incorporate various toll infrastructure including toll gantries with transponder readers and high-speed digital cameras (49), directional and informational signage, dynamic message signs to communicate real-time toll rates to drivers (25), complete closed circuit television coverage of the entire express lanes corridor, and fiber optics linking the infrastructure to a centralized toll operations office. Toll equipment would meet Title 21 specification and national protocol, as well as interoperability with other toll facilities in California.

The Metropolitan Transportation Commission has prepared a simple fact sheet to further explain toll infrastructure components. This fact sheet is reproduced in whole as Exhibit 1 along with photographs of express lane construction work along I-680 in Walnut Creek and Concord.

The Operations Center mentioned in Exhibit 1 is assumed to be funded by a separate project and not a component of cost for the Route 85 Transit Guideway Project.

Exhibit 1A

3. System Technology and Elements

MTC Express Lanes are implemented by overlaying communications equipment on new and existing freeway infrastructure. Express lanes implementation requires four discrete elements that are integrated through design, construction and operations, including:

Civil Infrastructure (Highway Modifications)

For lane conversions, the civil infrastructure consists of sign structures, sign panels, lane striping, and conduit work for power and communications. For gap closure and extension projects, the civil infrastructure includes highway widening to add lanes as well as the signage and communications equipment required for conversions.

The civil contractor will put in place the foundations and structures upon which the toll systems contractor will install the toll equipment. In addition, the civil contractor will construct the infrastructure necessary to provide power and communications to the toll system.

Toll System

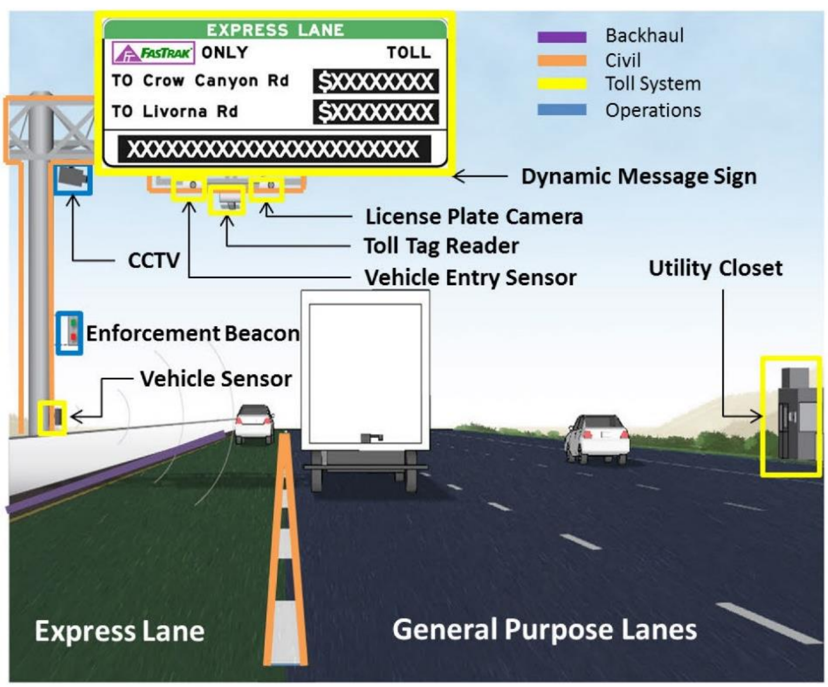
The toll system consists of two components, the in-lane system and the back-end "host" system. The lane system consists of all the equipment on the highway needed to operate the toll system including toll tag readers, cameras and vehicle detection. The host system serves as the brain of the toll system, which collects and processes all the data from the highway and sends it to the regional customer service center for billing.

Backhaul Communications Network

The backhaul network is the communication line along which data collected in the lanes is sent to the toll host system, operations center and regional customer service center. The backhaul contractor will install new conduit and communications fiber as well as utilize existing Caltrans, BART and other infrastructure to build the network. The backhaul network is being designed with the expectation that it will become part of a broader regional communications network.

Operations

The operations element consists of everything that is needed to successfully operate the express lanes including: an operations center, the regional customer service center, enforcement, public outreach, performance monitoring and ongoing maintenance. An express lanes Regional Operations Center will be established in the Bay Area Metrocenter building in San Francisco where operators will actively monitor the condition of the lanes and coordinate with Caltrans and the California Highway Patrol to ensure that the lanes operate efficiently.

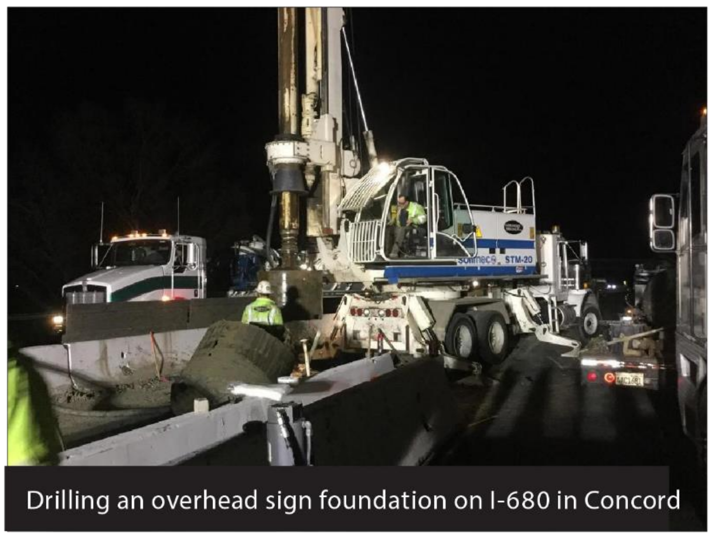


For illustrative purposes only

Source: MTC Express Lanes Program Quarterly Report/1st Quarter 2019

Exhibit 1B

Installing drainage on I-680 in Walnut Creek



Drilling an overhead sign foundation on I-680 in Concord

Extending PG&E service connections on I-680 in Concord

Source: MTC Express Lanes Program Quarterly Report/1st Quarter 2019

Tolling Policies

A *Concept of Operations Report* will be prepared to address various tolling policies under which the express lanes will be operated. This report will provide preliminary information regarding the type of tolling, toll exemption or rate reduction for HOVs, maximum target volume to maintain speed and minimize congestion in the express lanes, method for determining toll amount, methods for toll collection and toll enforcement, penalty rates for toll violations, and provision of supplemental service patrol. The items listed below represent key policies which have been assumed for the SR 85 express lanes; however, they are subject to change pending further studies.

- The express lanes are anticipated to operate part-time during peak hours, Monday through Friday.
- It is anticipated that HOVs with two or more occupants (HOV2+) will be allowed to use the express lanes toll-free. Single-occupancy vehicles will be allowed to use the express lanes for a toll.
- Motorcycles will be allowed to travel in the express lanes toll-free and are not required to have a transponder.
- Exempted vehicles including emergency response vehicles, highway maintenance vehicles serving the express lanes facility, and CHP vehicles assigned to patrol the express lane facility will have toll-free access to the express lanes, by registering these vehicles as toll exempt in the License Plate Recognition system.
- Clean air vehicles with valid clean air vehicle decals will be able to use the express lanes for a toll discount, assumed to 15 percent.
- Tolling is anticipated to be dynamic pricing based on real-time traffic levels to ensure peak period speed of no less than 45 mph.

Additional studies will be performed to establish the operating policies and business rules and determine pricing structures and toll violation rates.

Toll Operations and Maintenance

The institutional arrangements for operation and maintenance of the express lanes will be consistent with those implemented by VTA for the express lane system in Santa Clara County.

Express Lanes Incident Responses

At this time, it is anticipated that Freeway Service Patrol will be contracted to provide incident response for the express lanes similar to the current arrangement in the HOV and general-purpose lanes. It is currently planned to have dedicated roving Freeway Service Patrol patrolling the express lanes during hours of peak congestion, to respond to incidents that might affect the express lanes including clearing of debris, towing disabled vehicles, and minor auto repairs.

Conceptual Engineering Plans

Geometric cross sections for mainline segments and alignment plans **have not been developed** for this alternative. Physical changes include installing toll infrastructure in the median barrier south of Santa Teresa Boulevard and north of Stelling Road to accommodate toll gantries and dynamic message signs and widening the paved median shoulder to 14 feet in both directions from Santa Teresa Boulevard to South Stelling Road.

Right-of-Way Requirements

The HOV to Express Lane conversion project would be constructed entirely within the existing right-of-way.

SCENARIO B—FREEWAY WIDENING WITHOUT TRANSIT STATIONS

Alternative 2-1 and 2-2: Dual Express Lanes

Mainline Improvements

- Add one express lane in each direction from Almaden Expressway to Moffett Boulevard to operate jointly with existing HOV lanes as two express lanes in each direction.
- Convert existing HOV lane in each direction from U.S. 101 (southern end of SR 85) to Almaden Expressway to operate as one express lane in each direction.
- Provide continuous access to the express lane(s) from the adjacent general-purpose lanes.

- Extend existing auxiliary lane on northbound SR 85 from the South De Anza Boulevard northbound on-ramp to 0.2 mile south of the Stevens Creek Boulevard off-ramp.
- Provide CHP enforcement/observation areas in the median at selected locations along the corridor.
- Install double-luminaire mast arm lighting at 250- to 400-foot intervals from PM 6.00 (Almaden Expressway) to PM 17.70 (Stevens Creek Boulevard) and from PM 18.86 (Homestead Road) to PM 23.44 (Moffett Boulevard) as an optional improvement.
- Install high mast lighting at SR 17 and I-280 interchanges as needed to supplement existing as an optional improvement.

Interchange Improvements

Ramp improvements are required to implement this alternative. Conversion of the SR 85 interchange at SR 82/El Camino Real from a cloverleaf Type L-10 ramp configuration to a spread diamond Type L-2 ramp configuration is an optional improvement for consideration.

Partial realignment of ramps is proposed at the interchanges listed in Table 3. A diagram showing the relative location of the ramps is attached to this document as Attachment 1.

Local Street Improvements

No streets crossing under or over SR 85 would be reconstructed to accommodate the dual express lanes alternative. Conversion of the SR 85 interchange at SR 82/El Camino Real from a Type L-10 to a Type L-2, as an optional improvement, would require reconstruction of the ramp terminal intersections, installation of traffic signals, removal of a portion of the raised median and landscaping, and pavement signing and striping to accommodate dual left-turn lanes to the northbound and southbound on-ramps. No widening would be required along El Camino Real.

Table 3 Alternative 2-1 Ramp Improvements

Interchange Name	Ramp No.	Description	Ramp Improvement		
			Partial	Full	None
South De Anza Boulevard	51	South De Anza Boulevard northbound on-ramp	X		
Stevens Creek Boulevard	54	Stevens Creek Boulevard northbound off-ramp			X
	55	Stevens Creek Boulevard southbound on-ramp	X		
	56	Stevens Creek Boulevard southbound off-ramp			X
I-280	57	I-280 northbound off-ramp			X
	58	I-280 northbound loop on-ramp	X		
	59	I-280 northbound on-ramp	X		
	60	I-280 southbound on-ramp			X
	61	I-280 southbound loop on-ramp	X		
	62	I-280 southbound off-ramp	X		
Homestead Road	63	Homestead Road northbound on-ramp	X		
	64	Homestead Road southbound off-ramp	X		
Fremont Avenue	65	Fremont Avenue northbound off-ramp			X
	66	Fremont Avenue northbound on-ramp	X		
	67	Fremont Avenue southbound on-ramp	X		
	68	Fremont Avenue southbound off-ramp	X		
SR 82/El Camino Real	69	SR 82/El Camino Real northbound off-ramp	X		
	70	SR 82/El Camino Real northbound loop on-ramp	X		
	71	SR 82/El Camino Real northbound loop off-ramp	X		
	72	SR 82/El Camino Real northbound on-ramp	X		
	73	SR 82/El Camino Real southbound on-ramp	X		
	74	SR 82/El Camino Real southbound loop off-ramp	X		
	75	SR 82/El Camino Real southbound on-ramp	X		
SR 237	76	SR 237 northbound off-ramp	X		
	77	SR 237 northbound on-ramp	X		
	78	SR 237 southbound on-ramp	X		
	79	SR 237 southbound off-ramp			X
Evelyn Avenue	80	Evelyn Avenue northbound off-ramp	X		
	81	Evelyn Avenue southbound on-ramp	X		

Table 3 Alternative 2-1 Ramp Improvements

Interchange Name	Ramp No.	Description	Ramp Improvement Partial	Full	None
Central Expressway	82	Central Expressway northbound on-ramp	X		
	83	Central Expressway southbound off-ramp	X		
Moffett Boulevard	84	Moffett Boulevard northbound off-ramp	X		
	85	Moffett Boulevard southbound on-ramp	X		

The dual express lane alternative would accommodate additional throughput on the mainline and additional traffic volumes on the off-ramps and on-ramps. An environmental document for express lanes on SR 85, similar in definition to this alternative, was prepared and circulated for public comment from December 30, 2013 until February 28, 2014. The document was an Initial Study (IS) with Negative Declaration/Environmental Assessment (EA) with Finding of No Significant Impact. The Draft IS/EA did not include an analysis of local roadways and arterials.

In response to comments from the City of Saratoga and City of Cupertino, a supplemental assessment of project-related traffic impacts on the local roadways was conducted for 19 intersections in Saratoga and Cupertino, including the intersections of local roadways with SR 85 ramps. Saratoga and Cupertino staff reviewed and provided comments on the assessment materials, and their comments were incorporated into the final IS/EA. The assessment showed that none of the studied intersections would be significantly impacted by the proposed project.

Should this alternative advance to a new environmental assessment of project impacts, the topic of local street improvements, particularly at ramp terminal and adjacent intersections, will need to be revisited.

Railroad Involvement

Six (6) railroad crossings over or under SR 85 occur within the project limits.

1. VTA light rail tracks (Guadalupe Corridor) under southbound SR 85 at PM 1.33.
2. VTA light rail tracks (Guadalupe Corridor) under northbound SR 85 at PM 5.27, just west of Santa Teresa Boulevard.
3. VTA light rail track under SR 85 adjacent to Winfred Boulevard at PM 5.59.
4. Union Pacific track over SR 85 adjacent to Winchester Boulevard at PM 10.98.
5. Caltrain Peninsula Commuter tracks under SR 85 adjacent to Evelyn Avenue at PM 22.63.
6. VTA light rail tracks under SR 85 adjacent to Central Expressway at PM 22.63.

None of these crossings would require bridge work to accommodate the proposed freeway widening for the addition of one express lane in each direction.

Structure Improvements

The dual express lane alternative would necessitate the widening of nine bridge or undercrossing structures, the replacement of embankments with retaining walls at two overcrossings, and the replacement of one pedestrian overcrossing. Table 4 summarizes the proposed structure improvements under Alternative 2-2.

Table 4 Alternative 2-2 Structure Improvements

Structure No.	Postmile	Structure Name	Type*	Structure Improvement No Work	Widen	Replace
1	0.20	Bernal Road	Undercrossing	X		
2	0.29	Monterey Road/Union Pacific/Great Oaks Boulevard	Undercrossing/overpass	X		
3	1.22	Via Del Oro	Undercrossing	X		
4	1.33	VTA Light Rail	Overpass	X		
5	1.97	Cottle Road	Overcrossing	X		
6	2.73	Lean Avenue	Overcrossing	X		
7	3.48	Snell Avenue	Overcrossing	X		
8	3.93	Blossom Hill Road	Overcrossing	X		
9	4.28	Canoas Creek	Bridge	X		
10	4.50	Cahalan Avenue	Pedestrian undercrossing	X		
11	4.84	Southbound SR 87 to southbound SR 85	Overcrossing	X		

Table 4 Alternative 2-2 Structure Improvements

Structure No.	Postmile	Structure Name	Type*	Structure Improvement: No Work	Widen	Replace
12	5.20	Santa Teresa Boulevard	Undercrossing	X		
13	5.27	VTA Light Rail	Overpass	X		
14	5.31	Southbound SR 85 to northbound SR 87	Overcrossing	X		
15	5.59	Winfred Blvd/Guadalupe River/Sanchez Drive	Bridge	X		
16	6.00	Almaden Expressway	Undercrossing		X	
17	6.46	Russo Drive	Pedestrian overcrossing	X		
18	7.30	Meridian Avenue	Overcrossing	X		
19	7.50	Dent Avenue	Pedestrian overcrossing	X		
20	8.11	Camden Avenue	Undercrossing		X	
21	8.77	Leigh Avenue	Overcrossing	X		
22	9.28	Union Avenue	Overcrossing	X		
23	9.93	Samaritan Place	Pedestrian overcrossing	X		
24	10.23	Bascom Avenue	Overcrossing	X		
25	10.40	Southbound SR 17 to southbound SR 85	Undercrossing	X		
26	10.48	SR 17	Separation	X		
27	10.60	Oka Road	Undercrossing		X	
28	10.80	Los Gatos Creek	Bridge		X	
29	10.90	Winchester Boulevard	Underpass	X		
30	11.00	Winchester Boulevard	Overcrossing	X		
31	11.97	Pollard Road	Undercrossing		X	
32	12.45	More Avenue	Pedestrian overcrossing	X		
33	12.68	San Tomas Aquino Creek	Bridge		X	
34	12.91	Quito Road	Overcrossing	X		
35	13.73	Saratoga Avenue	Undercrossing		X	
36	13.91	Saratoga Creek	Bridge		X	
37	14.28	Cox Avenue	Overcrossing	X		
38	14.31	Cox Avenue utility	Overcrossing	X		
39	14.73	Scully Avenue utility	Overcrossing	X		
40	14.84	Blue Hills	Pedestrian overcrossing	X		
41	15.27	Prospect Road	Overcrossing	X		
42	15.40	Calabazas Creek	Bridge		X	
43	15.87	South De Anza Boulevard	Overcrossing	X		
44	16.61	South Stelling Road	Overcrossing		X	
45	17.17	McClellan Road	Overcrossing		X	
46	17.70	Stevens Creek Boulevard	Overcrossing	X		
47	18.35	Southbound/eastbound I-280	Undercrossing	X		
48	18.41	SR 85/I-280	Separation	X		
49	18.43	Northbound/westbound I-280	Undercrossing	X		
50	18.86	Homestead Road	Overcrossing	X		
51	19.39	The Dalles	Pedestrian overcrossing			X
52	19.86	Fremont Avenue	Undercrossing	X		
53	20.02	Stevens Creek	Bridge	X		
54	20.37	Hawkins Drive	Right-of-way	X		
55	20.69	Permanente Creek Diversion Channel	Culvert	X		
56	21.10	Stevens Creek Trail/Dale Avenue	Pedestrian overcrossing	X		
57	21.75	SR 82/SR 85/El Camino Real	Separation	X		
58	22.13	SR 85/SR 237	Separation	X		
59	22.43	Dana Street	Overcrossing	X		
60	22.63	Evelyn Avenue/Caltrain/Light Rail/Central Expressway	Undercrossing/overpass	X		
61	22.95	Stevens Creek	Bridge	X		
62	23.19	Middlefield Road	Overcrossing	X		
63	23.44	Moffett Boulevard	Undercrossing	X		

*Type:
- Undercrossing = local road under State highway
- Overcrossing = local road over State highway
- Pedestrian overcrossing = Pedestrian crossing over State highway
- Separation = State highway crossing
- Underpass = State highway under railroad
- Overpass = State highway over railroad
- Right-of-way = right-of-way required

The bridge and undercrossing widening would close the existing spaces between the separate northbound and southbound structures by installing new bridge decking in the median. At each location, the bridge decks would be extended using precast, prestressed concrete beams supported by new abutments and columns. Bridge crossings of creeks are assumed to be free span between the abutments at each end of the bridge, except for the Los Gatos Creek bridge which has two spans. Table 5 provides more specific information regarding the nine bridge and undercrossing structures that would be widened.

An existing auxiliary lane would be extended along a 1.1-mile segment of northbound SR 85 between the existing South De Anza Boulevard northbound on-ramp and 0.2 mile south of the Stevens Creek Boulevard northbound off-ramp where the auxiliary lane currently begins. The existing pavement would be widened by up to 14 feet to the outside (northeast). To accommodate the auxiliary lane, sections of the existing abutments at South Stelling Road and McClellan Road overcrossings adjacent to northbound SR 85 would be removed and replaced by new retaining walls to support the embankments behind them.

Table 5 Alternative 2-2 Structure Improvements

Structure No.	Postmile	Name	Type	Length (feet)	Spans (existing)	Minimum Vertical Clearances (feet)	Widening (feet)
16	6.0	Almaden Expressway	Undercrossing	238	2	19.16	50
20	8.11	Camden Avenue	Undercrossing	210	2	15.49	45
27	10.60	Oka Road	Undercrossing	102	1	16.31	33
28	10.80	Los Gatos Creek	Bridge	178	2	—	29
31	11.97	Pollard Road	Undercrossing	196	1	16.47	23
33	12.68	San Tomas Aquino Creek	Bridge	105	1	—	23
35	13.73	Saratoga Avenue	Undercrossing	192	2	16.67	23
36	13.91	Saratoga Creek	Bridge	100	1	—	23
42	15.40	Calabazas Creek	Bridge	156	2	—	22

The segment of northbound SR 85 where the extended auxiliary lane is proposed is up to 25 feet lower in elevation than surrounding development. In the majority of this segment, retaining walls extend along the toe of the slope by approximately 14 feet beyond the northbound shoulder, and sound walls exist at the top of the slope along the edge of the right-of-way. Widening for the proposed auxiliary lane would occur in the area between the northbound shoulder and the retaining walls or toe of the slope. The new retaining walls at the South Stelling Road and McClellan Road overcrossings would replace existing slope areas adjacent to northbound SR 85.

Drainage Improvements

Storm runoff is collected by inlets located along the outside edge of the right-side shoulders and in the center of the median. The dual express lane alternative will widen the travelway by adding one lane in each direction in the median. The elevation of the inlets located in the median may need to be adjusted (raised) to meet the plane of the widened travelway.

North of I-280, the right-side shoulders range in width from 4 to 10 feet. To meet the HDM standards for shoulder width, the AC paved shoulders would need to be widened, generally to 10 feet, and drainage inlets relocated to the outside edge of the shoulder.

Utilities

The project area contains overhead electric and communications lines and underground electric, gas, sanitary sewer, water, reclaimed water, communications, and fiber optic lines. Utility providers in the project area are listed below by category.

- Gas and electric—PG&E
- Communications—AT&T, Comcast, Level 3, Verizon, Nextlink, and MCI

- Water—San Jose Water Company, Santa Clara Valley Water District, California Water Service Company, Great Oaks Water Company, City of Sunnyvale Water Division, and City of Mountain View Water Division
- Sanitary—City of San Jose, West Valley Sanitation District, City of Cupertino, and City of Mountain View.

The project would not require utility relocations. Utility impacts would be limited to the extension of casings (protective pipes or channels) for existing underground facilities whose casings do not extend through the right-of-way. All other existing utilities would be protected in place.

Express Lane Begin/End Transitions

The SR 85 express lanes would extend from U.S. 101 in south San Jose to U.S. 101 in Mountain View. The existing HOV direct-connector ramps at both ends of SR 85 would be converted to express lane connectors. North of the northbound and southbound mainline bridges spanning Winfred Boulevard, Guadalupe River, and Sanchez Drive, a second express lane would be added in the median traveling northbound and dropped traveling southbound.

At the north end of SR 85, the second express lane would be added in the median immediately south of the southbound U.S. 101 to southbound SR 85 express lane (converted HOV lane) direct-connector ramp. Northbound, the inside express lane would connect directly with the northbound SR 85 to northbound U.S. 101 express lane (converted HOV lane) direct-connector ramp. The remaining express lane would continue as a general-purpose lane.

Express Lane Buffer

No buffer is proposed between the dual express lanes and the adjacent general-purpose lanes. A single, white striped lane line would separate the lanes and continuous access between the lanes would be permitted.

California Highway Patrol Observation/Enforcement Areas and Emergency Refuge Areas

State-of-the-art toll infrastructure will be installed to reduce the need for CHP observation areas given the right-of-way constraints north of South Stelling Road.

Pending future agreements, it is anticipated that the CHP will be contracted to provide toll enforcement including express lane eligibility violations.

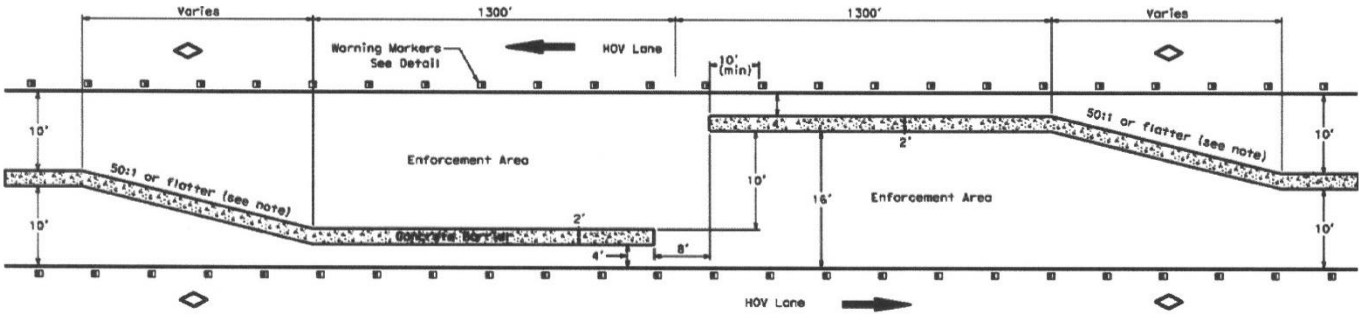
Existing emergency refuge areas (ERA) and proposed CHP observation/enforcement areas are listed in Table 6.

Table 6 Existing Emergency Refuge Areas and Proposed CHP Observation/Enforcement Areas

Northbound		Southbound	
1. Cottle Road	PM 1.97	1. Cottle Road	PM 1.97
2. Blossom Hill Road	PM 3.93	2. Blossom Hill Road	PM 3.93
3. Santa Teresa Boulevard	PM 5.20	*Rimwood Drive CHP*	*PM 6.72*
4. Almaden Expressway	PM 5.98	3. North of Russo Drive	PM 6.78
5. Almaden Expressway	PM 6.02	4. North of Leigh Avenue	PM 8.80
Rimwood Drive CHP	*PM 6.72*	5. North of Union Avenue	PM 9.66
6. North of Dent Avenue	PM 7.65	*Mulberry Drive CHP*	*PM 11.60*
7. North of Union Avenue	PM 9.34	6. South of Pollard Road	PM 11.71
8. North of Union Avenue	PM 9.50	7. More Avenue pedestrian overcrossing	PM 12.45
9. South of SR 17	PM 10.38	8. San Tomas Aquino Creek	PM 12.69
10. North of SR 17	PM 10.57	9. North of Saratoga Creek	PM 14.05
Mulberry Drive CHP	*PM 11.60*	10. Cox Avenue utility	PM 14.31
11. More Avenue pedestrian overcrossing	PM 12.45	*Hollanderry Place CHP*	*PM 16.23*
12. San Tomas Aquino Creek	PM 12.67	11. South of El Camino Real	PM 21.68
13. North of Saratoga Creek	PM 14.05	12. North of El Camino Real	PM 21.80
14. Cox Avenue utility	PM 14.31	13. North of El Camino Real	PM 21.84
Hollanderry Place CHP	*PM 16.23*		
15. South of Homestead Road	PM 18.80		
16. South of El Camino Real	PM 21.66		

Exhibit 2 illustrates a suggested layout for the proposed CHP observation/enforcement areas.

Exhibit 2. Bidirectional Enforcement Areas for Wide Medians



Toll Infrastructure

The express lane facility would incorporate various toll infrastructure including toll gantries with transponder readers and high-speed digital cameras (49), directional and informational signage, dynamic message signs to communicate real-time toll rates to drivers (25), complete closed circuit television coverage of the entire express lanes corridor, and fiber optics linking the infrastructure to a centralized toll operations office. Toll equipment would meet Title 21 specification and national protocol, as well as interoperability with other toll facilities in California.

Trenching would be conducted along the outside edge of pavement for installation of conduits. The depth of trenching would be 3 to 5 feet below the roadway surface. Conduits would be jacked across the freeway to the median where needed to provide power and communication feeds to the new overhead signs and toll structures.

The project would install new overhead and barrier-mounted signs, including dynamic message signs. The overhead signs would be installed in the median on cantilever structures supported on piles.

In some locations the express lane signs would replace existing signs or be added to existing sign structures, but most would be at new locations along SR 85. The exact number and locations of these features will be determined during the project design phase in coordination with the toll system design.

Please see Exhibit 1A, which further clarifies toll infrastructure components.

Tolling Policies

A *Concept of Operations Report* will be prepared to address various tolling policies under which the express lanes will be operated. This report will provide preliminary information regarding the type of tolling, toll exemption or rate reduction for HOVs, maximum target volume to maintain speed and minimize congestion in the express lanes, method for determining toll amount, methods for toll collection and toll enforcement, penalty rates for toll violations, and provision of supplemental service patrol. The items listed below represent key policies which have been assumed for the SR 85 express lanes; however, they are subject to change pending further studies.

- The express lanes are anticipated to operate part-time during peak hours, Monday through Friday.
- It is anticipated that HOVs with two or more occupants (HOV2+) will be allowed to use the express lanes toll-free. Single-occupancy vehicles will be allowed to use the express lanes for a toll.
- Motorcycles will be allowed to travel in the express lanes toll-free and are not required to have a transponder.
- Exempted vehicles including emergency response vehicles, highway maintenance vehicles serving the express lanes facility, and CHP vehicles assigned to patrol the express lane facility will have toll-free access to the express lanes, by registering these vehicles as toll exempt in the License Plate Recognition system.
- Clean air vehicles with valid clean air vehicle decals will be able to use the express lanes for a toll discount, assumed to 15 percent.
- Tolling is anticipated to be dynamic pricing based on real-time traffic levels to ensure peak period speed of no less than 45 mph.

Additional studies will be performed to establish the operating policies and business rules and determine pricing structures and toll violation rates.

Toll Operations and Maintenance
The institutional arrangements for operation and maintenance of the express lanes will be consistent with those implemented by VTA for the express lane system in Santa Clara County.

Express Lanes Incident Responses
At this time, it is anticipated that Freeway Service Patrol will be contracted to provide incident response for the express lanes similar to the current arrangement in the HOV and general-purpose lanes. It is currently planned to have dedicated roving Freeway Service Patrol patrolling the express lanes during hours of peak congestion, to respond to incidents that might affect the express lanes including clearing of debris, towing disabled vehicles, and minor auto repairs.

Conceptual Engineering Plans
Geometric cross sections for mainline segments and segments passing structures with restrictive widths are provided in Attachment 2.

Alignment plans for the dual express lane alternative are provided in Attachment 3 for the mainline segment from Prospect Road (PM 15.27) to just south of U.S. 101 in Mountain View (PM 23.70). Plan sheets are also provided for the segment from Almaden Boulevard to Santa Teresa Boulevard where the express lanes transition from one to two lanes in each direction.

Right-of-Way Requirements
South of I-280, in segments 1 and 2 of the corridor, the project would be constructed entirely within the existing right-of-way.

North of I-280, in segment 3 of the corridor, the alignment plans provided in Attachment 3 indicate that the pedestrian overcrossing at The Dalles (PM 19.39), illustrated on Sheet 17, will need to be relocated. This relocation will likely require new right-of-way to the east of SR 85 if the pedestrian overcrossing is reconstructed at this location.

A potential right-of-way impact is illustrated on Sheet 14 in Attachment 3 at PM 20.37 where the right-side shoulder narrows to six feet. A Design Standards Decision Document will need to be prepared and approved by Caltrans Division of Design Chief to avoid acquiring right-of-way and relocating the adjacent sound wall at this location.

SCENARIO C—FREEWAY WIDENING WITH TRANSIT STATIONS

Alternative 3-1 (Median) and Alternative 3-2 (Right-side)

Mainline Improvements
- Convert existing HOV lane in each direction from U.S. 101 (southern end of SR 85) to U.S. 101 in Mountain View to operate as a single express lane in each direction.
- Add one lane in each direction from Almaden Expressway to Evelynn Avenue or Moffett Boulevard. The added lane would be positioned in the existing median as the number 1 (inside) lane.
- With Alternative 3-1, the transit lane would occupy the number 1 lane position. With Alternative 3-2, the transit lane would occupy the number 4 (outside) lane position.
- Provide a buffer to separate the transit lane from the adjacent express lane (Alternative 3-1) or general-purpose lane (Alternative 3-2).
- Provide continuous access to the express lane(s) from the adjacent general-purpose lanes.
- Extend existing auxiliary lane on northbound SR 85 from the South De Anza Boulevard northbound on-ramp to 0.2 mile south of the Stevens Creek Boulevard off-ramp.
- Provide CHP enforcement/observation areas in the median at selected locations along the corridor.

- Install double-luminaire mast arm lighting at 250- to 400-foot intervals from postmile (PM) 6.00 (Almaden expressway) to PM 17.70 (Stevens Creek Boulevard) and from PM 18.86 (Homestead Road) to PM 23.44 (Moffett Boulevard) as an optional improvement.
- Install high mast lighting at SR 17 and I-280 interchanges as needed to supplement existing lighting as an optional improvement.

Interchange Improvements

Ramp improvements are required to implement this alternative. Conversion of the SR 85 interchange at SR 82/El Camino Real from a cloverleaf Type L-10 ramp configuration to a spread diamond Type L-2 ramp configuration is required to enable the provision of a transit station at this location.

Partial realignment of ramps is proposed at the interchanges listed in Table 7. A diagram showing the relative location of the ramps is attached to this document as Attachment 1.

Table 7 Alternative 3-2 Structure Improvements

			Ramp Improvement			
Interchange Name	**Ramp No.**	**Description**	**Partial**	**Full**	**Remove**	**None**
South De Anza Boulevard	51	South De Anza Boulevard northbound on-ramp	X			
Stevens Creek Boulevard	54	Stevens Creek Boulevard northbound off-ramp	X			
	55	Stevens Creek Boulevard southbound on-ramp	X			
	56	Stevens Creek Boulevard southbound off-ramp	X			
I-280	57	I-280 northbound off-ramp	X			
	58	I-280 northbound loop on-ramp				X
	59	I-280 northbound on-ramp	X			
	60	I-280 southbound on-ramp				X
	61	I-280 southbound loop on-ramp				X
	62	I-280 southbound off-ramp	X			
Homestead Road	63	Homestead Road northbound on-ramp	X			
	64	Homestead Road southbound off-ramp	X			
Fremont Avenue	65	Fremont Avenue northbound off-ramp				X
	66	Fremont Avenue northbound on-ramp	X			
	67	Fremont Avenue southbound on-ramp	X			
	68	Fremont Avenue southbound off-ramp	X			
SR 82/El Camino Real	69	SR 82/El Camino Real northbound off-ramp		X		
	70	SR 82/El Camino Real northbound loop on-ramp			X	
	71	SR 82/El Camino Real northbound loop off-ramp			X	
	72	SR 82/El Camino Real northbound on-ramp		X		
	73	SR 82/El Camino Real southbound on-ramp	X			
	74	SR 82/El Camino Real southbound loop off-ramp			X	
	75	SR 82/El Camino Real southbound on-ramp			X	
SR 237	76	SR 237 northbound off-ramp	X			
	77	SR 237 northbound on-ramp	X			
	78	SR 237 southbound on-ramp	X			
	79	SR 237 southbound off-ramp				X
Evelyn Avenue	80	Evelyn Avenue northbound off-ramp	X			
	81	Evelyn Avenue southbound on-ramp	X			
Central Expressway	82	Central Expressway northbound on-ramp	X			
	83	Central Expressway southbound off-ramp	X			
Moffett Boulevard	84	Moffett Boulevard northbound off-ramp	X			
	85	Moffett Boulevard southbound on-ramp	X			

The “Mainline Improvements” listed above indicated that the one lane added in each direction would extend from Almaden Expressway to Evelyn Avenue or Moffett Boulevard. As an option, Alternative 3-1 (Median) Long Transit Lane could include a drop ramp from the median of SR 85 to Evelyn Avenue in lieu of continuing the transit lanes to Moffett Boulevard.

Figure 3 illustrates a conceptual alignment plan for this option. The median direct connector ramp is facilitated by the freeway mainline rising by 16 feet between Dana Street and Evelyn Avenue, while the median transit lanes drop in elevation by 12 feet to meet the grade of Evelyn Avenue (see Figure 4). To construct the drop ramp, a tunnel could be "jacked" under the northbound travel lanes without the need to temporarily close the freeway (see Exhibit 3). Commuter buses not using the median drop lane could continue north to Moffett Boulevard and U.S. 101 using the adjacent express lane. Alternative 3-2 (Right-side) Long Transit Lane would allow VTA buses to utilize the right-side off-ramp and on-ramp to and from Evelyn Avenue while also allowing the transit lane to continue north to Moffett Boulevard for use by commuter buses.

Local Street Improvements

No streets crossing under or over SR 85 would be reconstructed to accommodate the transit lanes alternatives. Conversion of the SR 85 interchange at SR 82/El Camino Real from a Type L-10 cloverleaf layout to a Type L-2 spread diamond layout would require reconstruction of the ramp terminal intersections, installation of traffic signals, removal of a portion of the raised median and landscaping, and pavement signing and striping to accommodate dual left-turn lanes to the northbound and southbound on-ramps. No widening of El Camino Real would be required.

Conversion of the HOV lane to an express lane would allow for improved enforcement, a reduction in the proportion of HOV2+ "cheaters," and improved managed use to achieve speeds of 45 mph or higher in the express lane.

The HOV to Express Lane Conversion aspect of this alternative would not yield additional vehicle throughput, however. The HOV and general-purpose lanes each accommodate roughly 1,500 vehicles per hour per lane (vphpl) during peak hours in the peak direction. The capacity of the express lane at LOS C is 1,600 vphpl. While the volume of vehicles will likely remain unchanged, the speed of the vehicles using the express lane will likely increase, encouraging more SOV drivers to carpool and/or utilize commuter buses, if available.

With mainline traffic volumes expected to remain unchanged from no build conditions, no impacts to local streets would be expected.

Railroad Involvement

Six (6) railroad crossings over or under SR 85 occur within the project limits.

1. VTA light rail tracks (Guadalupe Corridor) under southbound SR 85 at PM 1.33.
2. VTA light rail tracks (Guadalupe Corridor) under northbound SR 85 at PM 5.27, just west of Santa Teresa Boulevard.
3. VTA light rail track under SR 85 adjacent to Winfred Boulevard at PM 5.59.
4. Union Pacific track over SR 85 adjacent to Winchester Boulevard at PM 10.98.
5. Caltrain Peninsula Commuter tracks under SR 85 adjacent to Evelyn Avenue at PM 22.63.
6. VTA light rail tracks under SR 85 adjacent to Central Expressway at PM 22.63.

None of these crossings would require bridge work to accommodate the proposed freeway widening for the addition of one transit lane in each direction.

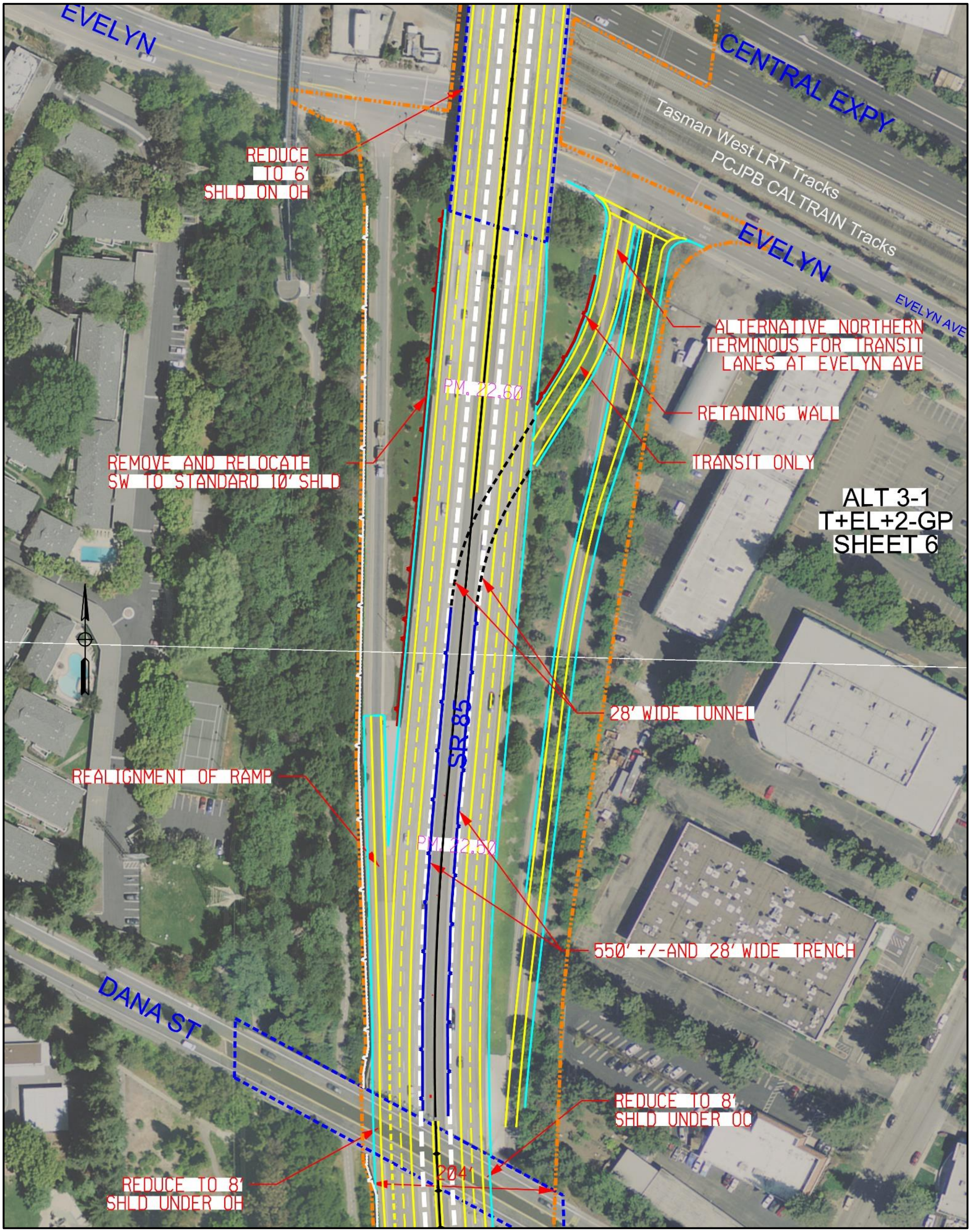


Figure 3 Alternative 3-1 Conceptual Alignment Plan for Direct Connector Drop Ramp to Evelyn Avenue

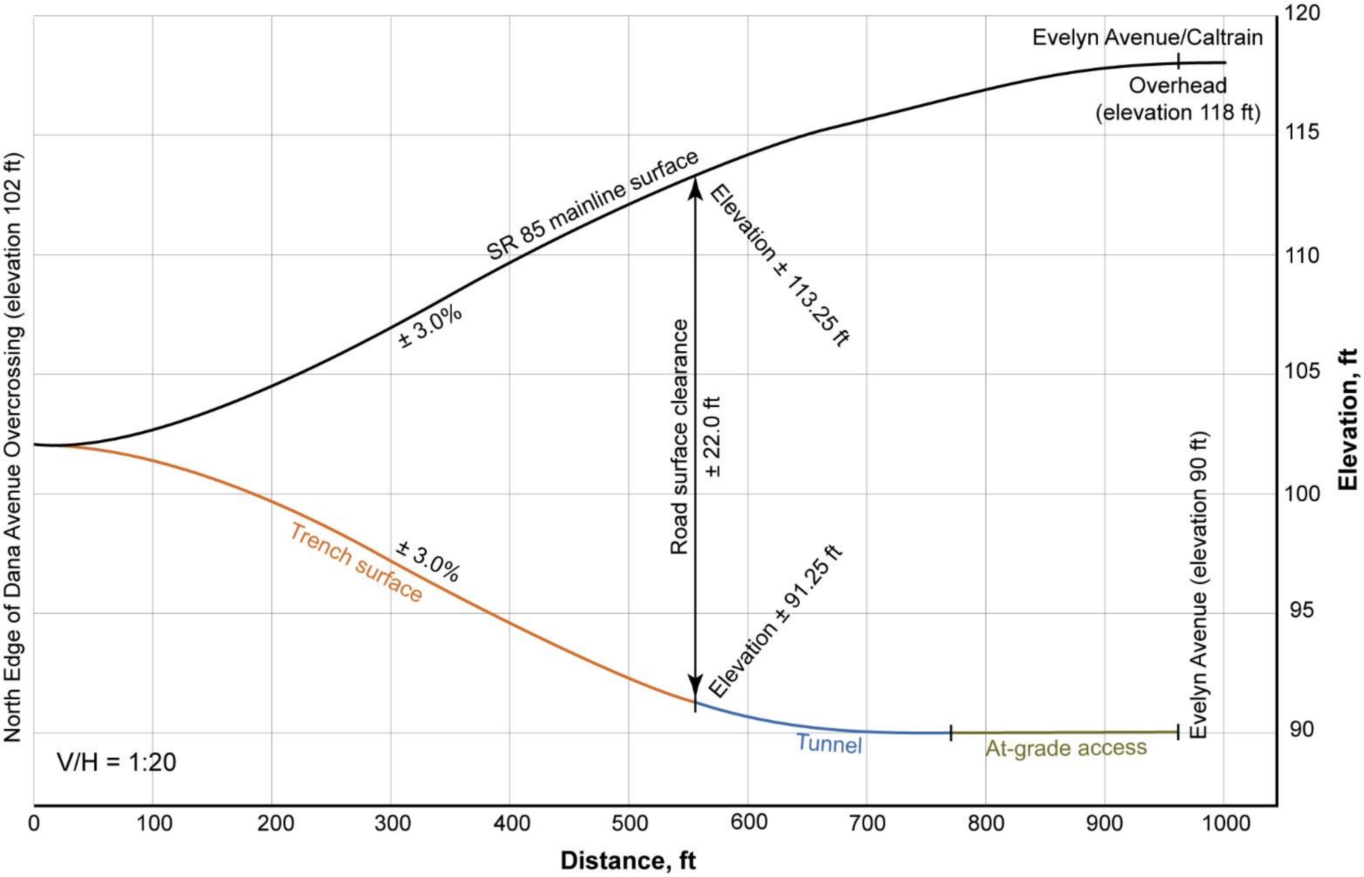
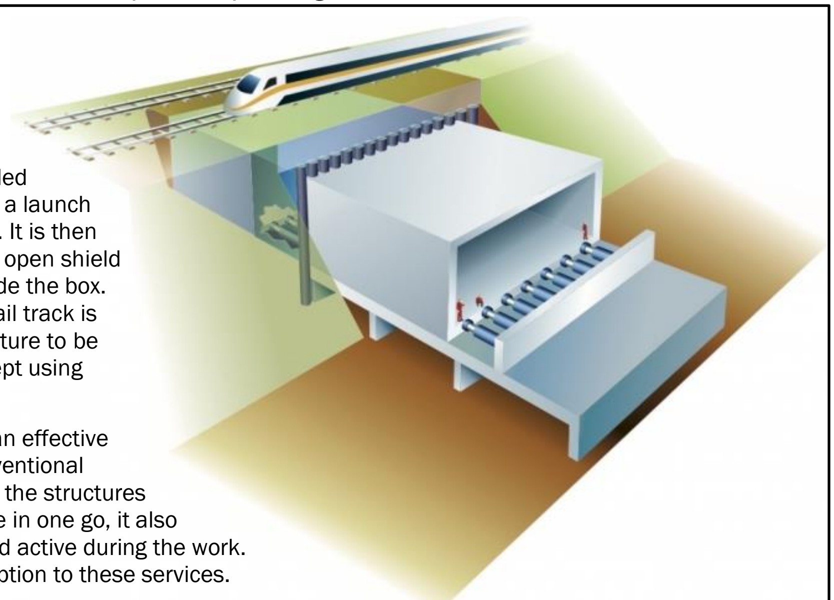


Figure 4 Conceptual Vertical Profile for Direct Connector Drop Ramp to Evelyn Avenue

Exhibit 3. Box (or Tunnel) Jacking

BOX JACKING



Box jacking, also known as Tunnel Jacking, involves the advancement of a site cast rectangular or other shaped sections using high capacity hydraulic jacks. The structure to be installed is constructed, normally in reinforced concrete, on a launch pad at site adjacent to where it has to be installed. It is then thrust forward horizontally using advance support, open shield and jacking technology with taking place from inside the box. This is frequently used where an existing road or rail track is on an embankment and space exists for the structure to be cast at the side. There are variations on this concept using short pre-cast units to form the box.

The main benefit of this approach is that it offers an effective alternative to disruptive open cut techniques, conventional tunneling methods being inappropriate so close to the structures above. Tunnel jacking can install the final structure in one go, it also allows the above infrastructure to remain "live" and active during the work. This obviously significantly reduces potential disruption to these services.

A number of installations have been made where the top of the box is immediately below the track. The system is designed for the track loads to be picked up by the box roof as it advances.

Source: Jacked Structures, Cheshire, United Kingdom

Structure Improvements

The transit lane alternatives would necessitate the widening of nine bridge or undercrossing structures, the replacement of embankments with retaining walls at three overcrossings, and the replacement of one pedestrian overcrossing. Table 8 summarizes the proposed structure improvements under Alternatives 3-1 and 3-2.

Table 8 Long Transit Lane Alternatives Structure Improvements

Structure No.	Postmile	Structure Name	Type*	Structure Improvement No Work	Widen	Replace
1	0.20	Bernal Road	Undercrossing	X		
2	0.29	Monterey Road/Union Pacific/Great Oaks Boulevard	Undercrossing/overpass	X		
3	1.22	Via Del Oro	Undercrossing	X		
4	1.33	VTA Light Rail	Overpass	X		
5	1.97	Cottle Road	Overcrossing	X		
6	2.73	Lean Avenue	Overcrossing	X		
7	3.48	Snell Avenue	Overcrossing	X		
8	3.93	Blossom Hill Road	Overcrossing	X		
9	4.28	Canoas Creek	Bridge	X		
10	4.50	Cahalan Avenue	Pedestrian undercrossing	X		
11	4.84	Southbound SR 87 to southbound SR 85	Separation	X		
12	5.20	Santa Teresa Boulevard	Undercrossing	X		
13	5.27	VTA Light Rail	Overpass	X		
14	5.31	Southbound SR 85 to northbound SR 87	Separation	X		
15	5.59	Winfred Blvd/Guadalupe River/Sanchez Drive	Bridge	X		
16	6.00	Almaden Expressway	Undercrossing		X	
17	6.46	Russo Drive	Pedestrian overcrossing	X		
18	7.30	Meridian Avenue	Overcrossing	X		
19	7.50	Dent Avenue	Pedestrian overcrossing	X		
20	8.11	Camden Avenue	Undercrossing	X	X	
21	8.77	Leigh Avenue	Overcrossing	X		
22	9.28	Union Avenue	Overcrossing	X		
23	9.93	Samaritan Place	Pedestrian overcrossing	X		
24	10.23	Bascom Avenue	Overcrossing	X		
25	10.40	Southbound SR 17 to southbound SR 85	Separation	X		
26	10.48	SR 17	Separation	X		
27	10.60	Oka Road	Undercrossing		X	
28	10.80	Los Gatos Creek	Bridge		X	
29	10.90	Winchester Boulevard	Underpass	X		
30	11.00	Winchester Boulevard	Overcrossing	X		
31	11.97	Pollard Road	Undercrossing		X	
32	12.45	More Avenue	Pedestrian overcrossing	X		
33	12.68	San Tomas Aquino Creek	Bridge		X	
34	12.91	Quito Road	Overcrossing	X		
35	13.73	Saratoga Avenue	Undercrossing		X	
36	13.91	Saratoga Creek	Bridge		X	
37	14.28	Cox Avenue	Overcrossing	X		
38	14.31	Cox Avenue utility	Overcrossing	X		
39	14.73	Scully Avenue utility	Overcrossing	X		
40	14.84	Blue Hills	Pedestrian overcrossing	X		
41	15.27	Prospect Road	Overcrossing	X		
42	15.40	Calabazas Creek	Bridge		X	
43	15.87	South De Anza Boulevard	Overcrossing	X		
44	16.61	South Stelling Road	Overcrossing		X	
45	17.17	McClellan Road	Overcrossing		X	
46	17.70	Stevens Creek Boulevard	Overcrossing		X	
47	18.35	Southbound/eastbound I-280	Separation	X		
48	18.41	SR 85/I-280	Separation	X		
49	18.43	Northbound/westbound I-280	Separation	X		
50	18.86	Homestead Road	Overcrossing	X		
51	19.39	The Dalles	Pedestrian overcrossing			X

Table 8 Long Transit Lane Alternatives Structure Improvements

Structure No.	Postmile	Structure Name	Type*	Structure Improvement No Work	Widen	Replace
52	19.86	Fremont Avenue	Undercrossing	X		
53	20.02	Stevens Creek	Bridge	X		
54	20.37	Hawkins Drive	Right-of-way	X		
55	20.69	Permanente Creek Diversion Channel	Culvert	X		
56	21.10	Stevens Creek Trail/Dale Avenue	Pedestrian overcrossing	X		
57	21.75	SR 82/SR 85/El Camino Real	Separation	X		
58	22.13	SR 85/SR 237	Separation	X		
59	22.43	Dana Street	Overcrossing	X		
60	22.63	Evelyn Avenue/Caltrain/Light Rail/Central Expressway	Undercrossing/overpass	X		
61	22.95	Stevens Creek	Bridge	X		
62	23.19	Middlefield Road	Overcrossing	X		
63	23.44	Moffett Boulevard	Undercrossing	X		

*Type:
- Undercrossing = local road under State highway
- Overcrossing = local road over State highway
- Pedestrian overcrossing = Pedestrian crossing over State highway
- Separation = State highway crossing
- Underpass = State highway under railroad
- Overpass = State highway over railroad
- Right-of-way = right-of-way required

The bridge and undercrossing widening would close the existing spaces between the separate northbound and southbound structures by installing new bridge decking in the median. At each location, the bridge decks would be extended using precast, prestressed concrete beams supported by new abutments and columns. Bridge crossings of creeks are assumed to be free span between the abutments at each end of the bridge, except for the Los Gatos Creek bridge which has two spans. **Table 5**, reported earlier, provides more specific information regarding the nine bridge and undercrossing structures that would be widened.

An existing auxiliary lane would be extended along a 1.1-mile segment of northbound SR 85 between the existing South De Anza Boulevard northbound on-ramp and 0.2 mile south of the Stevens Creek Boulevard northbound off-ramp where the auxiliary lane currently begins. The existing pavement would be widened by up to 14 feet to the outside (northeast). To accommodate the auxiliary lane, sections of the existing abutments at South Stelling Road and McClellan Road overcrossings adjacent to northbound SR 85 would be removed and replaced by new retaining walls to support the embankments behind them.

The segment of northbound SR 85 where the extended auxiliary lane is proposed is up to 25 feet lower in elevation than surrounding development. In the majority of this segment, retaining walls extend along the toe of the slope by approximately 14 feet beyond the northbound shoulder, and sound walls exist at the top of the slope along the edge of the right-of-way. Widening for the proposed auxiliary lane would occur in the area between the northbound shoulder and the retaining walls or toe of the slope. The new retaining walls at the South Stelling Road and McClellan Road overcrossings would replace existing slope areas adjacent to northbound SR 85.

Drainage Improvements

Storm runoff is collected by inlets located along the outside edge of the right-side shoulders and in the center of the median. The transit lane alternatives will widen the travelway by adding one lane in each direction in the median. The elevation of the inlets located in the median may need to be adjusted (raised) to meet the plane of the widened travelway.

North of I-280, the right-side shoulders range in width from 4 to 10 feet. To meet the HDM standards for shoulder width, the AC paved shoulders would need to be widened, generally to 10 feet, and drainage inlets relocated to the outside edge of the shoulder.

Utilities

The project area contains overhead electric and communications lines and underground electric, gas, sanitary sewer, water, reclaimed water, communications, and fiber optic lines. Utility providers in the project area are listed below by category.

- Gas and electric—PG&E
- Communications—AT&T, Comcast, Level 3, Verizon, Nextlink, and MCI
- Water—San Jose Water Company, Santa Clara Valley Water District, California Water Service Company, Great Oaks Water Company, City of Sunnyvale Water Division, and City of Mountain View Water Division
- Sanitary—City of San Jose, West Valley Sanitation District, City of Cupertino, and City of Mountain View.

The project would not require utility relocations. Utility impacts would be limited to the extension of casings (protective pipes or channels) for existing underground facilities whose casings do not extend through the right-of-way. All other existing utilities would be protected in place.

Transit and Express Lane Begin/End Transitions

The SR 85 express lanes would extend from U.S. 101 in south San Jose to U.S. 101 in Mountain View. The existing direct-connector ramps at both ends of SR 85 would be converted to express lane connectors. North of Santa Teresa Boulevard, the northbound and southbound mainline bridges spanning Winfred Boulevard, Guadalupe River, and Sanchez Drive, a second lane would be added in the median traveling northbound and dropped traveling southbound.

At the north end of SR 85, the second lane would be added in the median immediately south of the southbound U.S. 101 to southbound SR 85 express lane (converted HOV lane) direct-connector ramp. Northbound, the inside lane would connect directly with the northbound SR 85 to northbound U.S. 101 express lane (converted HOV lane) direct-connector ramp. The remaining lanes would continue as general-purpose lanes.

With Alternative 3-1, the number 1 one lane will be designated and signed for transit use plus qualifying first responder and CHP use. With Alternative 3-2, the number 4 lane will be designated for these uses along with users of the general-purpose lanes who are exiting or entering the freeway to off-ramps and on-ramps, respectively.

Express Lane Buffer

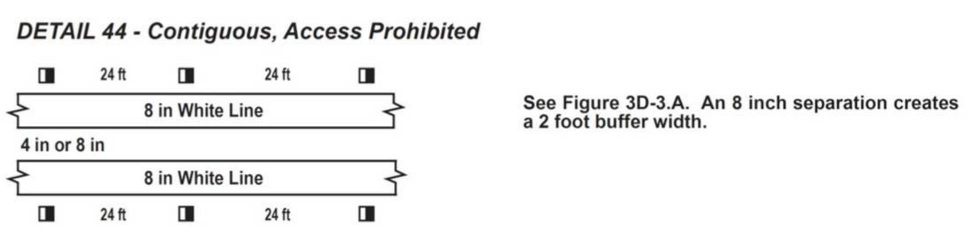
No buffer is proposed between the express lane and the adjacent general-purpose lanes. A single, white striped lane line would separate the lanes and continuous access between the lanes would be permitted.

Transit Lane Buffer

The proposed transit lanes would be located in lane 1 nearest the median or lane 4 nearest the right-side shoulder of the widened SR 85 freeway. The transit lanes are proposed to be buffer-separated from the adjacent express lane or general-purpose lanes.

A minimum buffer width of two feet is proposed. The diagram below presents the anticipated striping detail for the 2-foot buffer, which is Detail 44 with an 8-inch separation per the 2014 California MUTCD Revision 4, effective March 29, 2019.

Figure 3A-113 (CA). Examples of Preferential Lane Lines

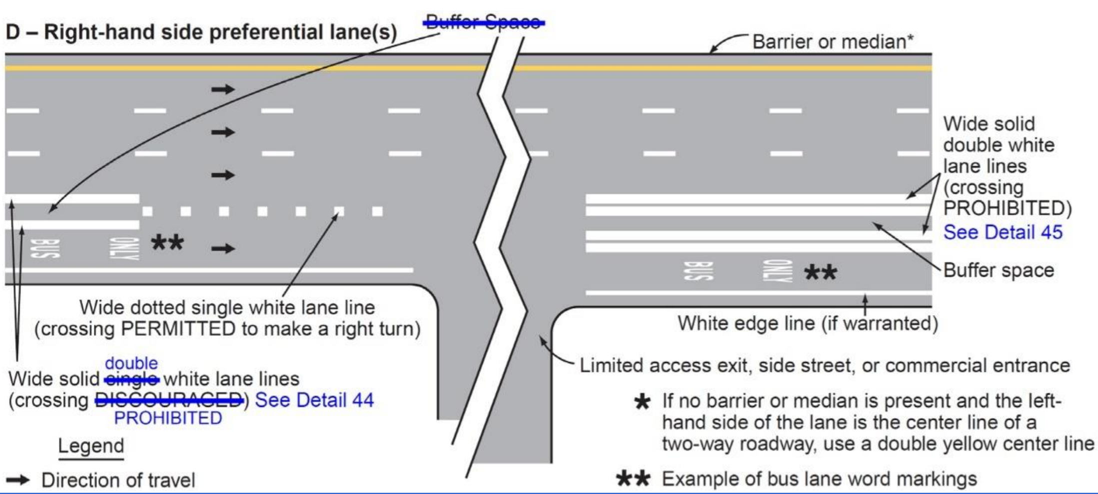


Source: California Manual on Uniform Traffic Control Devices, 2014 Edition, Revision 4 (March 29, 2019), California State Transportation Agency, 2019

Transit Lane Intermediate Access Points

Intermediate access points for the transit lanes will be identified once transit routing plans are refined during the PA/ED phase of project development. In the case of Alternative 3-2, access through the striped buffer to off-ramps and from on-ramps will be as defined by the CA MUTCD in Figure 3D-2D, Right-hand Side Preferential Lane(s), shown below.

Figure 3D-2D. Right-hand side Preferential Lane(s)



Source: California Manual on Uniform Traffic Control Devices, 2014 Edition, Revision 4 (March 29, 2019), California State Transportation Agency, 2019

California Highway Patrol Observation/Enforcement and Emergency Refuge Areas

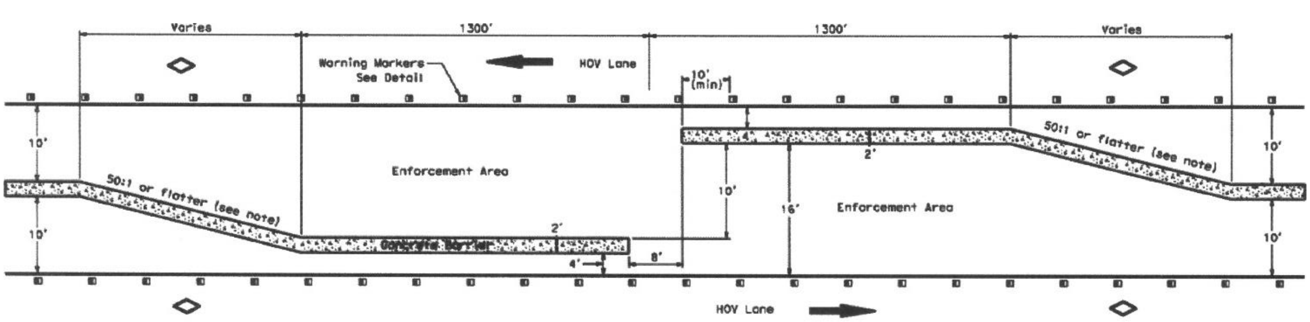
State-of-the-art toll infrastructure will be installed to reduce the need for CHP observation areas given the right-of-way constraints north of South Stelling Road.

Pending future agreements, it is anticipated that the CHP will be contracted to provide toll enforcement including express lane eligibility violations.

California Highway Patrol observation/enforcement areas are proposed at locations where the width of the median and separation between upstream and downstream structures will permit the design guidance illustrated as Figure 6.1 of Caltrans' High-Occupancy Vehicle Guidelines dated January 2018 to be implemented. Figure 6.1 is illustrated below for reference.

Figure 6.1 Bi-directional Enforcement Areas for Wide Medians

NOT TO SCALE



Source: High-Occupancy Vehicle Guidelines for Planning, Design and Operations, California State Transportation Agency, January 2018

The locations which permit the installation of these bi-directional CHP enforcement areas are:

- Rimwood Drive (north of Almaden Expressway at PM 6.72)
- Mulberry Drive (north of Winchester Boulevard at PM 11.60)
- Hollanderry Place (north of De Anza Boulevard at PM 16.23).

The CHP is anticipated to be contracted to conduct routine and supplemental enforcement services on SR 85 express lanes.

The locations of emergency refuge areas were listed previously on Table 6. All of the emergency refuge areas would be retained with this alternative.

Toll Infrastructure

The express lane facility would incorporate various toll infrastructure including toll gantries with transponder readers and high-speed digital cameras (49), directional and informational signage, dynamic message signs to communicate real-time toll rates to drivers (25), complete closed circuit television coverage of the entire express lanes corridor, and fiber optics linking the infrastructure to a centralized toll operations office. Toll equipment would meet Title 21 specification and national protocol, as well as interoperability with other toll facilities in California. Please see Exhibit 1A, displayed previously, for an illustration of the tolling infrastructure.

Trenching would be conducted along the outside edge of pavement for installation of conduits. The depth of trenching would be 3 to 5 feet below the roadway surface. Conduits would be jacked across the freeway to the median where needed to provide power and communication feeds to the new overhead signs and toll structures.

The project would install new overhead and barrier-mounted signs, including dynamic message signs. The overhead signs would be installed in the median on cantilever structures supported on piles.

In some locations the express lane signs would replace existing signs or be added to existing sign structures, but most would be at new locations along SR 85. The exact number and locations of these features will be determined during the project design phase in coordination with the toll system design.

Tolling Policies

A *Concept of Operations Report* will be prepared to address various tolling policies under which the express lanes will be operated. This report will provide preliminary information regarding the type of tolling, toll exemption or rate reduction for HOVs, maximum target volume to maintain speed and minimize congestion in the express lanes, method for determining toll amount, methods for toll collection and toll enforcement, penalty rates for toll violations, and provision of supplemental service patrol. The items listed below represent key policies which have been assumed for the SR 85 express lanes; however, they are subject to change pending further studies.

- The express lanes are anticipated to operate part-time during peak hours, Monday through Friday.
- It is anticipated that HOVs with two or more occupants (HOV2+) will be allowed to use the express lanes toll-free. Single-occupancy vehicles will be allowed to use the express lanes for a toll.
- Motorcycles will be allowed to travel in the express lanes toll-free and are not required to have a transponder.
- Exempted vehicles including emergency response vehicles, highway maintenance vehicles serving the express lanes facility, and CHP vehicles assigned to patrol the express lane facility will have toll-free access to the express lanes, by registering these vehicles as toll exempt in the License Plate Recognition system.
- Clean air vehicles with valid clean air vehicle decals will be able to use the express lanes for a toll discount, assumed to 15 percent.
- Tolling is anticipated to be dynamic pricing based on real-time traffic levels to ensure peak period speed of no less than 45 mph.

Additional studies will be performed to establish the operating policies and business rules and determine pricing structures and toll violation rates.

Toll Operations and Maintenance

The institutional arrangements for operation and maintenance of the express lanes will be consistent with those implemented by VTA for the express lane system in Santa Clara County.

Express Lanes Incident Responses

At this time, it is anticipated that Freeway Service Patrol will be contracted to provide incident response for the express lanes similar to the current arrangement in the HOV and general-purpose lanes. It is currently planned to have dedicated roving Freeway Service Patrol patrolling the express lanes during hours of peak congestion, to respond to incidents that might affect the express lanes including clearing of debris, towing disabled vehicles, and minor auto repairs.

Conceptual Engineering Plans

Conceptual cross sections for mainline segments and segments passing structures with restrictive widths are provided in Attachment 2.

Alignment plans for the transit lane alternatives are provided in Attachment 3 for the mainline segment from Prospect Road (PM 15.27) to just south of U.S. 101 in Mountain View (PM 23.70). Plan sheets are also provided for segments including transit stations at El Camino Real, Stevens Creek Boulevard, Saratoga Avenue and Bascom Avenue.

Right-of-Way Requirements

South of I-280, in segments 1 and 2 of the corridor, the project would be constructed entirely within the existing right-of-way.

North of I-280, in segment 3 of the corridor, the alignment plans provided in Attachment 3 indicate that the pedestrian overcrossing at The Dalles (PM 19.39) illustrated on Sheet 17, will need to be relocated. This relocation will likely require new right-of-way to the east of SR 85 if the pedestrian overcrossing is reconstructed at this location.

A potential right-of-way impact is illustrated on Sheet 14 in Attachment 3 at PM 20.37 where the right-side shoulder narrows to six feet. A Design Standards Decision Document will need to be prepared and approved by Caltrans Division of Design Chief to avoid acquiring right-of-way and relocating the adjacent sound wall at this location.

Transit Lane Stations

Stations are proposed along the Route 85 Transit Guideway at the following locations.

- Ohlone-Chynoweth Light Rail Station at Santa Teresa Boulevard
- Bascom Avenue
- Saratoga Avenue
- Stevens Creek Boulevard
- SR 82/El Camino Real

These station locations are preliminary and representative of different right-of-way availability, mainline and median conditions, and interchange configurations. The locations of the stations proposed for proof of concept evaluation are illustrated on Figure 5.

The conceptual design options for these stations are presented later in this document following the discussion of engineering features for Scenario D, Part-time Shoulder Use.

SCENARIO D—PART-TIME SHOULDER USE (BUS ON SHOULDER)

Alternative 3-5 (Long Shoulder—Median) and Alternative 3-6 (Long Shoulder—Right Side)

These alternatives include utilizing the median shoulder (Alternative 3-5) or the right-side shoulder (Alternative 3-6) for bus on shoulder transit operations.

The Federal Highway Administration defines part-time shoulder use as a transportation system management and operation strategy for addressing congestion and reliability issues within the transportation system. There are many forms of part-time shoulder use or “shoulder running”; however, they all involve use of the left or right shoulders of an existing roadway for temporary travel during certain hours of the day. Part-time shoulder use has primarily been used in locations where there is recurring congestion due to lack of peak period capacity through the corridor.

Part-time shoulder use is primarily used on freeways. There are multiple examples of how highway agencies have used the shoulders of roadways to address congestion and reliability needs and to improve overall system performance. These options vary in terms of the location of the shoulder (left/right shoulder options) used, vehicle-use options [e.g., bus only, HOV only, all vehicles except trucks], operating schedule, and special speed controls. In all of these options, the use is “temporary” for part of the day, and the lane continues to operate as a refuge shoulder when not being used for these travel purposes.

Traffic Considerations

Peak period traffic volumes for three representative locations are reported in Table 9. The table indicates that traffic demand accommodated by the existing facility is highly directional, northbound in the morning and southbound in the afternoon/evening. Segment travel speed data further emphasizes the directional nature of peak period traffic.

Figure 6 illustrates a five-minute slice of traffic speeds along SR 85 at 7:30 a.m. The top portion of the graphic illustrates northbound speeds in the two general-purpose lanes and the adjacent HOV lane. In segment 2 of the corridor, from SR 87 to I-280, speeds drop below 35 mph, which indicates “significant congestion.” Southbound during the same 5-minute slice of time, motorists travel at or above the speed limit of 65 mph.

Similar speed profiles exist for the afternoon peak hours. Figure 7 illustrates speeds during the 5:30 p.m. 5-minute slice of time.

More extensive analysis of existing traffic conditions and congestion is presented in the Traffic Study Report prepared for this SR 85 Transit Guideway Study.

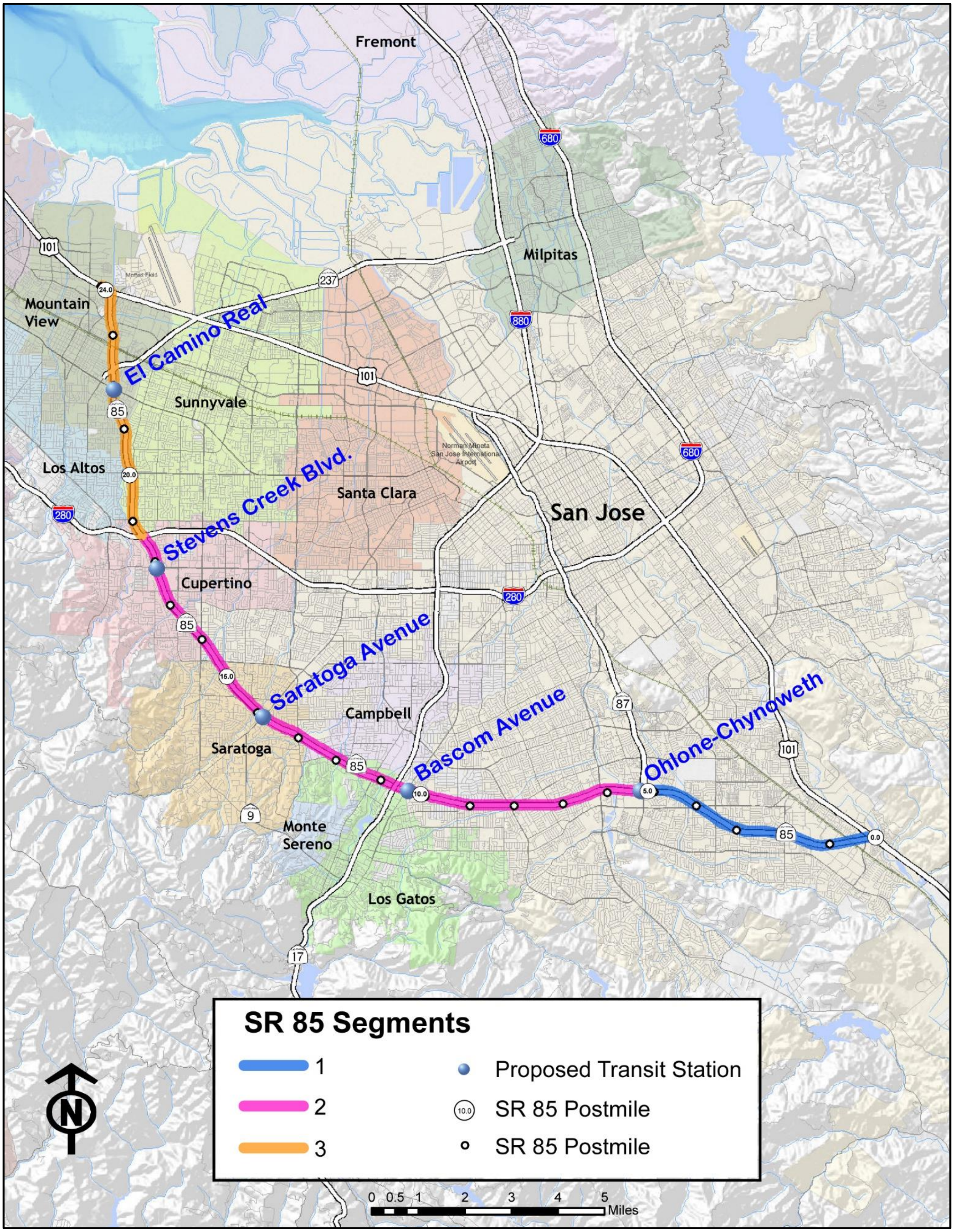


Figure 5 Transit Lane Station Locations

Table 9 State Route 85 Peak Period Hourly Traffic Volumes

	Northbound Throughput (vehicles/hour) at Location		
AM Peak Hour	❶	❷	❸
0600	1,871	2,824	5,309
0700	3,098	3,535	5,849
0800	4,612	3,961	5,162
0900	3,995	3,711	4,760
1000	4,154	3,638	4,542
PM Peak Hour	❶	❷	❸
1400	4,930	3,536	3,300
1500	4,737	3,553	3,634
1600	5,024	3,673	3,571
1700	5,634	4,101	3,868
1800	5,154	3,702	3,741
1900	4,043	2,860	2,933
Daily Total	**71,841**	**58,934**	**71,641**

	Southbound Throughput (vehicles/hour) at Location		
AM Peak Hour	❶	❷	❸
0600	963	936	1,170
0700	2,600	2,329	2,736
0800	3,445	2,824	3,077
0900	2,970	2,453	2,686
1000	2,597	2,182	2,427
PM Peak Hour	❶	❷	❸
1400	4,367	4,086	4,968
1500	5,985	4,504	4,476
1600	6,357	4,726	4,630
1700	6,177	4,710	4,749
1800	5,677	4,448	4,619
1900	4,405	3,992	4,735
Daily Total	**63,356**	**53,925**	**59,823**

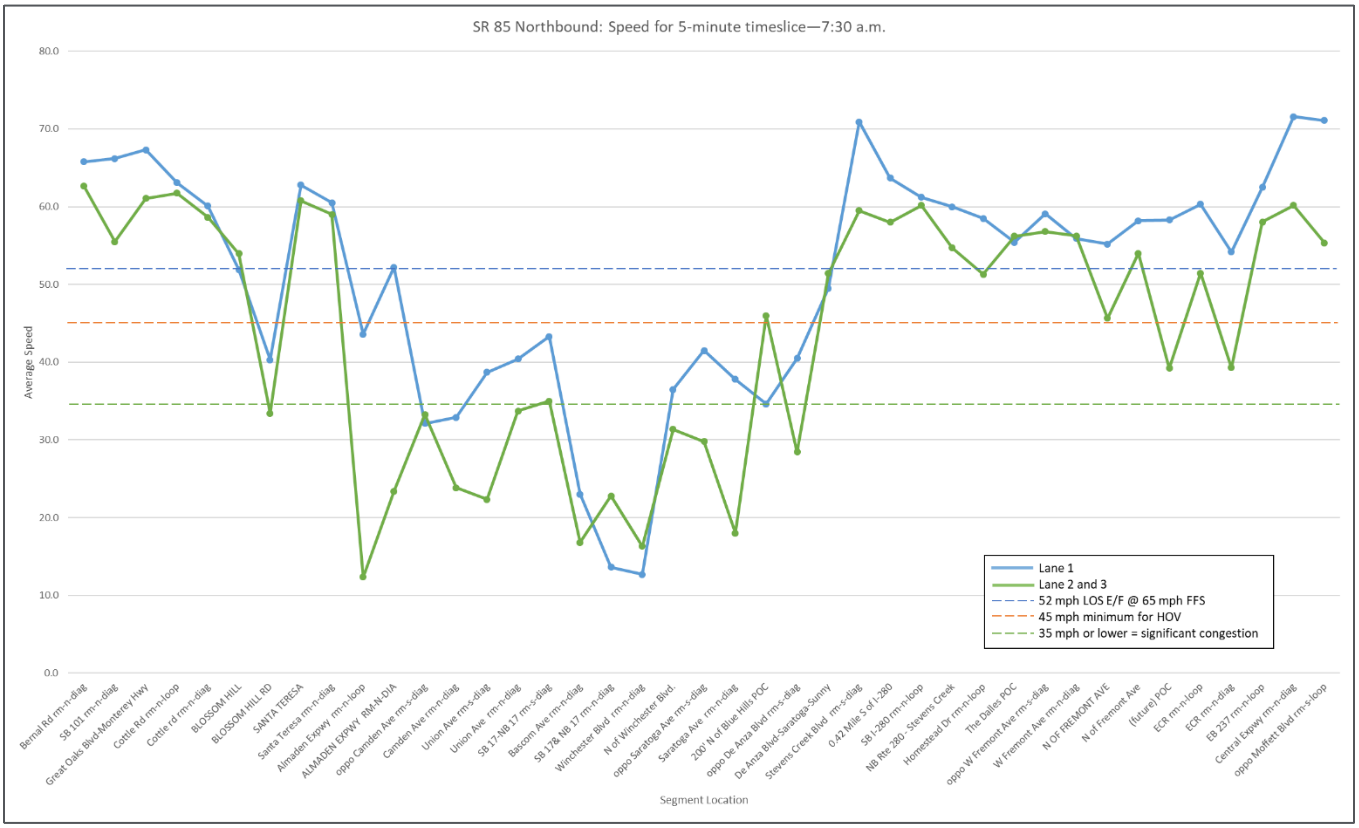
Locations:
❶ Camden Avenue to Union Avenue
❷ Saratoga Avenue to De Anza Boulevard
❸ Fremont Avenue to El Camino Real

Mainline Improvements

- Includes all elements of Alternative 1-2, HOV to Express Lane Conversion
  - Convert existing HOV lane in each direction from Bernal Road, near U.S. 101 in south San Jose to Moffett Boulevard, near U.S. 101 in Mountain View, a distance of 23.2 miles.
  - Provide continuous access to express lane from the adjacent general-purpose lanes.
  - Install toll infrastructure in median to support express lanes.
  - Reconstruct concrete median barrier south of Santa Teresa Boulevard and north of Stelling Road to accommodate toll gantries and dynamic message signs.
  - Widen paved median shoulder to 14 feet in both directions from Santa Teresa Boulevard to South Stelling Road (excepting structures) to provide continuous CHP enforcement area.
  - Widen right-side shoulders to meet Highway Design Manual standards (10 feet). Relocate drainage inlets as needed to the outside edge of shoulder.
  - Install high mast lighting at SR 17 and I-280 interchanges as needed to supplement existing (optional improvement).
- For Alternative 3-5, the median shoulder is assumed to be paved with full depth AC or PCC to provide a 12-foot-wide part-time travel lane and a total shoulder width of 14 feet where space permits (from Santa Teresa Boulevard to South Stelling Road, excepting structures).
- For Alternative 3-6, the right-side shoulder is assumed to be paved with full depth AC or PCC to provide a 12-foot-wide part-time travel lane and a total width of 14 feet where space permits. In many to most cases, widening the right-side shoulders will involve widening the median shoulder with full depth PCC and relocating the lane markings and delineators. This will avoid the need for retaining the side slopes, reconstructing existing retaining walls and/or soundwalls.
- At structures, shoulders used by buses will be a minimum of 11.5 feet wide.

Interchange Improvements

Conversion of the SR 85 interchange at SR 82/El Camino Real from a cloverleaf Type L-10 ramp configuration to a spread diamond Type L-2 ramp configuration is a required improvement for these alternatives.



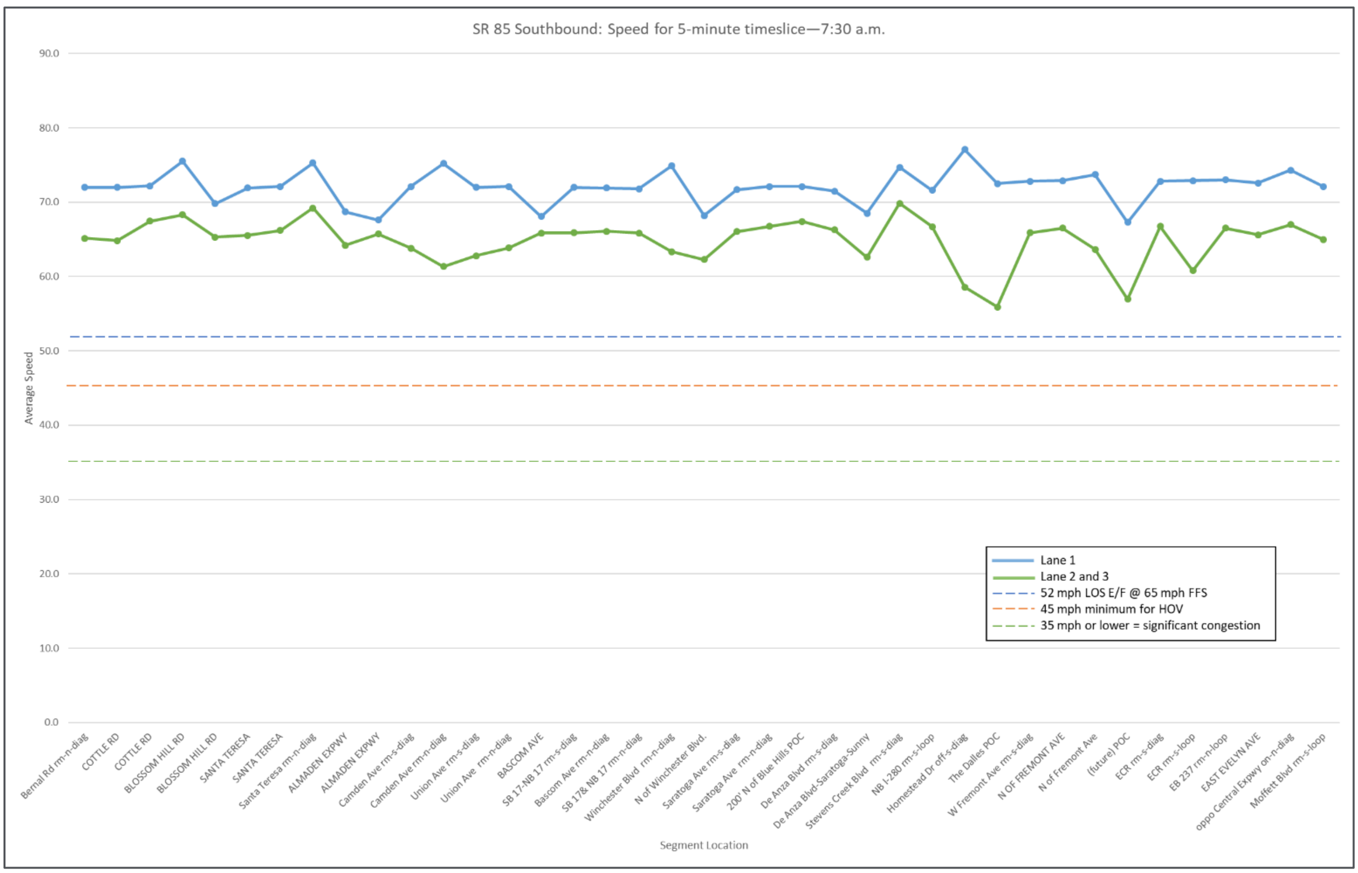
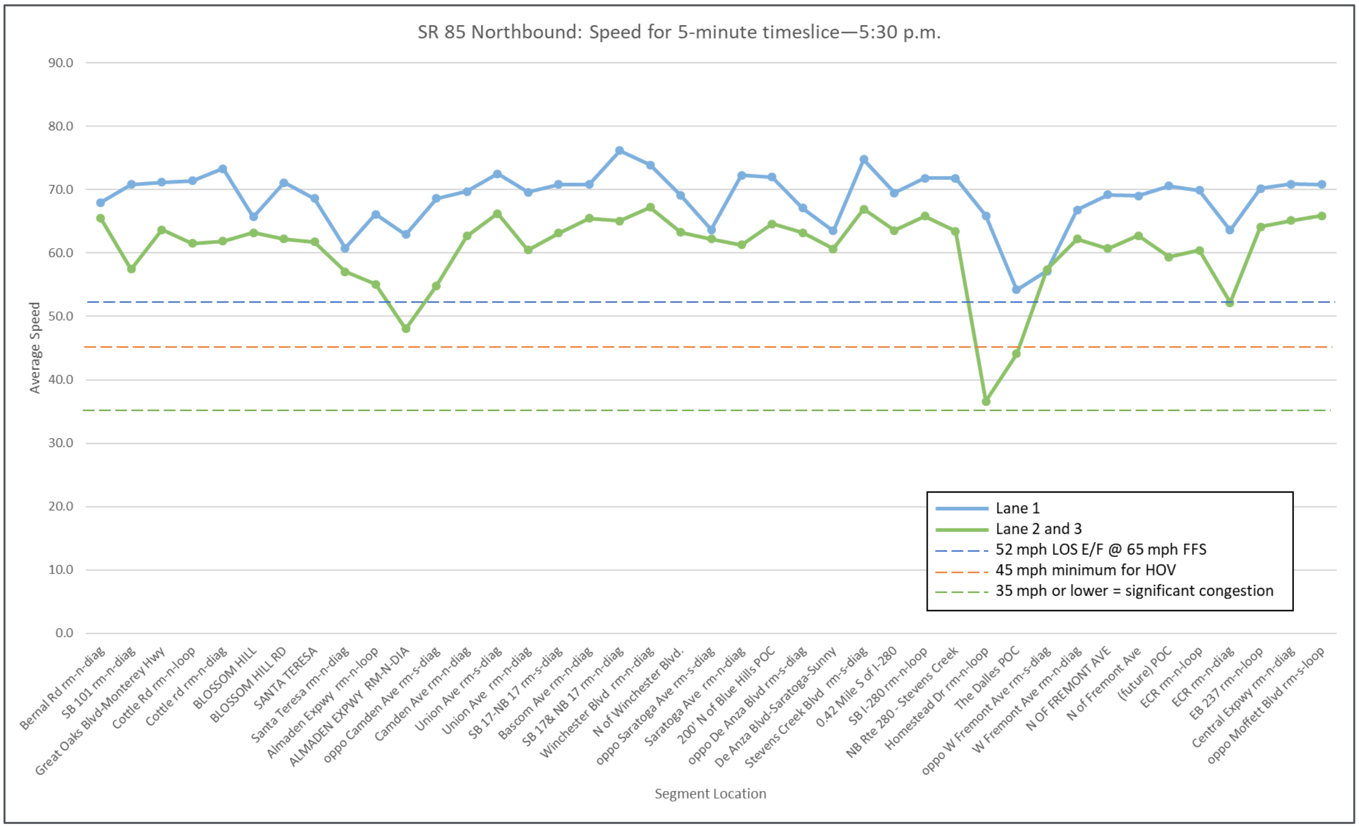


Figure 6 State Route 85 AM Peak Period 5-minute Timeslice



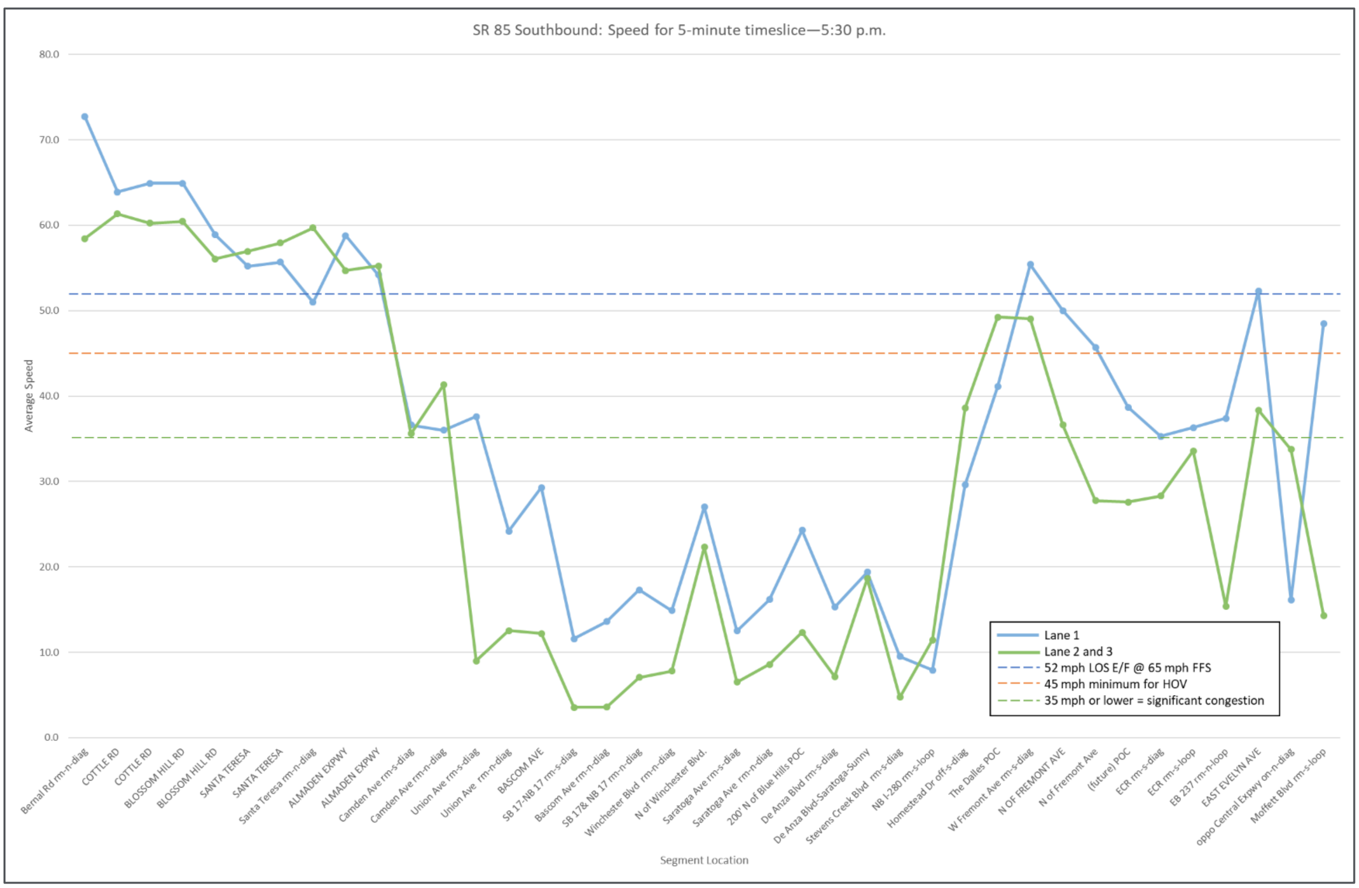


Figure 7 State Route 85 PM Peak Period 5-minute Timeslice

Local Street Improvements

No streets crossing under or over SR 85 would be reconstructed to accommodate the HOV to express lane conversion or bus on shoulder operations. Conversion of the SR 85 interchange at SR 82/El Camino Real from a Type L-10 to a Type L-2 will require reconstruction of the ramp terminal intersections, installation of traffic signals, removal of a portion of the raised median and landscaping, and pavement signing and striping to accommodate dual left-turn lanes to the northbound and southbound on-ramps. No widening of El Camino Real will be required.

Conversion of the HOV lane to an express lane would allow for improved enforcement, a reduction in the proportion of HOV2+ "cheaters," and improved managed use to achieve speeds of 45 mph or higher in the express lane.

The HOV to Express Lane Conversion element of these alternatives would not yield additional vehicle throughput, however. The HOV and general-purpose lanes each accommodate roughly 1,500 vehicles per hour per lane (vphpl) during peak hours in the peak direction. The capacity of the express lane at LOS C is 1,600 vphpl. While the volume of vehicles will likely remain unchanged, the speed of the vehicles using the express lane will likely increase, encouraging more SOV drivers to carpool and/or utilize commuter buses, if available.

With mainline traffic volumes expected to remain unchanged from no build conditions, no impacts to local streets would be expected.

Railroad Involvement

Six (6) railroad crossings over or under SR 85 occur within the project limits.

1. VTA light rail tracks (Guadalupe Corridor) under southbound SR 85 at PM 1.33.
2. VTA light rail tracks (Guadalupe Corridor) under northbound SR 85 at PM 5.27, just west of Santa Teresa Boulevard.
3. VTA light rail track under SR 85 adjacent to Winfred Boulevard at PM 5.59.
4. Union Pacific track over SR 85 adjacent to Winchester Boulevard at PM 10.98.
5. Caltrain Peninsula Commuter tracks under SR 85 adjacent to Evelyn Avenue at PM 22.63.
6. VTA light rail tracks under SR 85 adjacent to Central Expressway at PM 22.63.

None of these crossings would require bridge work to accommodate the proposed HOV to express lane conversion or bus on shoulder operations.

Structure Improvements

Including the Bernal Road and Moffett Boulevard undercrossings at the two ends of the corridor, there are 63 structures which could be affected by the build alternatives. One of these structures at Saratoga Avenue would require widening to accommodate a median station as a result of implementing bus on shoulder operations with Alternative 3-5. The replacement of embankments with retaining walls to accommodate a median station at Stevens Creek Boulevard would also be required for Alternative 3-5.

Drainage Improvements

Storm runoff is collected by inlets located along the outside edge of the right-side shoulders and in the center of the median. North of I-280, the right side-shoulders range in width from 4 to 10 feet. To meet the HDM standards for shoulder width, the AC paved shoulders would need to be widened, generally to 10 feet, and drainage inlets relocated to the outside edge of the shoulder. In the case of Alternative 3-6, the right-side shoulder will need to be repaved with full depth AC or PCC and widened to 14 feet, except at structures.

Utilities

The project area contains overhead electric and communications lines and underground electric, gas, sanitary sewer, water, reclaimed water, communications, and fiber optic lines. Utility providers in the project area are listed below by category.

- Gas and electric—PG&E
- Communications—AT&T, Comcast, Level 3, Verizon, Nextlink, and MCI
- Water—San Jose Water Company, Santa Clara Valley Water District, California Water Service Company, Great Oaks Water Company, City of Sunnyvale Water Division, and City of Mountain View Water Division
- Sanitary—City of San Jose, West Valley Sanitation District, City of Cupertino, and City of Mountain View.

The project would not require utility relocations. Utility impacts would be limited to the extension of casings (protective pipes or channels) for existing underground facilities whose casings do not extend through the right-of-way. All other existing utilities would be protected in place.

Express Lane Begin/End Transitions

The SR 85 express lanes would extend from U.S. 101 in south San Jose to U.S. 101 in Mountain View. The existing HOV direct-connector ramps at both ends of SR 85 would be converted to express lane connectors.

Bus on Shoulder Limits of Operation

Bus on shoulder operations will extend from Almaden Expressway to Moffett Boulevard.

Bus on Shoulder Access

Continuous access between the adjacent travel lanes and the shoulder is assumed.

Express Lane Buffer

No buffer is proposed between the express lane and the adjacent general-purpose lanes. A single, white-striped lane line would separate the lanes and continuous access between the lanes would be permitted.

California Highway Patrol Observation/Enforcement Areas and Emergency Refuge Areas

State-of-the-art toll infrastructure will be installed to reduce the need for CHP observation areas given the right-of-way constraints north of South Stelling Road.

Pending future agreements, it is anticipated that the CHP will be contracted to provide toll enforcement including express lane eligibility violations.

Inside median shoulders will be widened south of Stelling Road to Santa Teresa Boulevard to 14 feet in both directions to provide a continuous CHP enforcement area. In the case of Alternative 3-5, the median shoulder will need to be repaved with full depth AC or PCC. At structures such as bridges and undercrossings, existing shoulders will be maintained and structures will not be widened for this purpose.

Emergency refuge areas along the outside shoulders would be unaffected by the part-time shoulder operations.

Toll Infrastructure

The express lane facility would incorporate various toll infrastructure including toll gantries with transponder readers and high-speed digital cameras (49), directional and informational signage, dynamic message signs to communicate real-time toll rates to drivers (25), complete closed circuit television coverage of the entire express lanes corridor, and fiber optics linking the infrastructure to a centralized toll operations office. Toll equipment would meet Title 21 specification and national protocol, as well as interoperability with other toll facilities in California.

The Metropolitan Transportation Commission has prepared a simple fact sheet to further explain toll infrastructure components. This fact sheet is reproduced in whole as Exhibit 1A along with photographs of express lane construction work along I-680 in Walnut Creek and Concord.

The Operations Center mentioned in Exhibit 1A is assumed to be funded by a separate project and not a component of cost for the Route 85 Transit Guideway Project.

Tolling Policies

A *Concept of Operations Report* will be prepared to address various tolling policies under which the express lanes will be operated. This report will provide preliminary information regarding the type of tolling, toll exemption or rate reduction for HOVs, maximum target volume to maintain speed and minimize congestion in the express lanes, method for determining toll amount, methods for toll collection and toll enforcement, penalty rates for toll violations, and provision of supplemental service patrol. The items listed below represent key policies which have been assumed for the SR 85 express lanes; however, they are subject to change pending further studies.

- The express lanes are anticipated to operate part-time during peak hours, Monday through Friday.
- It is anticipated that HOVs with two or more occupants (HOV2+) will be allowed to use the express lanes toll-free. Single-occupancy vehicles will be allowed to use the express lanes for a toll.
- Motorcycles will be allowed to travel in the express lanes toll-free and are not required to have a transponder.
- Exempted vehicles including emergency response vehicles, highway maintenance vehicles serving the express lanes facility, and CHP vehicles assigned to patrol the express lane facility will have toll-free access to the express lanes, by registering these vehicles as toll exempt in the License Plate Recognition system.
- Clean air vehicles with valid clean air vehicle decals will be able to use the express lanes for a toll discount, assumed to 15 percent.
- Tolling is anticipated to be dynamic pricing based on real-time traffic levels to ensure peak period speed of no less than 45 mph.

Additional studies will be performed to establish the operating policies and business rules and determine pricing structures and toll violation rates.

Toll Operations and Maintenance

The institutional arrangements for operation and maintenance of the express lanes will be consistent with those implemented by VTA for the express lane system in Santa Clara County.

Express Lanes Incident Responses

At this time, it is anticipated that Freeway Service Patrol will be contracted to provide incident response for the express lanes similar to the current arrangement in the HOV and general-purpose lanes. It is currently planned to have dedicated roving Freeway Service Patrol patrolling the express lanes during hours of peak congestion, to respond to incidents that might affect the express lanes including clearing of debris, towing disabled vehicles, and minor auto repairs.

Conceptual Engineering Plans

Geometric cross sections for mainline segments and segments passing structures with restrictive widths are provided in Attachment 2.

Alignment plans for bus-on-shoulder alternatives are not provided in Attachment 3, except for the median crossover station option at El Camino Real for Alternative 3-5.

Right-of-Way Requirements

South of I-280, in segments 1 and 2 of the corridor, the project would be constructed entirely within the existing right-of-way.

North of I-280, in segment 3 of the corridor, the project would also be constructed within the existing right-of-way and the pedestrian overcrossing at The Dalles (PM 19.39), would not need to be relocated.

Bus on Shoulder Stations

Stations are proposed along the Route 85 Transit Guideway at the following locations.

- Ohlone-Chynoweth Light Rail Station at Santa Teresa Boulevard

- Bascom Avenue
- Saratoga Avenue
- Stevens Creek Boulevard
- SR 82/El Camino Real

These station locations are preliminary and representative of different right-of-way availability, mainline and median conditions, and interchange configurations. The locations of the stations proposed for proof of concept evaluation were previously illustrated on Figure 5.

The conceptual design options for these stations are the same or similar to those proposed for the Scenario C, Freeway Widening with Transit Stations alternatives and are presented in the following section of this document.

Stations

Transit stations are proposed for the transit lane alternatives (3-1, 3-2, 3-3, and 3-4) and the bus on shoulder alternatives (3-3, 3-5, and 3-6). Alternative 3-3 is a hybrid alternative which could include dedicated transit lanes south of I-280 and bus on shoulder use north of I-280.

In all cases, the stations are proposed for the following locations for the purpose of this alternatives analysis investigation.

- Ohlone-Chynoweth Light Rail Station at Santa Teresa Boulevard
- Bascom Avenue
- Saratoga Avenue
- Stevens Creek Boulevard
- El Camino Real

Alternatives featuring left-side running in Lane 1 or the shoulder adjacent to lane 1 situate the station platform(s) in the median. Alternatives featuring right-side running in lane 4 or the shoulder adjacent to lane 3 situate the station platforms to the right of the transit lane or shoulder.

Right-side running alternatives could additionally or alternatively provide bus stops along on-ramps or off-ramps near the ramp terminal intersections with cross streets. The flexible routing capabilities of bus service also allow these transit vehicles to deviate from the freeway corridor altogether, to access nearby (but off-line) transit centers.

Design options are presented below for each of the five stations proposed to support the SR 85 Transit Guideway service.

The Concept of Operations Report, prepared by CDM Smith, provides additional insights regarding which types of transit services are most compatible with the different types of transit stations that are described below.

OHLONE-CHYNOWETH

State Route 85 buses serving the Ohlone-Chynoweth LRT is one example of an off-line transit station. All of the alternatives addressed by this assessment of engineering features assume that transit service provided by the Valley Transportation Authority will begin/end or stop off-line at this existing station. Access to SR 85 will be afforded by the on-ramp to northbound SR 85 and the off-ramp from southbound SR 85 at Santa Teresa Boulevard.

The Ohlone-Chynoweth station at Santa Teresa Boulevard serves the Guadalupe Corridor LRT line, the Almaden LRT spur line, and VTA bus routes 13 and 102. The adjacent park-and-ride lots provide 549 parking spaces. Figure 8 illustrates the bus route ingress and egress to this station from and returning to SR 85.

No construction is assumed at the Ohlone-Chynoweth LRT station to accommodate SR 85 bus service other than bus stop signage and information displays. The park-and-ride lots could become oversubscribed by the addition of SR 85 bus service, however. Construction of a parking structure or additional right-of-way acquisition for surface parking is not included in the scope of project definition.

No other design options have been investigated for this location.

BASCOM AVENUE

South Bascom Avenue is the next proposed station location, 5.0 miles north of the Ohlone-Chynoweth Station. The Good Samaritan Hospital complex is immediately adjacent along with the Los Gatos “North 40” specific plan development parcels. The freeway median is 66 to 68 feet wide at this location including the paved shoulders adjacent to the mainline travel lanes. South Bascom Avenue crosses over SR 85, and the arterial street’s name changes to Los Gatos Boulevard south of the freeway. VTA bus routes 49 and 61 operate along this road with Route 49 stopping both north and south of SR 85.

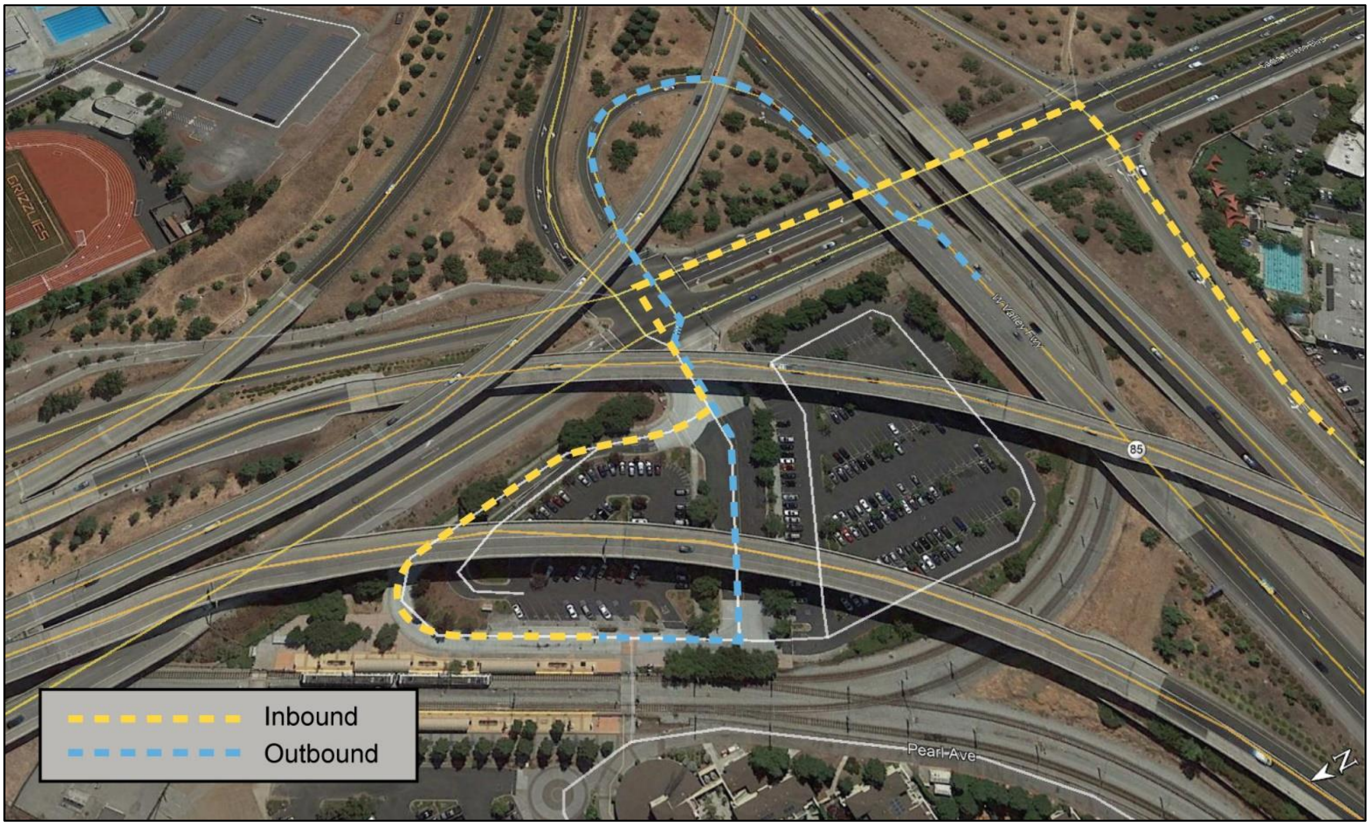


Figure 8 Bus Routing between Ohlone-Chynoweth Station and State Route 85

Station design options for the Bascom Avenue location include:

- Median crossover platform
- Median split platforms
- Side platforms
- On-ramp/off-ramp bus stops.

The median crossover platform option is discussed below. The other options will be discussed for the Saratoga Avenue Station and the Stevens Creek Boulevard station.

The **median crossover platform** option is modeled on the Minneapolis-Saint Paul Twin Cities Metro station on I-35W at 46th Street. The station is located between the northbound and southbound lanes of I-35W, which allows buses to pick up and drop off customers without leaving the freeway. Customers can board express or BRT buses on the freeway level or transfer to local buses on the 46th Street bridge, which crosses over I-35W. There are two stairway and elevator towers, one on each side of 46th Street, that provide movement between the upper-level bridge and lower-level freeway.

Freeway buses crossover from one side of the median platform to the other to permit boarding from the right side of the bus. Gates and traffic signals control movements of buses passing through the crossover maneuver.

Photographs of the I-35W/46th Street Station are provided as Exhibit 4. An aerial photograph of a median crossover platform station at this location is presented as Figure 9.

Geometric cross sections for several of the design options for a transit station at Bascom Avenue are presented as Figure 10.

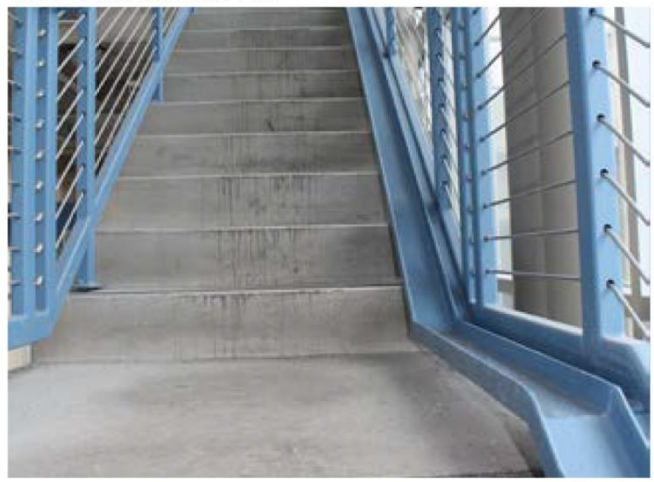
Exhibit 4. I-35W/46th Street Bus Rapid Transit Station in Minneapolis, Minnesota

46th: Existing BRT Station

46th: Entrance to BRT Station

46th: Lower level of BRT Station

46th: Stairs and Bike Rail



46th: Center Platform at BRT Station

46th: Real-time Information

Source: *Orange Line Bus Rapid Transit Existing Conditions Report,* Metro Transit, December 2013

Figure 9 Aerial View of Median Crossover Platform Station at I-35W/46th Street

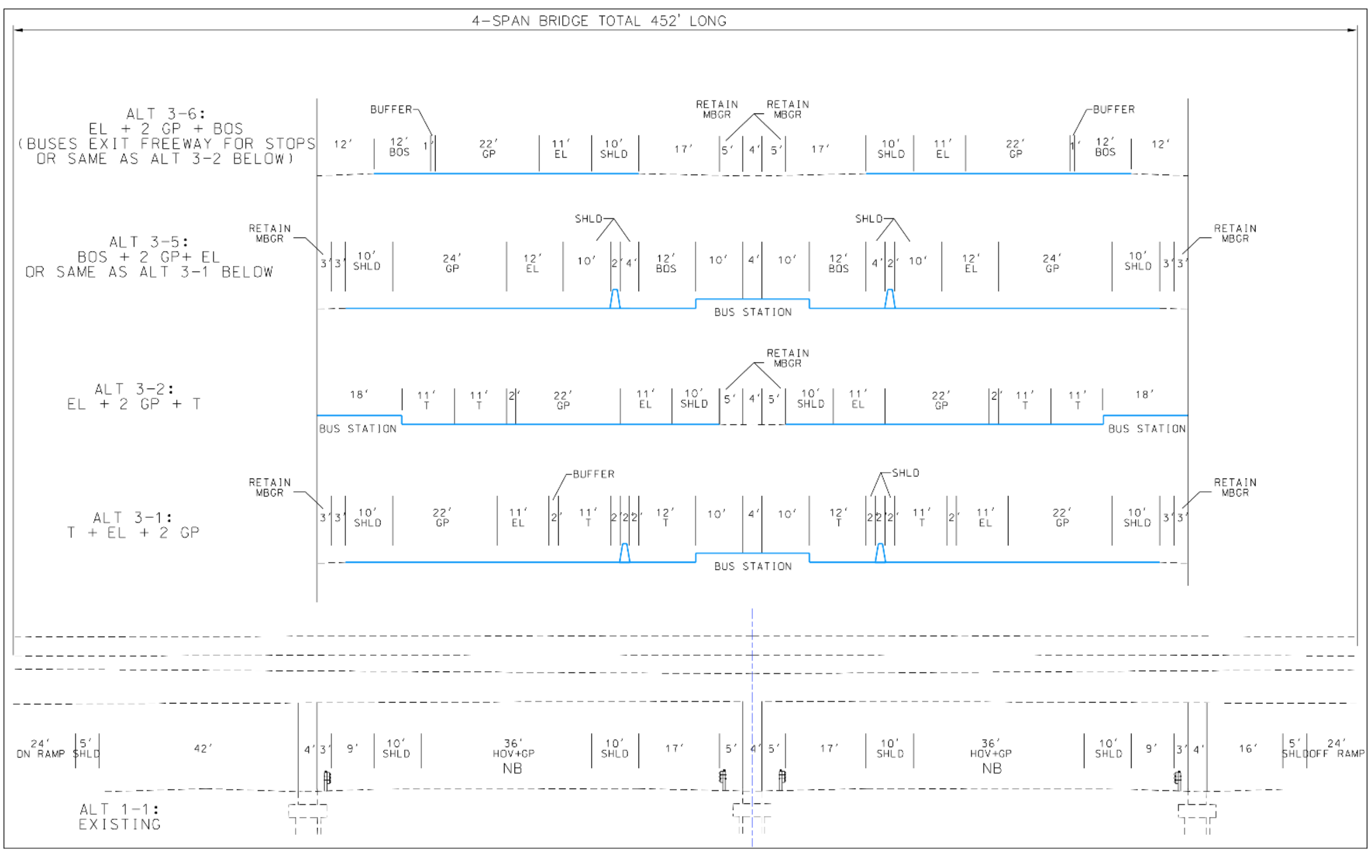


Figure 10 Bascom Avenue Transit Station Geometric Cross Sections

SARATOGA AVENUE

Saratoga Avenue is the next proposed station location, situated 3.5 miles north of South Bascom Avenue. Saratoga Avenue crosses under SR 85 with two through lanes, dual left-turn lanes, a bicycle lane and sidewalk in each direction. The twin SR 85 bridges crossing Saratoga Avenue are each 190 feet long on two spans and are each 60 feet wide. The bridges are box girders in which the main beams comprise girders in the shape of a hollow box composed of prestressed concrete.

The twin bridges are separated by a gap that is 22 feet wide. The gap would be filled by constructing a new box girder bridge between the two existing bridges. Station design options for the Saratoga Avenue location include:

- Median crossover platform
- Median split platforms
- Side platforms
- On-ramp/off-ramp bus stops.

A **median crossover platform for part-time shoulder** use is discussed below.

Exhibit 4 and Figure 9, presented previously, illustrate a median crossover platform designed for two-way, all-day use. Separate lanes for buses which do not stop at the station lay astride the station area in Lane 1 of the four travel lanes, in both directions.

A variation of the above would address the needs of Alternative 3-5, Bus on Median Shoulder. With part-time shoulder use, buses would utilize the shoulder adjacent to Lane 1 (the express lane) for northbound travel during the morning peak hours and southbound travel during the afternoon and early evening peak hours. During off-peak hours and in the off-peak direction of travel, buses would use express lanes or general-purpose lanes which are uncongested.

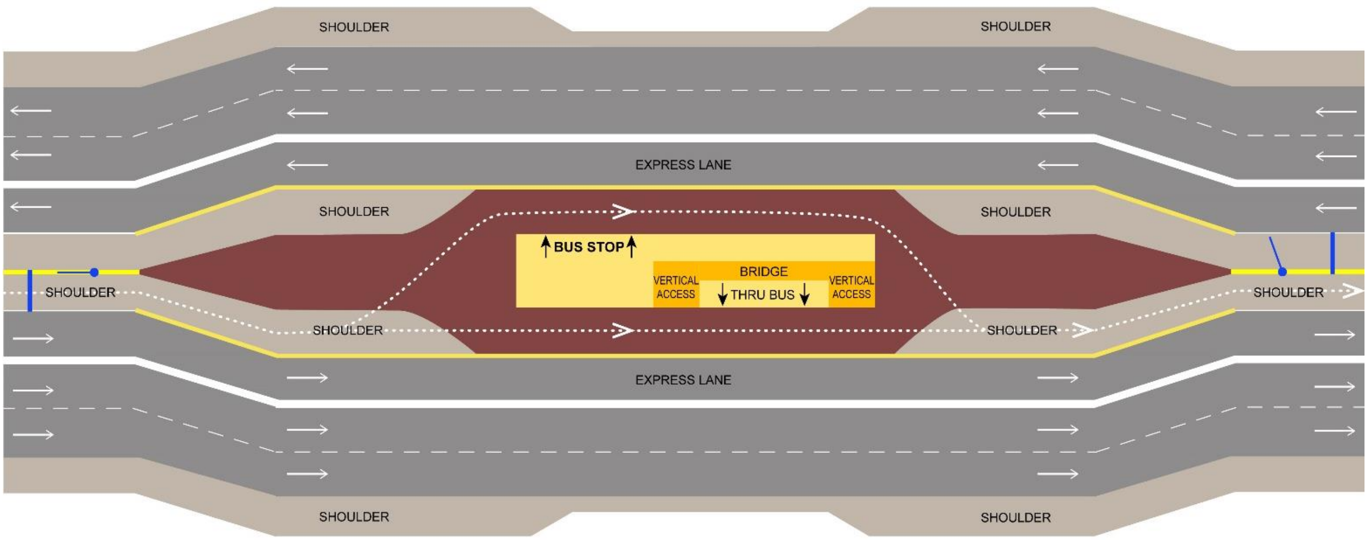
Figure 11 illustrates the movement of buses passing through a median crossover platform station being utilized for part-time shoulder use. The Santa Clara Valley Transportation Authority buses stopping at the station would cross from the right side of the platform to the left side of the platform so that customers can board from the right side of the buses.

Figure 11 Aerial View of Median Crossover Platform Station for Part-time Shoulder Use at I-35W/46th Street

Commuter shuttle buses which do not stop at the station would continue straight along the right side of the platform without stopping. Figure 12 illustrates the directionality of the bus flows during the AM and PM peak periods.

During off-peak times and/or directions, VTA buses would utilize bus stops located along the off-ramps or on-ramps at Saratoga Avenue.

AM Peak Direction Only—Reversible



PM Peak Direction Only—Reversible

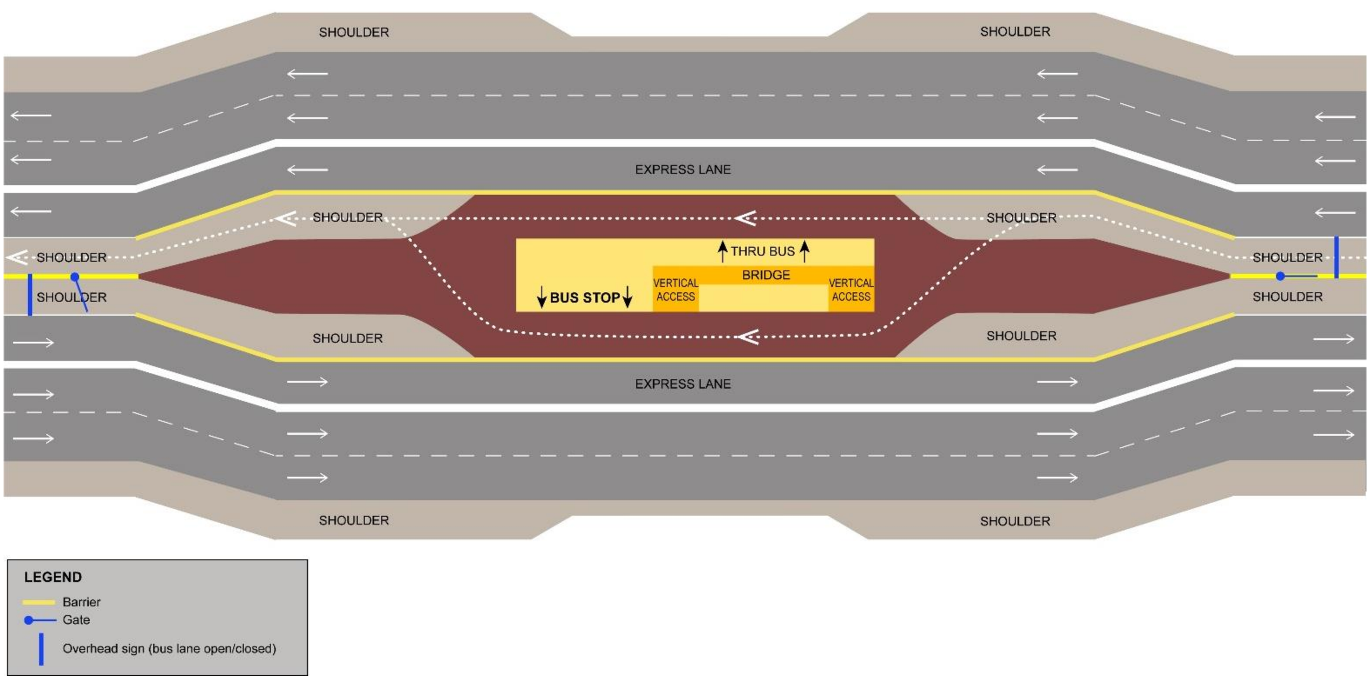


Figure 12 Conceptual View of Median Crossover Platform Station for Part-time Shoulder Use during Peak Periods

Figure 13 illustrates a variety of geometric cross sections for a potential transit station at Saratoga Avenue.

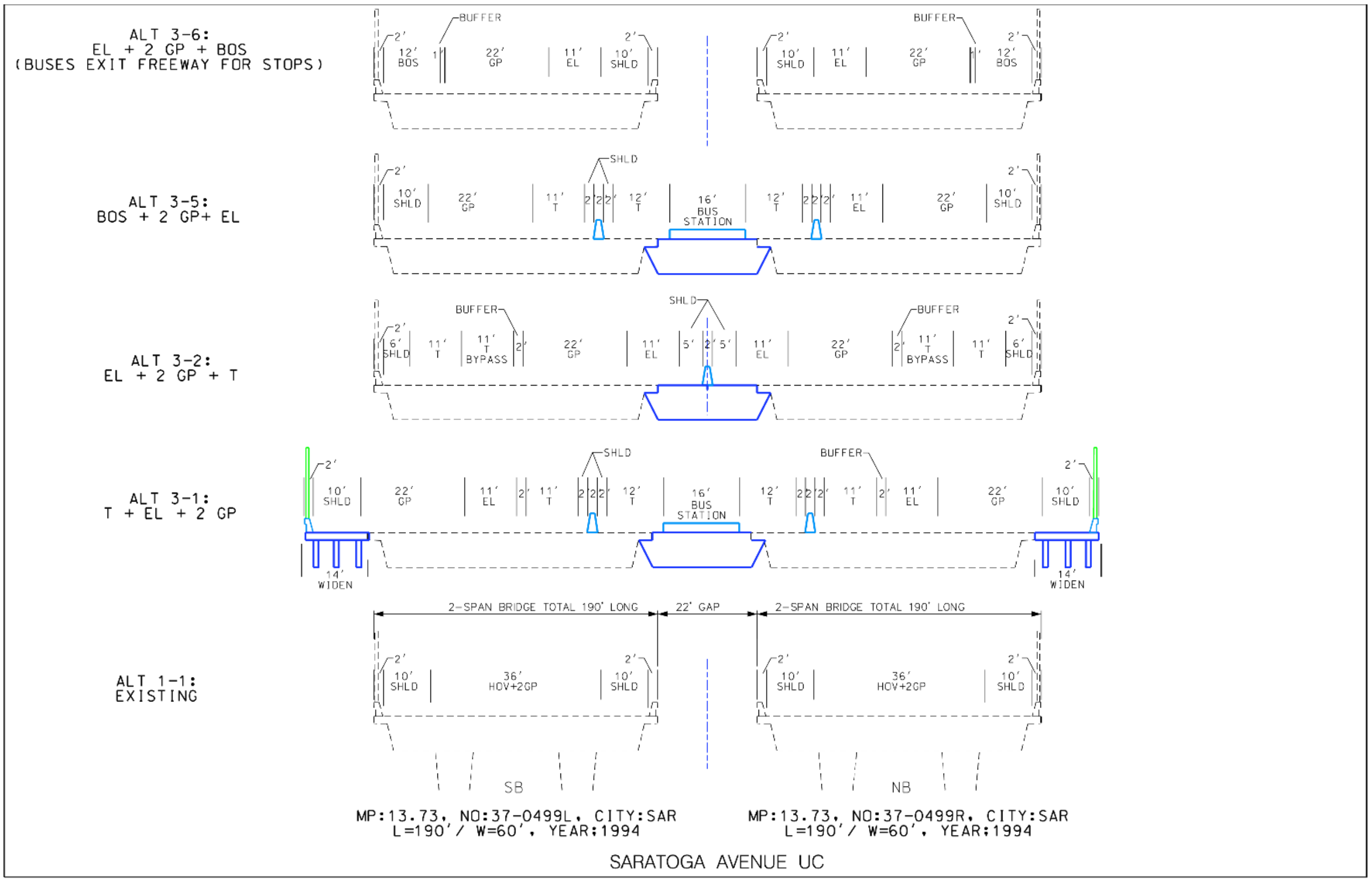


Figure 13 Saratoga Avenue Transit Station Geometric Cross Sections

STEVENS CREEK BOULEVARD

Whereas the median including inside shoulders is 44 feet wide at Saratoga Avenue, it begins to narrow north of South Stelling Road opposite Kenmore Court (PM 16.85). At Stevens Creek Boulevard, the median is approximately 24 feet wide including the paved shoulders and Type 60 concrete barrier. Four travel lanes lay astride the median in both directions.

Figure 14 illustrates a variety of cross sections for accommodating a bus station at this location. These include:

- Median crossover platform
- Side platforms
- On-ramp/off-ramp bus stops.

Figure 15 illustrates potential cross sections for a median split platform station option that is discussed below.

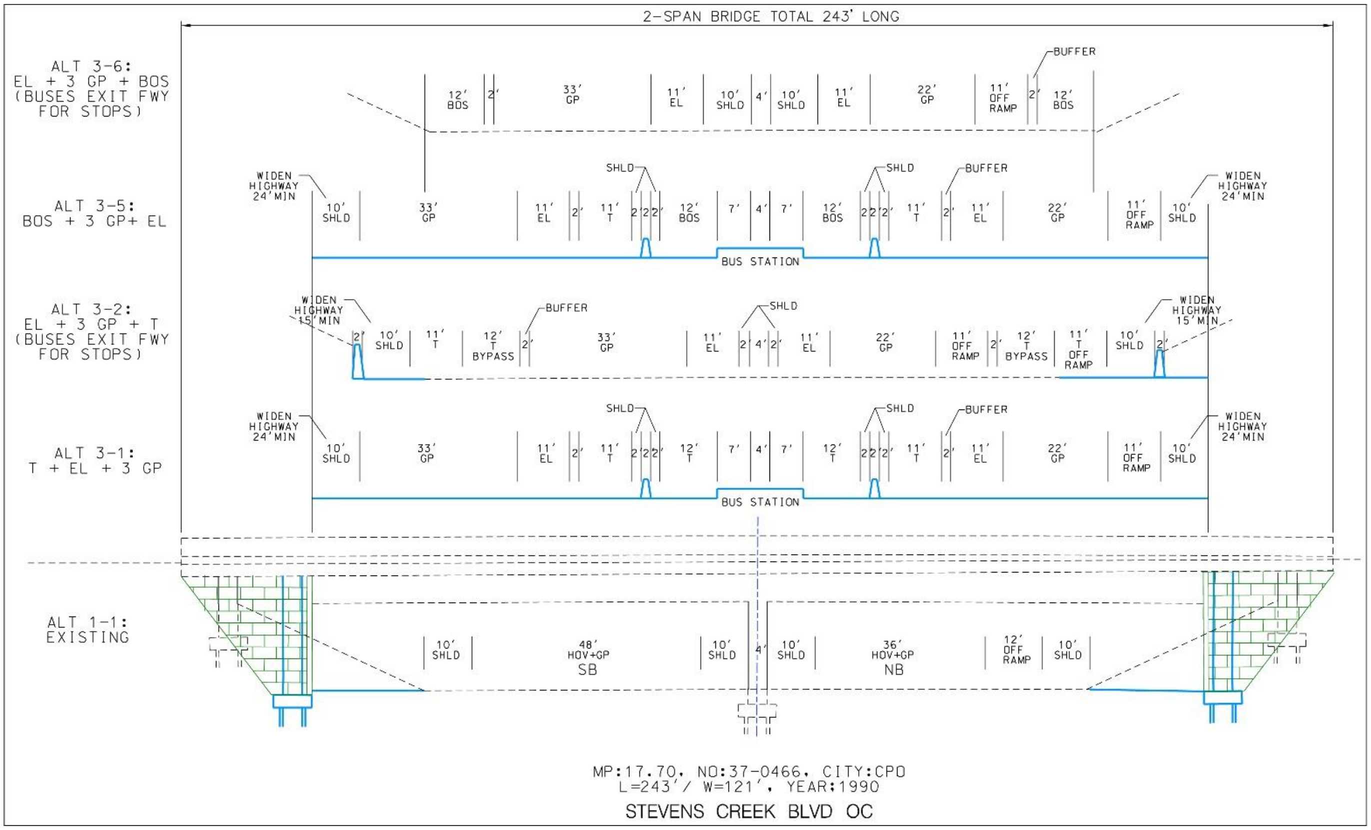


Figure 14 Stevens Creek Boulevard Transit Station Geometric Cross Sections

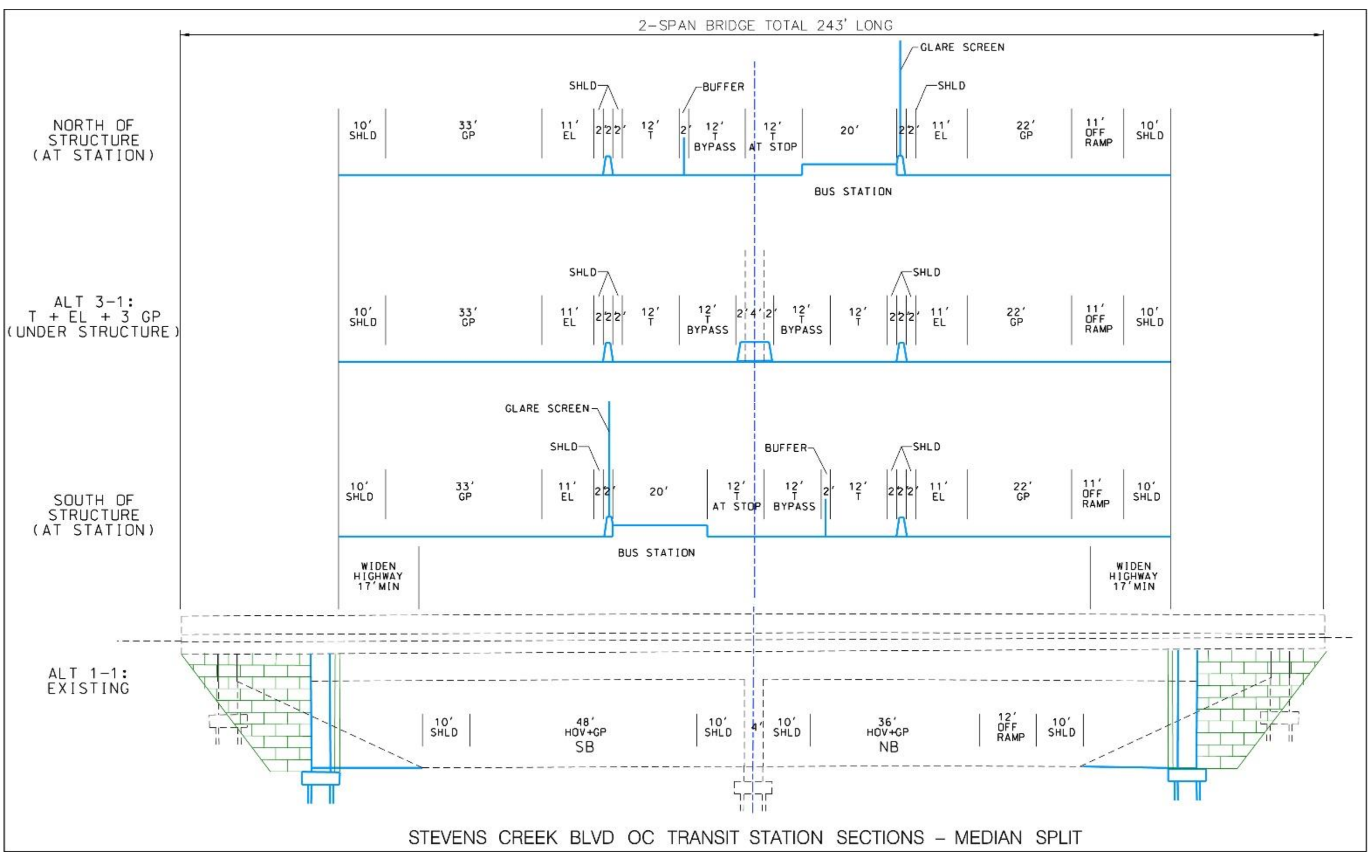


Figure 15 Median Split Platform Geometric Cross Sections

The **median split platforms option** is modeled on the San Diego Metropolitan Transit System (MTS) Bus Rapid Transit Stations on I-15 at University Avenue and at El Cajon Boulevard. These stations are approximately 0.4 mile apart. Both stations feature a bus plaza serving local buses at street level and freeway level split boarding platforms for passengers transferring to/from bus rapid transit vehicles. Each platform provides a stairway and elevator tower for movement between the upper-level bridge and lower-level freeway.

Photographs of these stations are provided as Exhibit 5. An aerial photograph of the split platform station at this location is presented as Figure 16.

Exhibit 5 San Diego MTS Bus Rapid Transit Stations: I-15 at University Avenue and at El Cajon Boulevard

Source: *How to Use Centerline Rapid Transit Stations,* San Diego MTS, March 12, 2018

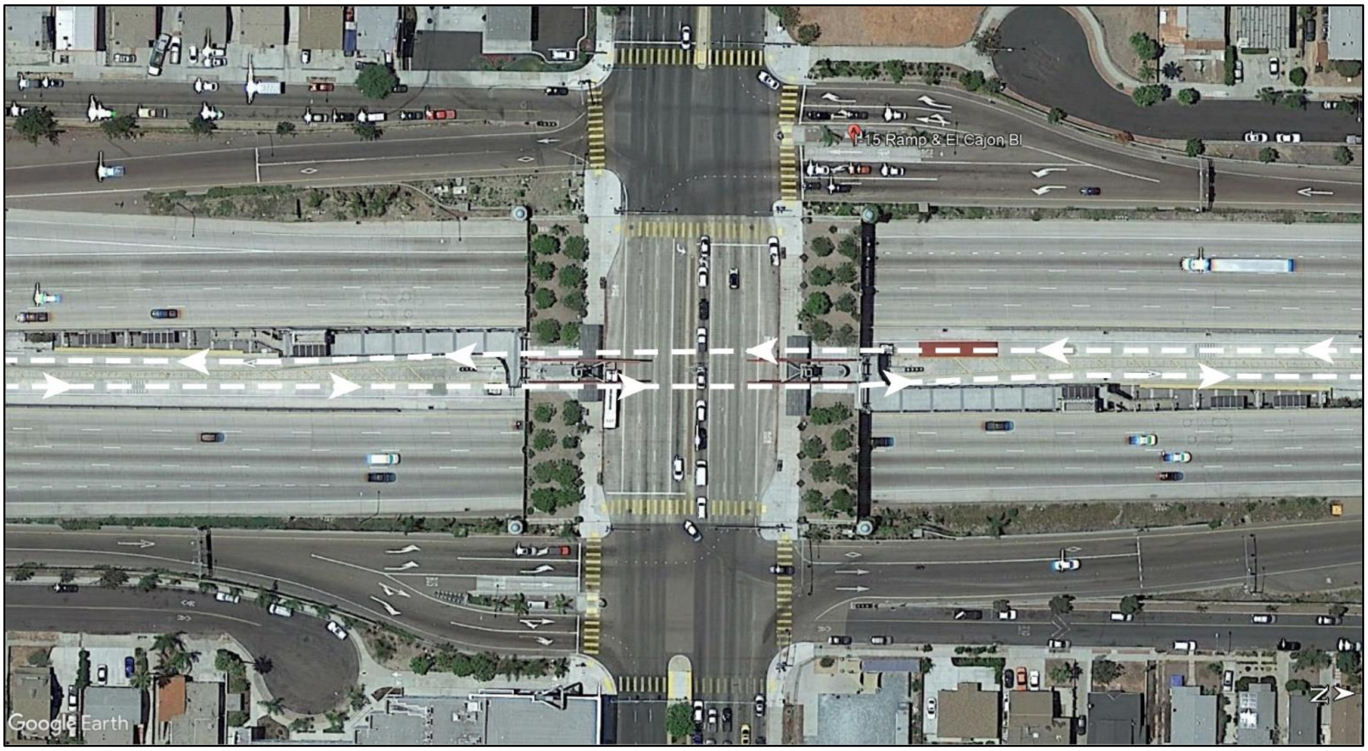


Figure 16 Aerial View of Split Platform Station at I-15 and El Cajon Boulevard

State Route 85 freeway buses will be able to stop at the far side platform or, in the case of commuter shuttles, use a bypass lane to avoid VTA buses which stop to pick up or discharge riders. In both cases, the speed limit passing through the station will be 25 mph due to the shift of the entering vs exiting lane alignments.

The width of the median required to accommodate this station design option is 60 feet as indicated on Figure 15. The width of the median required to accommodate the crossover median station, including the two transit lanes which bypass the station altogether, is 72 feet as depicted on Figure 14. The tradeoff between the two designs is the speed afforded to the commuter shuttle buses.

In both cases, the northbound and southbound freeway travel lanes will need to be spread to accommodate the transit station, as the median is only 24 feet wide at this location.

EL CAMINO REAL (SR 82)

El Camino Real is located four miles north of Stevens Creek Boulevard along SR 85. This state route crosses above SR 85 as a six-lane principal arterial. A four-quadrant cloverleaf (Type L-10) interchange connects the two roadways.

The median along SR 85 is 20 feet wide passing under SR 85, measured from the inside edges of the mainline PCC pavement. The cloverleaf ramps limit the width of the outside shoulders to six feet. To provide adequate width for a median station, the Type L-10 interchange will need to be reconfigured as a Type L-2 spread diamond interchange. The right side running transit lane (Alternative 3-2) would also require this same reconfiguration of the interchange.

Station design options for El Camino Real include:

- Median overpass platforms
- Median crossover platform
- Median split platforms
- Side platforms
- On-ramp/off-ramp bus stops.

These options are discussed below.

A **median overpass station** design could accompany Alternative 3-1, Long Transit Lane (Median Adjacent Lane). As envisioned for El Camino Real, northbound and southbound SR 85 would each provide a transit lane occupying the number 1 lane position, an express lane as the number 2 lane, and two general purpose lanes in the numbers 3 and 4 positions. Between the two transit lanes, a one-way reversible ramp would be constructed between the freeway median and the El Camino Real bridge crossing over SR 85. Far side bus stop platforms would be constructed at the top of the ramps adjacent to El Camino Real. The bus stop boarding platforms would cantilever over the transit lanes below. A traffic signal would be installed along El Camino Real where the VTA buses cross, northbound in the morning and southbound in the afternoon/early evening. The fourth lane (per direction) which currently exists on the bridge connecting the cloverleaf ramps would be repurposed as a bus stopping lane for VTA buses operating along El Camino Real (SR 82). The ramps up and down to the overcrossing bridge would each be 24 feet wide and approximately 500 feet long. During off-peak hours and off-peak directions, a second set of bus stops would be constructed at the freeway level, connected to El Camino Real above by stairs and an elevator tower.

Figure 17 presents a partial alignment plan for this station option paired with Alternative 3-1. An expanded view of the freeway widening needed to accommodate this design option can be viewed on sheets 8 through 10 of the portion of Attachment 3 illustrating the alignment plans for Alternative 3-1. Figure 18 provides an aerial view of a median overpass station constructed along I-405 at NE 128th Street in the Seattle metropolitan area. The I-405 example provides two-way ramps as more space is available compared with SR 85 at El Camino Real.

An alignment plan for a **median crossover station** is presented on Figure 19. This design option is appropriate for Alternative 3-5, Long Shoulder (Median) whereby VTA and commuter buses pass through the station during peak hours in the peak direction of travel. During off-peak hours and off-peak direction of travel, VTA buses stop at side platforms located at the freeway level. All platforms are connected to El Camino Real above via stairs and elevator towers located on both the north and south sides of the arterial street.

A **median split platform station** alignment plan is illustrated on Figure 20. All buses (VTA and commuter shuttles) pass through the station. Due to the shift in travel lane alignment between the south and north side of the bridge, speeds are limited to 25 mph. A traffic signal midblock would be installed along El Camino Real to allow bus passengers to cross the arterial as needed to board eastbound or westbound local buses.

Conceptual plans are provided at the end of the alignment plans for Alternative 3-5 or 3-1, respectively, for deploying these two design options at El Camino Real.

Alternatives 3-2, Long Transit Lane (Right-side Lane) and 3-6, Long Shoulder (Right-side) will utilize the number 4 outside right lane or the reconstructed and widened right-side shoulder adjacent to lane number 3. In either case, **side platforms** would be constructed at the freeway level with lanes for stopping to the right of the transit lane (Alternative 3-2) or shoulder (Alternative 3-6), respectively. An alignment plan displaying this side platform station configuration is presented as Figure 21. A more complete set of alignment plans for Alternative 3-2 is provided in Attachment 3, which additionally illustrate side platform stations at Stevens Creek Boulevard (sheet 22) and both Saratoga Avenue and Bascom Avenue (following sheet 29). Figure 22 provides an example of a side platform station along the I-10 express lanes serving the California State University, Los Angeles campus.

Utilization of **on-ramp or off-ramp bus stops** has been mentioned previously as a station design option for Bascom Avenue, Saratoga Avenue, and Stevens Creek Boulevard, for pairing typically with Alternative 3-6, Bus on Right-side Shoulder. At El Camino Real, a southbound off-ramp is typically missing from the Type L-2 spread diamond interchange plans proposed for this location, to replace the Type L-10 cloverleaf configuration which exists currently. For the right-side bus on shoulder alternative, it may be possible to include an auxiliary lane from the westbound SR 237 on-ramp to a new diagonal off-ramp to El Camino Real subject to further investigation and Caltrans approval of design exceptions. Inclusion of a southbound diagonal off-ramp would allow this on-ramp/off-ramp bus stop option to be worthy of consideration.

Figure 23 illustrates a prototypical freeway ramp bus stop proposed for implementation in Minneapolis/Saint Paul.

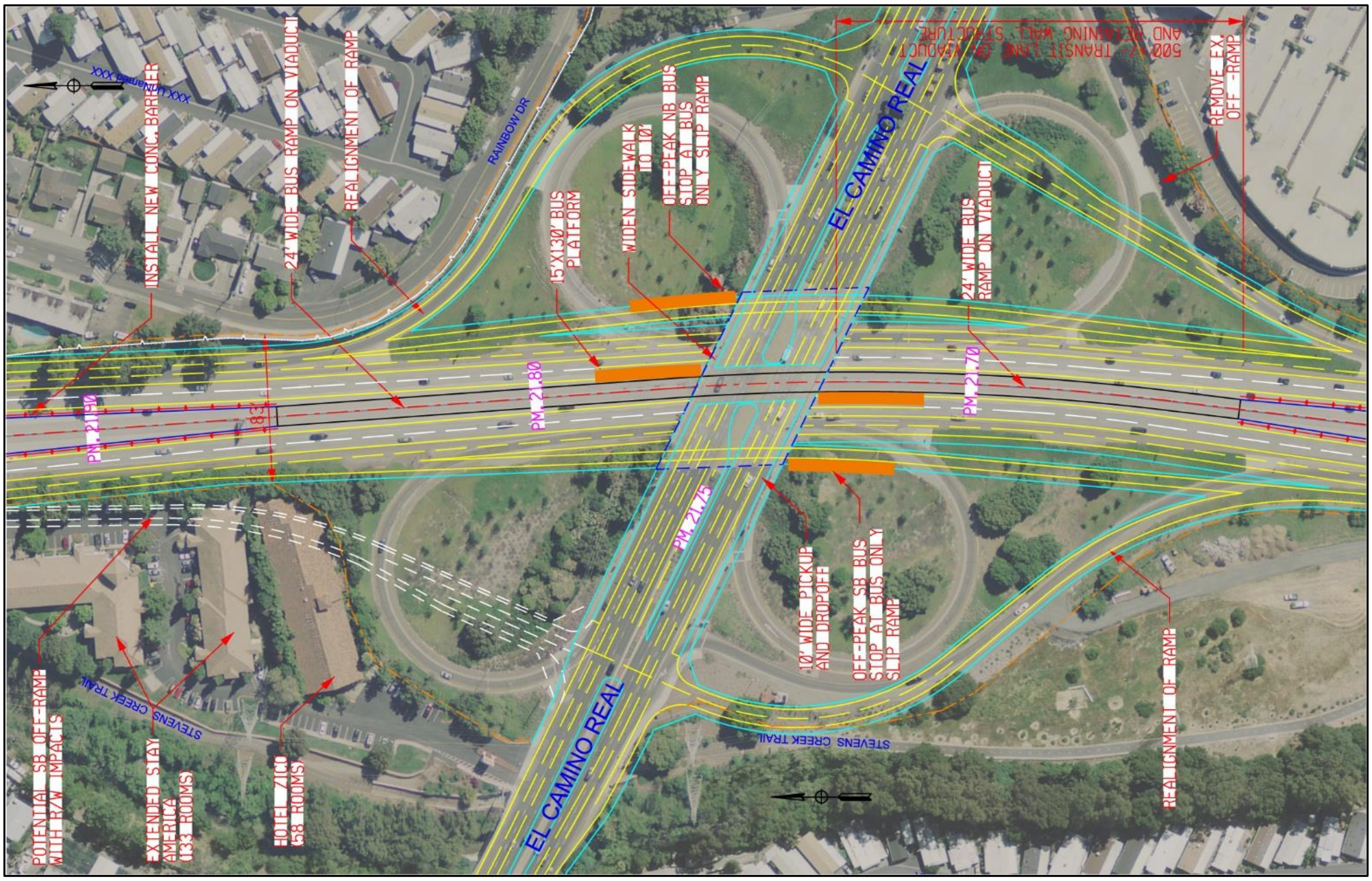


Figure 17 El Camino Real Station Partial Median Overpass Station Design

Figure 18 Aerial View of a Median Overpass Station along I-405 at NE 128th Street

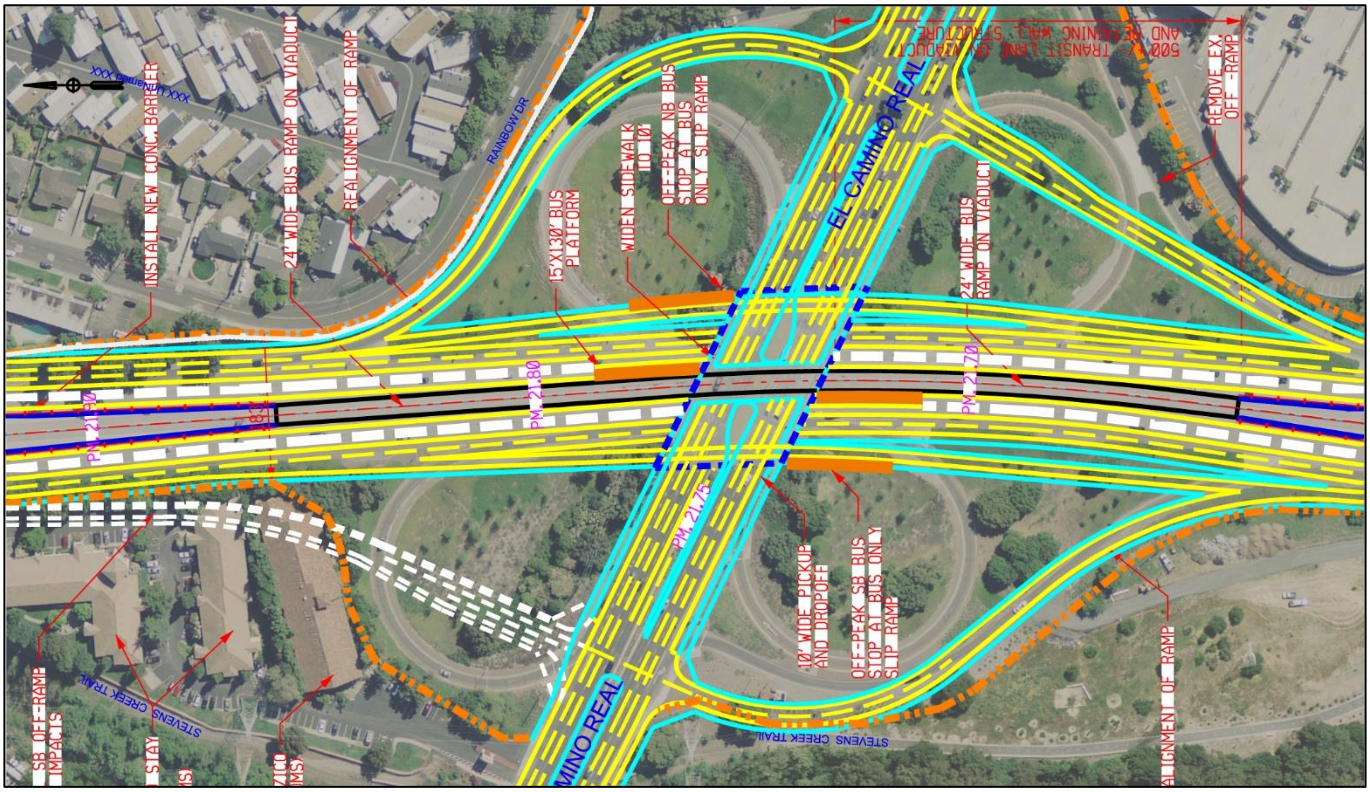


Figure 19 Median Crossover Station

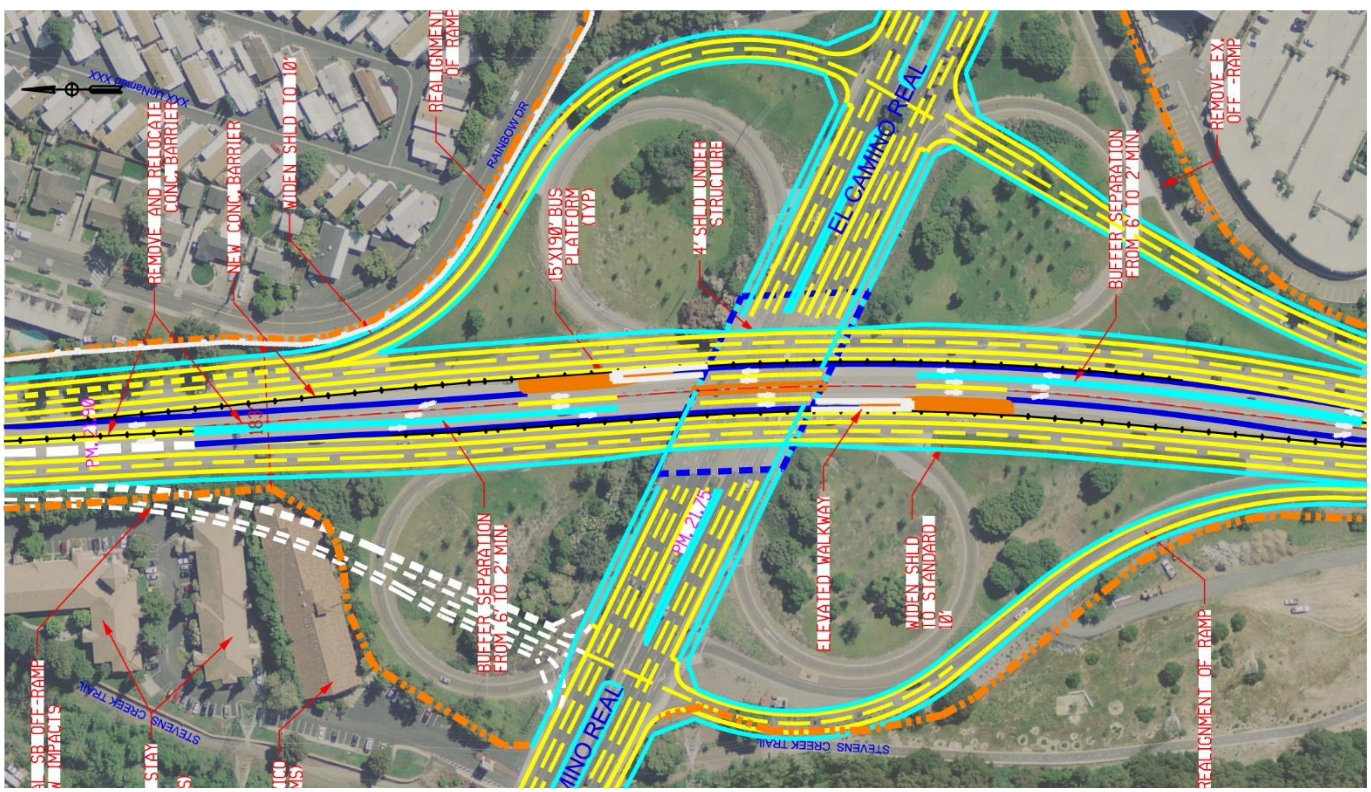


Figure 20 Median Split Platform Station

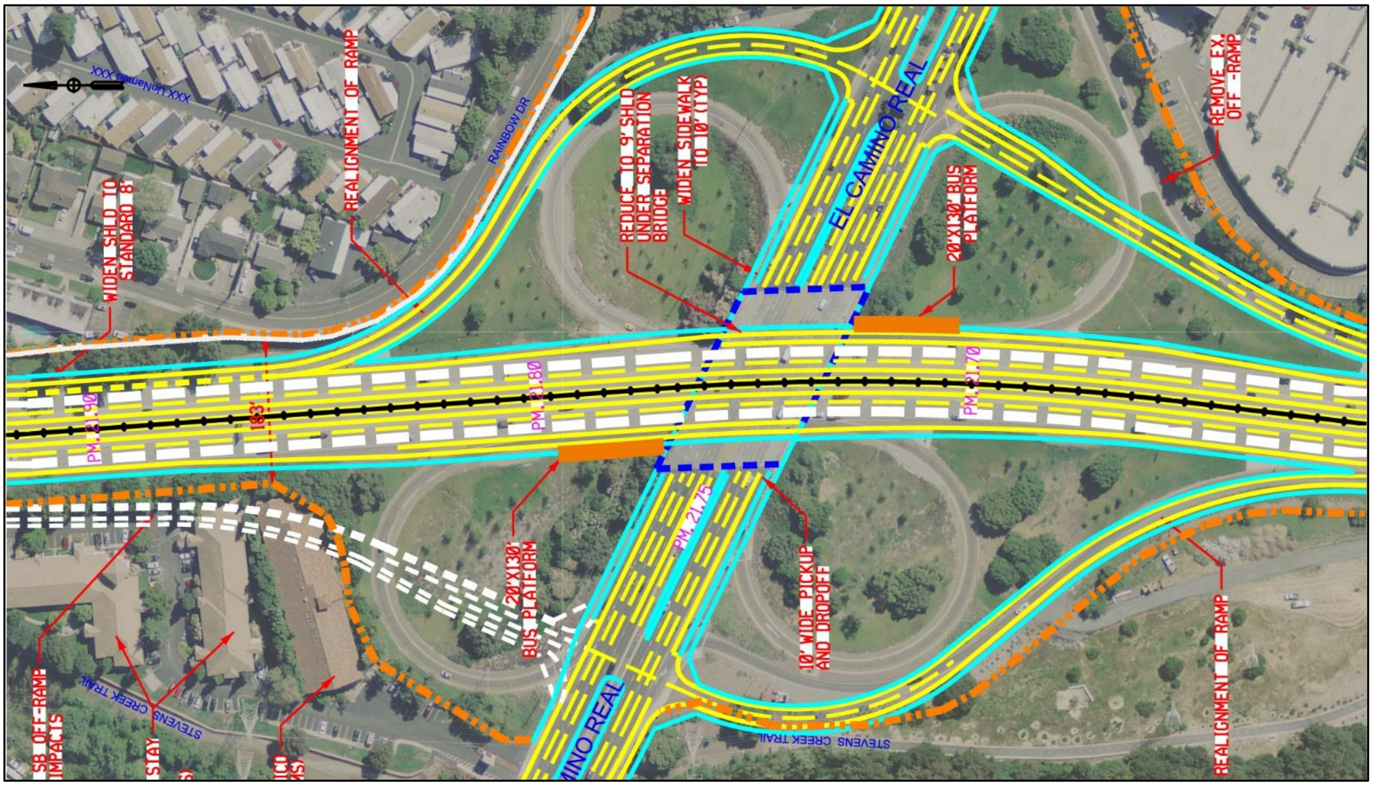
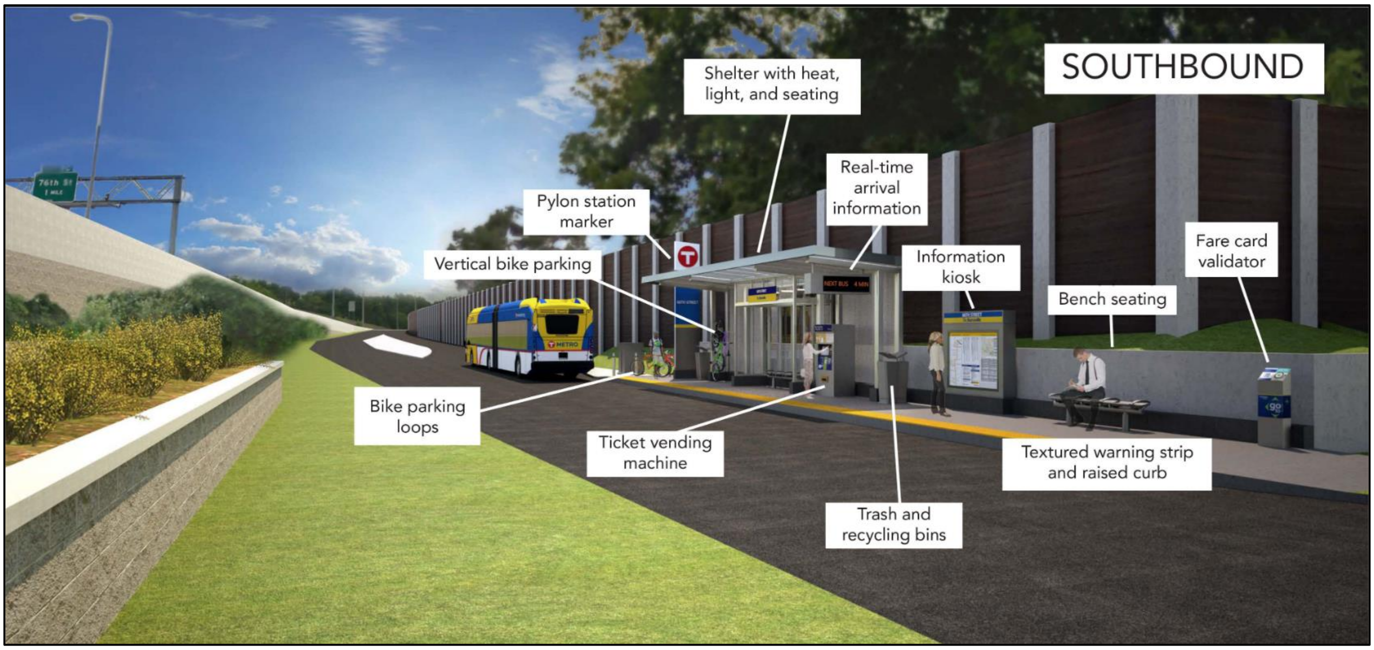


Figure 21 Side Platform Station at El Camino Real

Figure 22 Side Platform Station along I-10 at Cal State, Los Angeles



Source: Metro Transit, Minneapolis/St. Paul Area, I-35W & 66th St Station, Richfield, Metro Orange Line, https://www.metrotransit.org/orange-line-66th-street-station, downloaded 10/7/2019

Figure 23 Prototypical Freeway Ramp Bus Stop

Cross sections covering most of these station design options for El Camino Real are presented on Figure 24 and Figure 25.

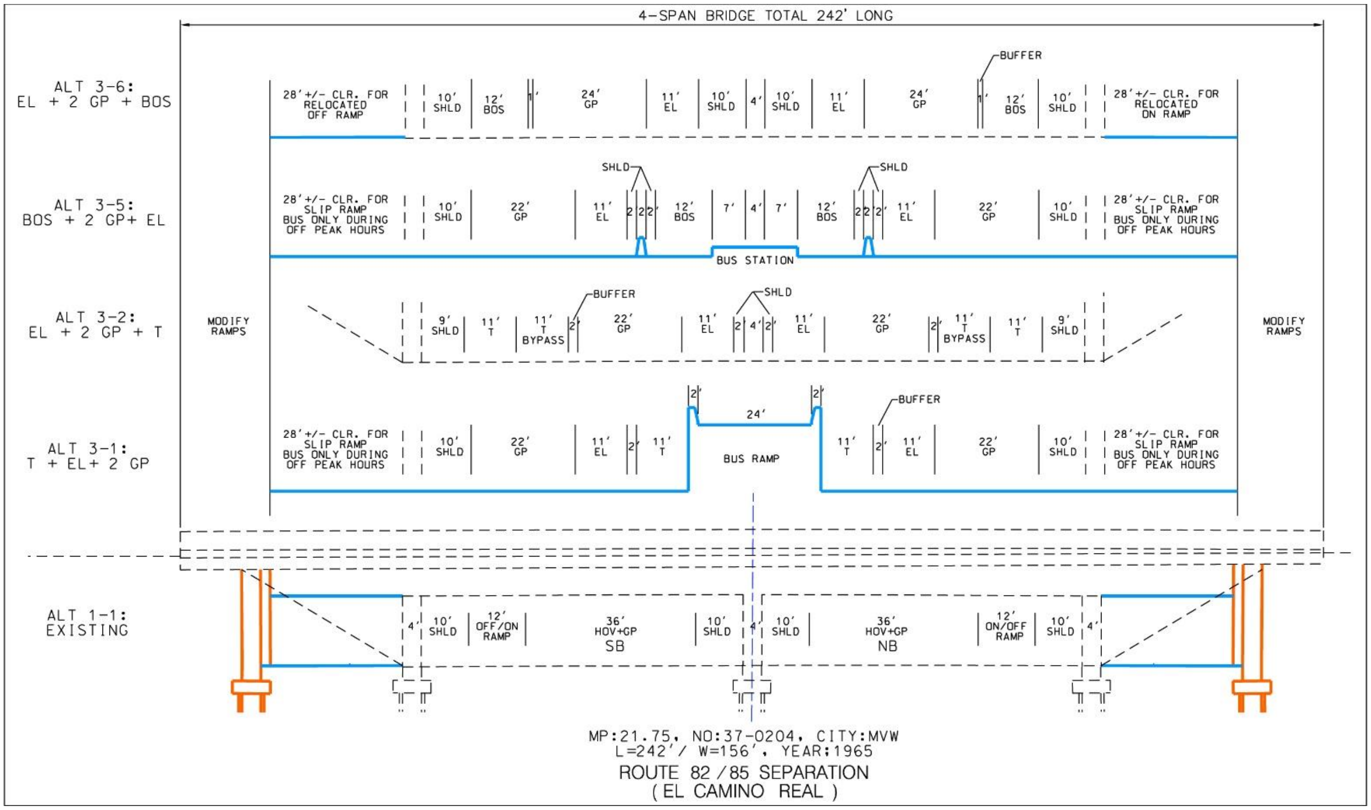


Figure 24 El Camino Real Transit Station Geometric Cross Sections

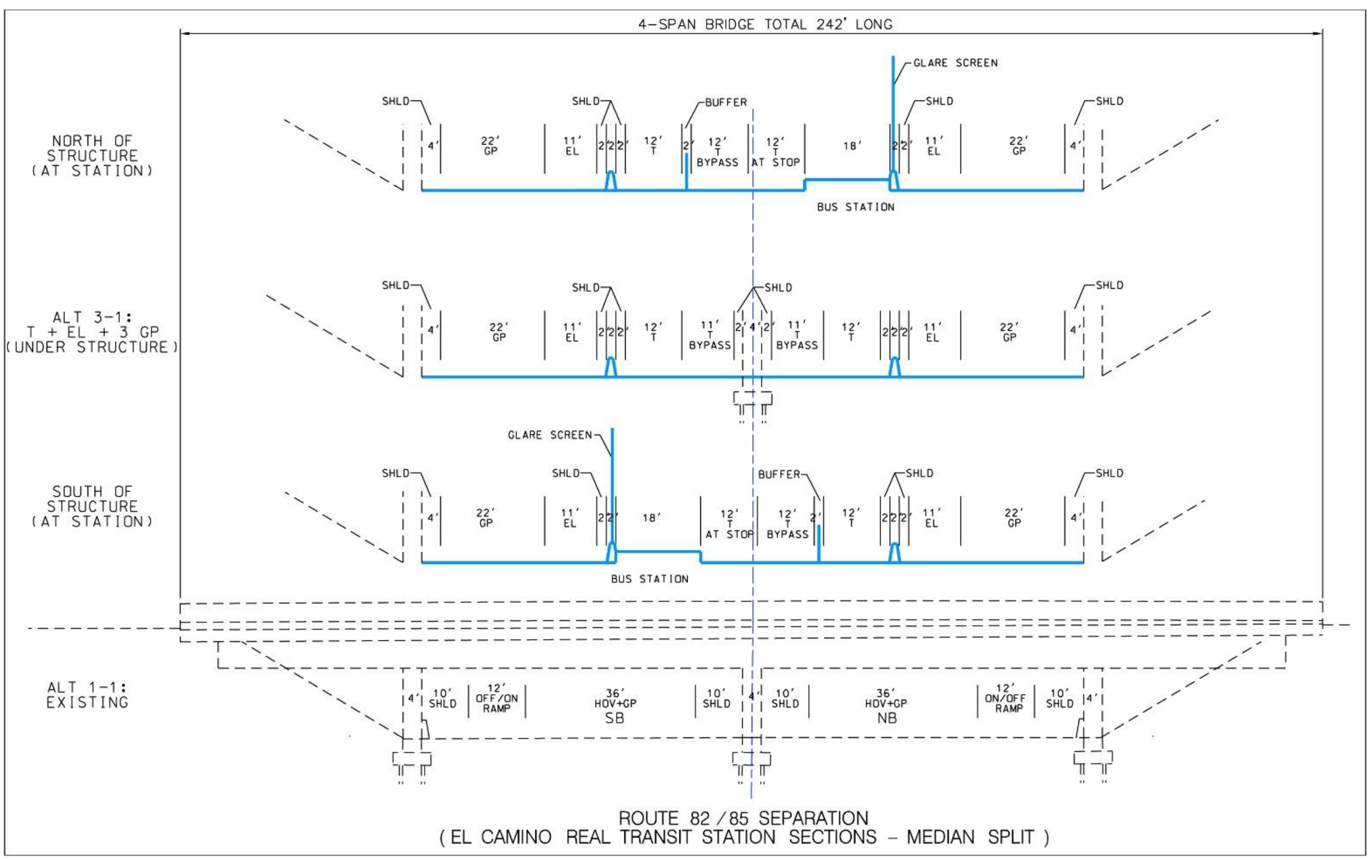


Figure 25 Median Split Platform Geometric Cross Sections at El Camino Real

Coordination with Other Potential Improvements

A number of transportation investments are planned for implementation along the SR 85 corridor. Several of these will be potentially impacted by one or more of the alternatives considered by this SR 85 Transit Guideway Study. Table 10 lists projects included in the Metropolitan Transportation Commission's *Plan Bay Area 2040* adopted on July 16, 2017 and those submitted by VTA to MTC in July/August 2019 for potential inclusion in the upcoming Plan Bay Area 2050 (PBA 2050).

Planned projects potentially impacted by the transit guideway are discussed following the table.

Table 10 PBA 2050 Regionally Significant Projects Potentially Impacted by SR 85 Transit Guideway Study Alternatives

	Alternative									
	1-1 No Build	1-2 HOV to Express Lane Conversion	2-1 Express Lanes Project	2-2 Long Express Lanes	3-1 Long Transit Lane in Median	3-2 Long Transit Lane on Right Side	3-3 Long Transit Lane Hybrid	3-4 Short Transit Lane	3-5 Long Bus on Median Shoulder	3-6 Long Bus on Right Shoulder
1. Extend light rail transit from Winchester Station to SR 85 (Vasona Junction)					X	X	X	X	X	X
2. Mountain View Transit Center improvements					X		X		X	
3. SR 85 NB to EB SR 237 connector ramp and NB SR 85 auxiliary lane										
4. SR 85/El Camino Real interchange improvements										
5. SR 237 WB to SB SR 85 connector ramp improvements				X	X	X	X		X	
6. SR 85/I-280/Homestead Road interchange improvements										
7. SR 85 soundwalls										
8. SR 85 to I-280 HOT direct connector	X			X	X	X	X		X	
9. SR 85 Express Lanes: U.S. 101 (south San Jose) to Mountain View	X				X	X	X	X	X	
10. SR 87 Express Lanes: I-880 to SR 85										
11. SR 85 corridor improvements—reserve amount	X									

1. Extend light rail transit from Winchester Station to SR 85. Winchester Boulevard lies 0.7 miles north of the proposed SR 85 Transit Guideway station at South Bascom Avenue. Approximately 2,000 persons are employed nearby at Netflix and VTA bus route 48 operates along Winchester Boulevard passing SR 85. Figure 26 provides an aerial view of the proposed Vasona Junction end-of-line LRT station and its adjacent park-and-ride lot with 108 to 135 spaces.

The median of SR 85 is 48 feet wide at Winchester Boulevard including two paved inside shoulders. This width is nearly sufficient to accommodate a number of station design options presented earlier. Given widening of the freeway mainline to spread the northbound and southbound travel lanes, a transit guideway station with pedestrian overcrossing bridge could be constructed to interconnect these two services. As an example, Figure 27 illustrates a median crossover station with a pedestrian overcrossing to an adjacent local bus transfer stop and park-and-ride lot along the Metro Red (BRT) Line in the Twin Cities at Route 77 and Cedar Grove.

2. Mountain View Transit Center Improvements. The City of Mountain View has nominated extensive improvements at the existing transit center adjacent to its downtown at Evelyn Avenue and Castro Street. Figure 3, presented previously,

Figure 26 Vasona Junction at SR 85

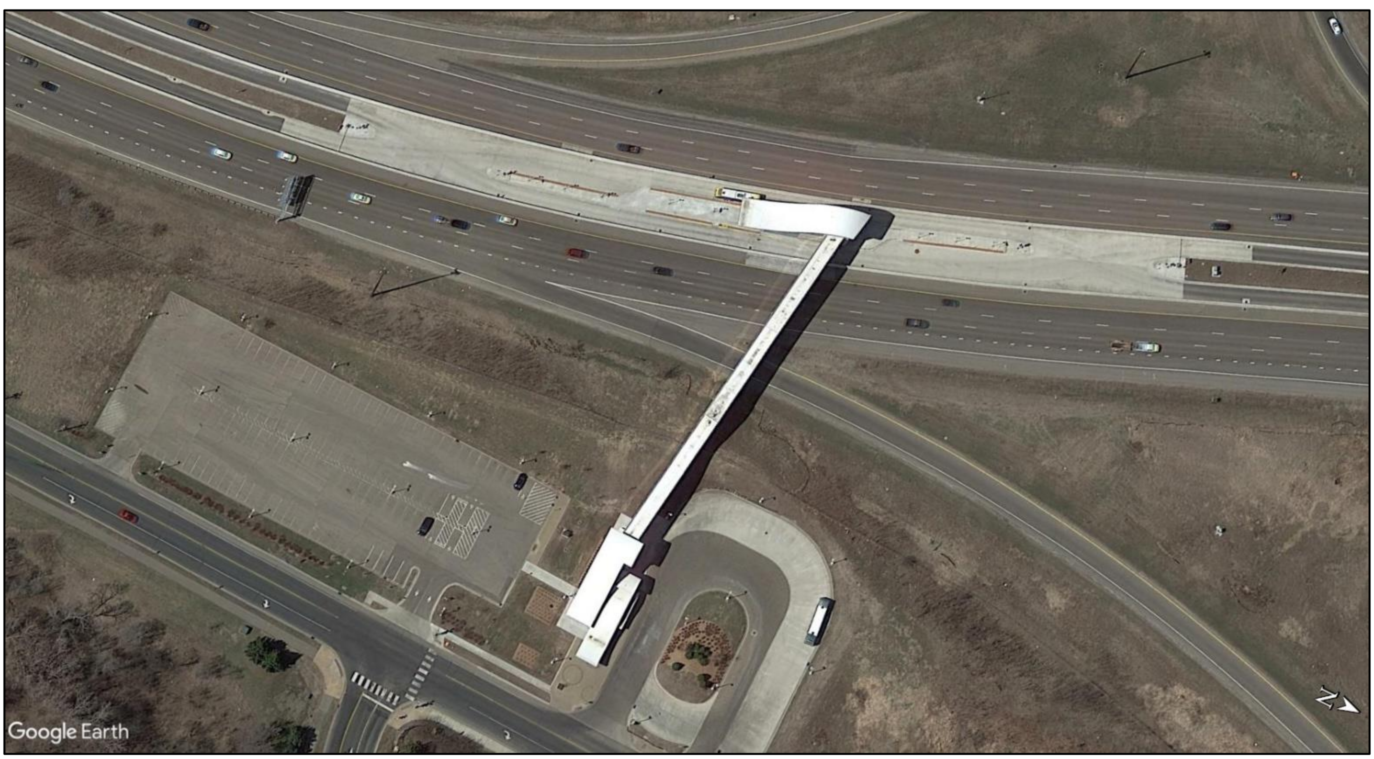


Figure 27 Cedar Grove Transit Station Median Crossover Platform with Pedestrian Overcrossing

illustrated a potential direct connector drop ramp to Evelyn Avenue from the median of SR 85. This optional ramp could be an element of all median running transit guideway alternatives (3-1, 3-3 potentially, and 3-5).

3. SR 85 Northbound to Eastbound SR 237 Connector Ramp and Northbound SR 85 Auxiliary Lane. A northbound SR 85 auxiliary lane from the El Camino Real interchange on-ramp to the SR 237 off-ramp is included with each of the alignment plan sets provided as Attachment 3 to this document (sheets 8 and 9) for alternatives 2-2, 3-1, and 3-2. Details for the connector ramp to eastbound SR 237 are not available. It should be noted that construction of any transit platform in the median of SR 85 at El Camino Real will constrain the space available along SR 85 for connector ramp improvements to SR 237.

4. SR 85/El Camino Real Interchange Improvements. Conversion of the SR 85 interchange at SR 82/El Camino Real from a cloverleaf Type L-10 ramp configuration to a spread diamond Type L-2 ramp configuration is an optional improvement for Scenario A—Limited Physical Change and Scenario B—Freeway Widening without Transit Stations; and required for Scenario C—Freeway Widening with Transit Stations and Scenario D—Part-time Shoulder Use (Bus on Shoulder).

Implementation of any of the Scenario B, C, or D alternatives limit the opportunity to provide a southbound diagonal off-ramp directly to El Camino Real without the need for potentially expensive right-of-way acquisition, or shifting the freeway mainline toward the east.

5. SR 237 Westbound to Southbound SR 85 Connector Ramp Improvements (including SR 85 Auxiliary Lane between El Camino Real and SR 237). The right-of-way along the west side of SR 85 is constrained from PM 21.85 (opposite the northbound on-ramp from El Camino Real) to PM 22.0 (opposite the off-ramp to eastbound SR 237). Two hotels with surface parking lots lay astride the west side of this pinch point. Widening the freeway to provide dual express lanes or the addition of a transit lane or the addition of a station for the bus on shoulder alternatives would preclude the inclusion of a southbound auxiliary lane between SR 237 and El Camino Real.

6. SR 85/I-280/Homestead Road Interchange Improvements. No conflicts with the SR 85 transit guideway alternatives identified for study are known to exist. All freeway widening alternatives under Scenario B and C should be monitored for potential conflicts with this interchange improvement.

7. SR 85 Soundwalls. Implementation of the transit guideway study alternatives are not anticipated to conflict with soundwall improvements implemented by others.

8. SR 85 to I-280 HOT Direct Connector. The “Long Transit Lane” alternatives will construct a new travel lane in each direction along SR 85 passing through the separation with I-280. Space in the median of SR 85 will not exist for the addition of a two-way direct connector ramp absent the widening of all SR 85 bridge structures (3) crossing over the I-280 mainline and connector ramps.

9. SR 85 Express Lanes: U.S. 101 (South San Jose to Mountain View. This project reflects Alternative 2-1 addressed by this transit guideway study. Implementation of the Transit Lane Alternatives would preclude this investment. The single lane HOV to express lane conversion (Alternative 1-2) would not conflict given prior planning for overhead sign and toll antenna cantilever structure foundations and lighting installed on mast-arm standards. Implementation of Alternative 3-6, Long Bus on Right-side Shoulder, could also be added to this project or precede it.

10. SR 87 Express Lanes: I-880 to SR 85. A modest budget of $41 million is identified for this HOV to express lane conversion; hence, no direct connector ramps to the express lanes along SR 85 appear to be envisioned. No conflict would occur by implementing any of the SR 85 Transit Guideway Study alternatives.

11. SR 85 Corridor Improvements—Reserve Amount. The Santa Clara Valley Transportation Authority has listed a budget of $400 million for this line item in its submittal to MTC for the PBA 2050 Regionally Significant Project List.

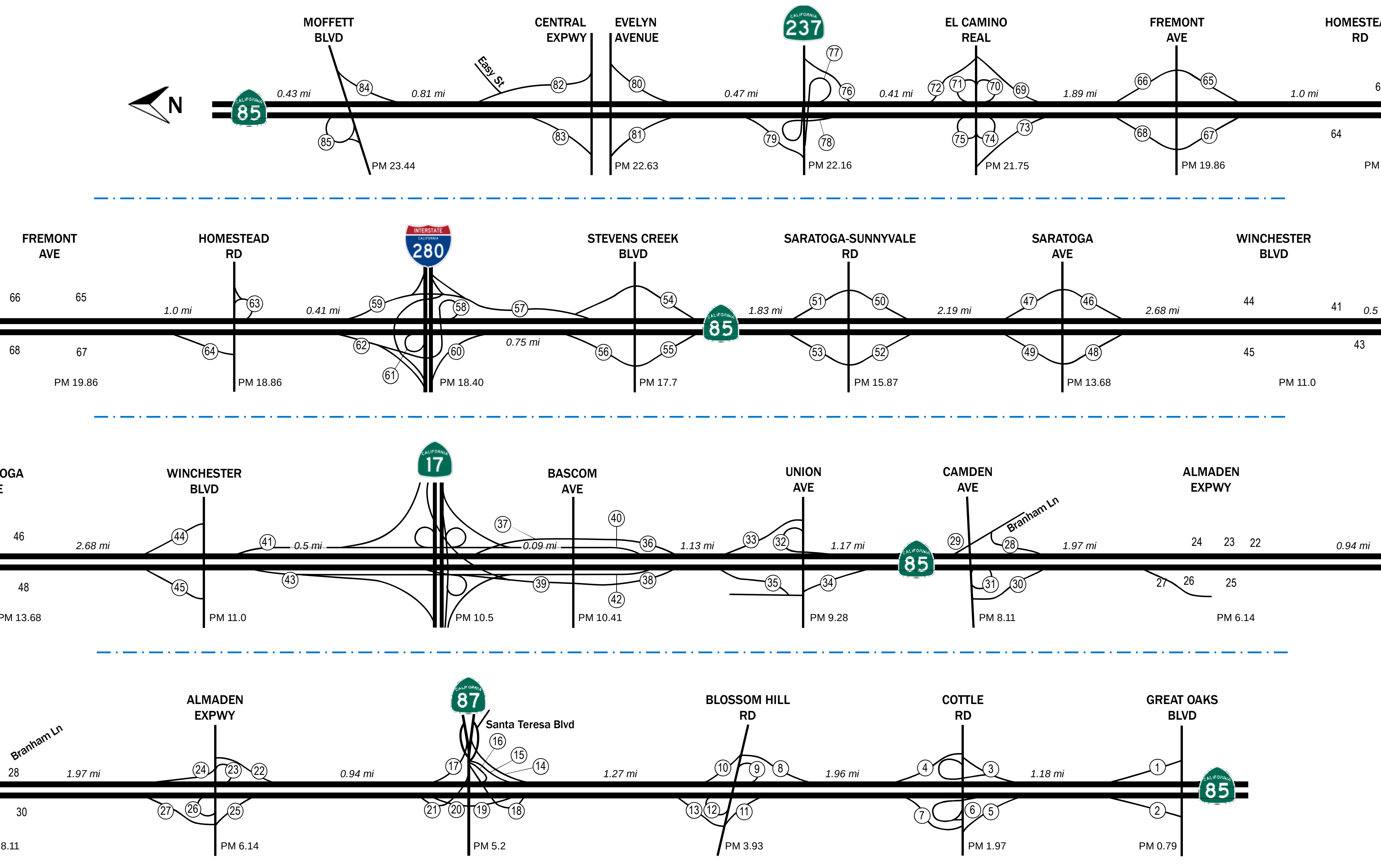
The budget reserve would not be required for Alternative 1-1, No Build. Less than this amount would be required for Alternatives 2-1 and 2-2. All or less than all of this amount would be required for the transit guideway alternatives given the inclusion of in-line transit stations along SR 85.

ATTACHMENT 1

SR 85 Interchange Ramps

CDM Smith

PARSONS



State Route 85 Proposed Engineering Features

Version 2.0, November 8, 2019

Basis of Design Report

STATE ROUTE 85 TRANSIT GUIDEWAY STUDY

Part 1: Proposed Engineering Features

October 9, 2019
November 8, 2019

PARSONS

100 West San Fernando Street, Suite 375

San Jose, CA 95113-2233

Valley Transportation Authority

Solutions that move you

MEASURE B

Revision History

Revision	Date	Description
1.0	October 9, 2019	Initial Draft Submission
2.0	November 8, 2019	Revised Draft Submission

Table of Contents

Introduction

The Santa Clara Valley Transportation Authority (VTA), in cooperation with the California Department of Transportation (Caltrans), proposes transit and managed lane improvements along 24 miles of State Route (SR) 85 between U.S. 101 in south San Jose and U.S. 101 in Mountain View, California (see Figure 1). These improvements are intended to enhance trip reliability, increase person throughput, encourage mode shift to transit and carpools, and provide long-term congestion management of the corridor.

Within the project limits, SR 85 is generally a six-lane, divided, controlled-access freeway with two general-purpose lanes in each direction plus one high-occupancy vehicle (HOV) lane in each direction. At the southern end of the route, from postmile (PM) 1.33 to PM 5.27, VTA additionally provides a light rail transit (LRT) line with two tracks and stations in the median of the divided freeway. Some parts of SR 85 also have auxiliary lanes that extend from on-ramps to off-ramps.

The existing travel lane width is generally 12 feet throughout the corridor. The inside shoulder has a standard width of 10 feet throughout the corridor with the exception of one overcrossing (northbound at Homestead Road). The outside shoulder has the standard width of 10 feet in the portion of the corridor from its southern junction with U.S. 101 to the separation with I-280, 18.4 miles to the north. From I-280 to the northern junction with U.S. 101, the outside shoulders range in width from 4 feet to 10 feet.

The width of the median varies considerably from end to end. Table 1 lists the approximate width of the median from inside edge of travelway to inside edge of travelway. This measurement includes paved shoulders, barriers, columns supporting overhead structures, and the width between bridges. South of Santa Teresa Boulevard, the listed median width does not include VTA's LRT trackway.

The pavement is generally in excellent condition. From U.S. 101 at the south end of SR 85 to the Guadalupe River Bridge (PM 5.59), the mainline lanes are full depth asphalt concrete (AC). From that point north, the mainline pavement is Portland cement concrete (PCC). Shoulders, both inside and outside, are partial depth AC. Heavy trucks, those in excess of 4.5 tons, are prohibited from utilizing SR 85 between I-280 and U.S. 101 in southern San Jose.

The freeway generally lies on level original ground, but alternates between segments on embankments and in depressed sections. The northbound and southbound roadbeds are typically at the same elevation and separated by a median concrete barrier(s) south of Almaden Expressway (PM 6.00) and north of McClellan Road (PM 17.17). Between these points, a thrie metal beam barrier separates the roadbeds.

For the purpose of defining managed lane investments, the corridor is segmented into three parts:

- Segment 1 from U.S. 101 in South San Jose to SR 87. This segment includes a VTA light rail line in the median of SR 85.
- Segment 2 from SR 87 to I-280. This segment for the most part includes a wide unpaved median.
- Segment 3 from I-280 to U.S. 101 in Mountain View. This segment includes a narrow median.

In all three segments, SR 85 passes through predominately residential neighborhoods. Sound walls line both sides of the freeway. The PCC pavement is grooved and microplaned. A SR 85 Noise Reduction Study is underway and five locations have been identified to test alternative noise reduction strategies. Balancing the noise concerns of residents and the mobility aspirations of commuters is an important aspect of VTA's Route 85 Transit Guideway Study.

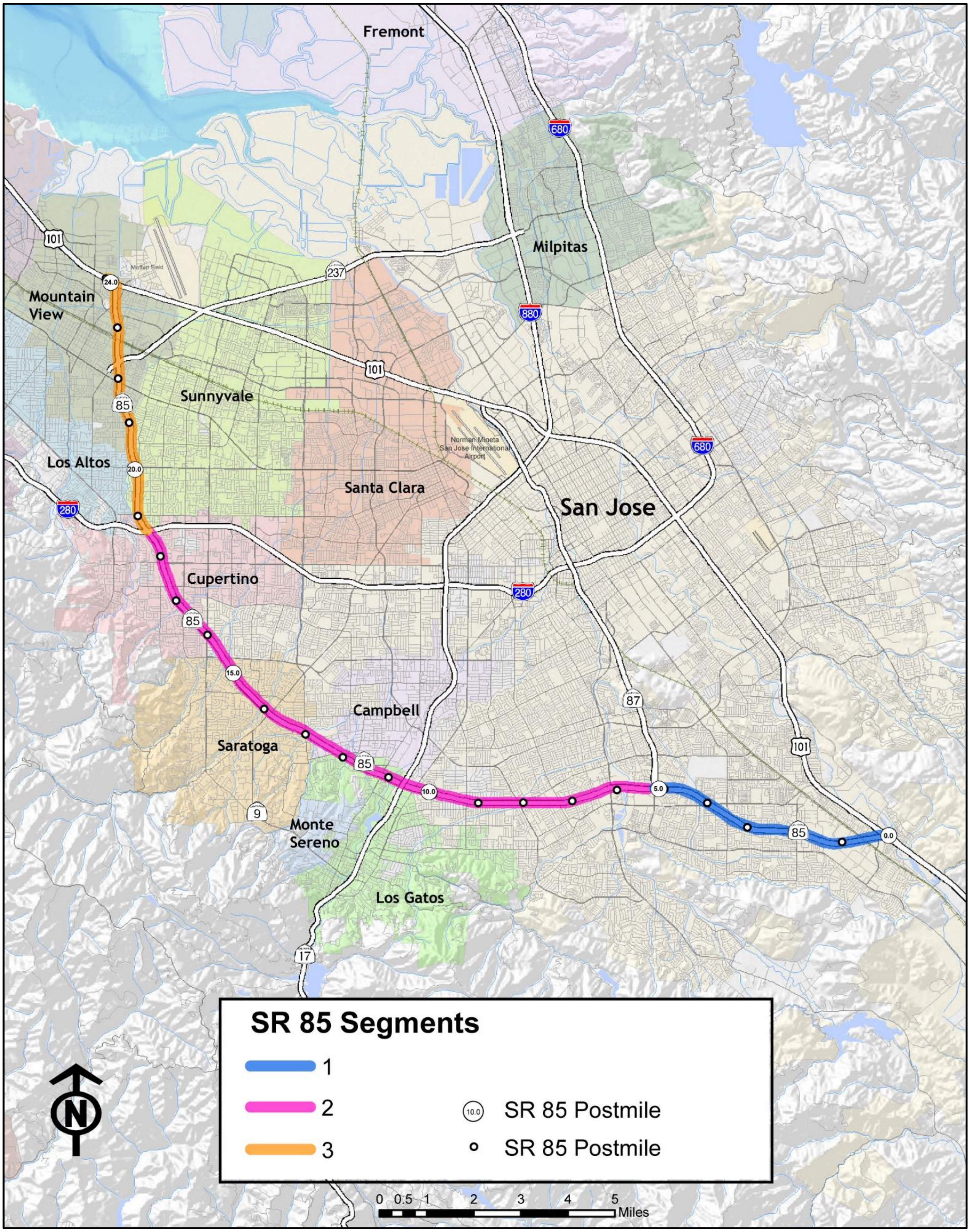


Figure 1 Vicinity Map

Table 1 Median Width along State Route 85

Structure No.	Postmile	Structure Name	Type*	Median Width (feet)
1	0.20	Bernal Road	Undercrossing	33
2	0.29	Monterey Road/Union Pacific/Great Oaks Boulevard	Undercrossing/overpass	46
3	1.22	Via Del Oro	Undercrossing	60
4	1.33	VTA Light Rail	Overpass	68
5	1.97	Cottle Road	Overcrossing	20
6	2.73	Lean Avenue	Overcrossing	18
7	3.48	Snell Avenue	Overcrossing	18
8	3.93	Blossom Hill Road	Overcrossing	16
9	4.28	Canoas Creek	Bridge	18
10	4.50	Cahalan Avenue	Pedestrian undercrossing	20
11	4.84	Southbound SR 87 to southbound SR 85	Separation	19
12	5.20	Santa Teresa Boulevard	Undercrossing	68
13	5.27	VTA Light Rail	Overpass	18
14	5.31	Southbound SR 85 to northbound SR 87	Separation	68
15	5.59	Winfred Blvd/Guadalupe River/Sanchez Drive	Bridge	68
16	6.00	Almaden Expressway	Undercrossing	70
17	6.46	Russo Drive	Pedestrian overcrossing	48
18	7.30	Meridian Avenue	Overcrossing	48
19	7.50	Dent Avenue	Pedestrian overcrossing	48
20	8.11	Camden Avenue	Undercrossing	66
21	8.77	Leigh Avenue	Overcrossing	48
22	9.28	Union Avenue	Overcrossing	68
23	9.93	Samaritan Place	Pedestrian overcrossing	50
24	10.23	Bascom Avenue	Overcrossing	66
25	10.40	Southbound SR 17 to southbound SR 85	Separation	56
26	10.48	SR 17	Separation	50
27	10.60	Oka Road	Undercrossing	50
28	10.80	Los Gatos Creek	Bridge	48
29	10.90	Winchester Boulevard	Underpass	48
30	11.00	Winchester Boulevard	Overcrossing	48
31	11.97	Pollard Road	Undercrossing	44
32	12.45	More Avenue	Pedestrian overcrossing	44
33	12.68	San Tomas Aquino Creek	Bridge	44
34	12.91	Quito Road	Overcrossing	44
35	13.73	Saratoga Avenue	Undercrossing	44
36	13.91	Saratoga Creek	Bridge	44
37	14.28	Cox Avenue	Overcrossing	44
38	14.31	Cox Avenue utility	Overcrossing	44
39	14.73	Scully Avenue utility	Overcrossing	44
40	14.84	Blue Hills	Pedestrian overcrossing	44
41	15.27	Prospect Road	Overcrossing	45
42	15.40	Calabazas Creek	Bridge	44
43	15.87	South De Anza Boulevard	Overcrossing	44
44	16.61	South Stelling Road	Overcrossing	44
45	17.17	McClellan Road	Overcrossing	30
46	17.70	Stevens Creek Boulevard	Overcrossing	24
47	18.35	Southbound/eastbound I-280	Separation	20
48	18.41	SR 85/I-280	Separation	20
49	18.43	Northbound/westbound I-280	Separation	20
50	18.86	Homestead Road	Overcrossing	18
51	19.39	The Dalles	Pedestrian overcrossing	22

Table 1 Median Width along State Route 85

Structure No.	Postmile	Structure Name	Type*	Median Width (feet)
52	19.86	Fremont Avenue	Undercrossing	20
53	20.02	Stevens Creek	Bridge	20
54	20.37	Hawkins Drive	Right-of-way	20
55	20.69	Permanente Creek Diversion Channel	Culvert	20
56	21.10	Stevens Creek Trail/Dale Avenue	Pedestrian overcrossing	22
57	21.75	SR 82/SR 85/El Camino Real	Separation	20
58	22.13	SR 85/SR 237	Separation	22
59	22.43	Dana Street	Overcrossing	20
60	22.63	Evelyn Avenue/Caltrain/Light Rail/Central Expressway	Undercrossing/overpass	20
61	22.95	Stevens Creek	Bridge	22
62	23.19	Middlefield Road	Overcrossing	22
63	23.44	Moffett Boulevard	Undercrossing	22

*Type:
- Undercrossing = local road under State highway
- Overcrossing = local road over State highway
- Pedestrian overcrossing = Pedestrian crossing over State highway
- Separation = State highway crossing
- Underpass = State highway under railroad
- Overpass = State highway over railroad
- Right-of-way = right-of-way required

Basis of Design

To enhance trip reliability, increase person throughput, encourage mode shift to transit and carpools, and provide long-term congestion management of the corridor, VTA and its State Route 85 Policy Advisory Board (PAB) are considering the installation of express lanes and/or transit lanes along SR 85. Earlier phases of this study considered, but eventually ruled out other investment options such as light rail transit, or reversible lanes using movable barriers.

The purpose of this document is to provide a physical definition of the alternatives advanced for further study, based on conceptual engineering considerations. As such, this documentation of "Proposed Engineering Features" provides scoping information for subsequent capital cost estimating, preliminary environmental assessment, and stakeholder/community outreach.

As SR 85 is owned and maintained by the State of California, alterations or expansions of the facility must be approved by Caltrans, no matter the source of funding. Documents which guide and govern the design of the proposed investments include:

- Caltrans Transportation Planning Manual
- Caltrans Project Development Procedures Manual
- Caltrans Highway Design Manual
- Manual on Uniform Traffic Control Devices (MUTCD) and the California Supplement to the MUTCD
- Caltrans Traffic Operations Policy Directives.

As the installation of express lanes and/or transit lanes are frequently retrofits of existing facilities, Caltrans has also published *High-Occupancy Vehicle Guidelines for Planning, Design and Operations.* The guidelines acknowledge, "For most situations, retrofitting an HOV [high occupancy vehicle] lane [includes express and transit lanes] on an existing freeway requires some compromises in design standards." The guidelines go on to emphasize the following:

> "The Guidelines are advisory in nature and are to be <u>used only when every effort to conform to established standards has been exhausted.</u> When conformance is not possible, the deviation must be documented by a sound and defensible analysis and an approved design exception fact sheet."

Collectively, the guidance covering the alteration of State Route 85 covers literally hundreds, if not thousands, of topics. For the purpose of this physical definition and conceptual design investigation, select guidance covering the geometric cross section of the proposed investments are summarized in Table 2.

Guidance provided in Caltrans Highway Design Manual is extremely important. Deviations from this guidance typically requires approval of a Design Standards Decision Document by the Chief, Division of Design. Caltrans recognizes that retrofitting state facilities to include managed lane elements will typically require design exceptions and they have issued *High Occupancy Vehicle Guidelines* to indicate the department's priorities for the reduction of lane widths. Neither of these resources address part-time use of shoulders for bus use. The Federal Highway Administration (FHWA) recognizes this option as a valuable resource potential and has issued planning and design guidelines to advise State and local transportation agencies such as Caltrans. Lastly, Table 2 presents SR 85 project specific guidelines the design team has followed, in addition to those provided by Caltrans and FHWA.

Table 2 SR 85 Transit Corridor Design Guidance

Source	Topic	Horizontal Geometric Standard/Guidance Applicable to SR 85
Caltrans Highway Design Manual	108.3—Commuter and Light Rail Facilities within State Right of Way (3) Parallel Rail Facilities	As necessary, rail facilities may be located within the median upon approval from the District Director.
	108.5—Bus Rapid Transit	Bus rapid transit (BRT) is to be considered the same as commuter and light rail facilities with regard to approvals and design guidance.

Table 2 SR 85 Transit Corridor Design Guidance

Source	Topic	Horizontal Geometric Standard/Guidance Applicable to SR 85
		BRT located on freeways should be designed in accordance with the HOV Guidelines and per standards contained in the HDM (Highway Design Manual).
	108.6—High-occupancy Toll and Express Lanes	High-occupancy vehicle guidelines are to be consulted. High-occupancy toll (HOT) and express toll lane facilities are to comply with HDM design standards.
	301.1—Lane Width	12 feet
	302.1—Highway Shoulder Width	On freeways with six or more lanes, 10 feet left and 10 feet right paved shoulders. Ramps—4 feet left and 8 feet right. For single or two-lane branch connections, 5 feet left and 10 feet right.
	305.1—Median Width for (3) Facilities under Restrictive Conditions	22 feet minimum
	305.5—Paved Medians	On freeways of six or more lanes, medians 30 feet wide or less should be paved. Where medians are paved, each half should be paved in the same plane as the adjacent traveled way.
	307.5—Multilane All Paved Cross Sections with Special (Narrow) Median Widths	May be used for widening of existing facilities.
	309.1—Horizontal Clearances (3) a. Minimum to objects b. Minimum to walls (including noise barriers)	 Equal to standard shoulder width, but not less than 4 feet. 10 feet
	(5) Parallel BRT facilities on freeways	4-foot separation between (mainline) lanes—see HOV Guidelines
High-occupancy Vehicle Guidelines[1]	3.10—Relative Priority of Cross-Sectional Elements (0) General	 A reduction in standards for cross-sectional elements may be necessary for most retrofit HOV projects and will require approved Design Standards Decision Documents.
	(3) Buffer-Separated HOV Facilities	First, reduce the median shoulder from 14 feet (the width to accommodate continuous enforcement areas) to 10 feet. Any reduction of the median shoulders should be accompanied by the addition of California Highway Patrol (CHP) enforcement areas. Second, reduce the buffer to 2 feet. Third, reduce the median shoulders to a minimum of 8 feet. Fourth, reduce the HOV lane to 11 feet. Fifth, reduce the number one general purpose lane to 11 feet. Sixth, reduce the remaining general-purpose lanes to 11 feet, starting with the number two lane and moving to the right as needed. The outside general-purpose lane should remain at 12 feet unless truck volume is less than 3 percent. Seventh, reduce the median shoulders to a minimum of 2 feet. Shoulders less than 8 feet, but greater than 5 feet, are not recommended. Any excess width resulting from a reduction of median shoulder width from 8 feet to 5 feet or less should be used to restore the general-purpose lane widths to 12 feet starting from the outside and moving left. The reduction of median shoulders from 14 feet to either 8 feet or 2 feet should be combined with the construction of enforcement areas.
	(4) Contiguous HOV Facilities	First, reduce the median shoulders from 14 feet (the width to accommodate continuous enforcement areas) to 10 feet. Any reduction of the median shoulders should be accompanied by the addition of CHP enforcement areas. Second, reduce the median shoulders to a minimum of 8 feet. Third, reduce the HOV lane to 11 feet. Fourth, reduce the general-purpose lanes to 11 feet, starting with the left lane and moving to the right as needed. The outside general-purpose lane should remain at 12 feet unless truck volumes are less than 3 percent.

[1] January 2018

Table 2 SR 85 Transit Corridor Design Guidance

Source	Topic	Horizontal Geometric Standard/Guidance Applicable to SR 85
		Fifth, reduce the median shoulders to a minimum of 2 feet. Shoulders less than 8 feet, but greater than 5 feet are not recommended. Any excess width from 8 feet to 5 feet or less should be used to restore the general-purpose lane widths to 12 feet starting from the outside and moving to the left.
FHWA[2]	Part-time Shoulder Use	Used for travel only during those times of day when the adjoining lanes are likely to be heavily congested. When not needed as an additional travel lane, the shoulder is restored to its original purpose.
	Bus-only Use of Shoulders (Bus on Shoulder—BOS)	To improve bus travel time and reliability.
	Lane Width	12 feet or more preferred.
	Shoulder Width	"Several" feet beyond BOS lane.
	Bridge Width	The minimum shoulder width on bridges is 11.5 feet (10 foot BOS lane plus 1.5 foot lateral offset to obstruction).
	Signage	Typically static, ground mounted.
	Pavement Markings	Solid edge line typically used between the shoulder and the adjacent travel lane remains in place. A second solid line is used on the outside of the shoulder beside the edge of pavement. The two solid lines should be the same color: white for part-time use of the right shoulder and yellow for part-time use of the left (median) shoulder.
Parsons	Preliminary Pavement Widths	Vary at interchange ramps, lane/shoulder transition areas, bridge columns and other roadway elements. Widths also vary where additional shoulder width is needed to improve stopping sight distance to obstructions (e.g., left shoulder along outside of horizontal curve with a median concrete barrier or right shoulder along outside of horizontal curves adjacent to a soundwall).
	Existing Bridges and Overcrossing Structures	Avoid replacement wherever possible.
	Restrictive Right of Way (R/W)	The R/W is particularly narrow in the northern/western segment of the project between I-280 and US 101. The surrounding area is fully developed with residential and commercial land uses. Reduced cross sections will be necessary where significant R/W acquisition and community impacts would otherwise be required.
	Existing Soundwalls	Reduced cross sections will be necessary to avoid reconstruction of soundwalls which would result in significant R/W acquisitions, park land and community impacts.
	Heavy Truck Volumes	Trucks in excess of 4.5 tons are prohibited from utilizing SR 85 south of I-280. Outside lanes may be reduced from 12 feet to 11 feet where necessary. A Design Standards Decision Document (DSDD) will need to be prepared for approval by the Chief, Division of Design.
	Proposed Lane Widths	Should be reasonably consistent throughout each segment of the corridor, without excessive variations (narrowing or widening) within short distances. The standard lane width of 12 feet may be reduced to 11 feet per Caltrans High-occupancy Vehicle Guidelines Topic 3.10. A design exception will need to be prepared for approval by the Chief, Division of Design.
	Buffer	No buffer is proposed between express lanes and general-purpose lanes as contiguous lane striping is assumed. A buffer width of 2 feet is proposed to separate transit lanes from adjacent HOV, express lane, and/or general-purpose lanes.
	Right Shoulder Width	The standard right shoulder width of 10 feet should be provided throughout the corridor. In restrictive conditions (e.g., existing bridges, overcrossings, soundwalls), the right shoulder may be reduced to below 10 feet, but no less than 8 feet. The transit lane buffer may need to be

[2] Use of Freeway Shoulders for Travel—Guide for Planning, Evaluating, and Designing Part-time Shoulder Use as a Traffic Management Strategy, Federal Highway Administration (FHWA), February 2016.

Table 2 SR 85 Transit Corridor Design Guidance

Source	Topic	Horizontal Geometric Standard/Guidance Applicable to SR 85
		removed to achieve the 8-foot right shoulder width minimum. An approved DSDD will be required.
	Left Shoulder Width	The standard left shoulder width of 10 feet may be reduced per Caltrans High-occupancy Vehicle Guidelines Topic 3.10. An approved DSDD will be required.
	Median Width	The standard median width of 22 feet may be reduced to 10 feet between structures to accommodate a concrete Type 60 median barrier with left shoulder widths of 4 feet or left shoulder widths of 2 feet at locations with overhead signs or bridge columns. An approved DSDD will be required.

A Concept of Operations Report, prepared by CDM Smith, will additionally set forth proposals for tolling the express lanes and managing the use of the transit lanes where provided. This Concept of Operations Report will additionally match the types of transit services which are compatible with the physical design options which are presented in this Proposed Engineering Features document.

Alternatives

ALTERNATIVES CONSIDERED

Ten alternatives are being considered. These are briefly described below and are illustrated on Figure 2.

Alternative 1-1: No Build

This alternative would not make any changes to SR 85. Metrics for this alternative can serve as a point of comparison for other alternatives.

Alternative 1-2: HOV to Express Lane Conversion

In this alternative, the existing HOV lane on SR 85 would be converted to an express lane, but the unused space in the median between I-280 and SR 87 would not be changed, leaving it available for a future transportation investment.

Alternative 2-1: Express Lanes Project

This alternative would convert the existing HOV lane on SR 85 to an express lane and would construct a new express lane between I-280 and SR 87 in accordance with the design in VTA's Silicon Valley Express Lane Program.

Alternative 2-2: Long Express Lanes

This alternative would convert the existing HOV lanes into express lanes and construct a new express lane between U.S. 101 in Mountain View and SR 87.

Alternative 3-1: Long Transit Lane (Median Adjacent Lane)

This alternative would construct a new, median-adjacent transit lane between U.S. 101 in Mountain View and SR 87 in San Jose. Access to the lane would be limited to large, space-efficient vehicles like public transit and private shuttles.

Stations would be located at El Camino Real, Stevens Creek Boulevard, Saratoga Avenue, Bascom Avenue, and the Ohlone-Chynoweth Light Rail Station at Santa Teresa Boulevard. Except for the Ohlone-Chynoweth Light Rail Station at Santa Teresa Boulevard, which already exists, buses would serve stations located in the median of SR 85.

In this alternative, VTA transit buses would travel in a direct path along the corridor, serving median stations. This would permit the fastest, most reliable travel time for the transit lane since the buses would not need to leave the freeway to pick up and drop off riders nor interact with other vehicles.

Alternative 3-2: Long Transit Lane (Right-side Lane)

This alternative would install a transit lane between U.S. 101 in Mountain View and SR 87 that would be located along the right side of the roadway. Access to the lane would be limited to large, space-efficient vehicles like public transit buses and private shuttles and vehicles merging across the lane to enter/exit the freeway at on-ramps/off-ramps.

Stations would be located at on-ramps and off-ramps at El Camino Real, Stevens Creek Boulevard, Saratoga Avenue, Bascom Avenue and the existing Oholone-Chynoweth Light Rail Station at Santa Teresa Boulevard. Routing deviations from the corridor to access high-demand locations or transit connections would be easily made since the buses are traveling in the right lane.

Figure 2 State Route 85 Transit Guideway Study Alternatives

Alternative 3-3: Long Transit Lane (Hybrid Median and Right-side Lanes)

This alternative is a combination of Alternatives 3-1 and 3-2, 3-1 and 3-5, or 3-2 and 3-6. Where the transit lane is median-adjacent, stations would be in the median. Where the transit lane is on the right side, stations would be on on-ramps or off-ramps. Among the Long Transit Lane alternatives, this alternative would strike a balance between capital cost, travel speeds and access. (Note: This alternative will be defined once the other alternatives are evaluated insofar as traffic and transit operations.)

Alternative 3-4: Short Transit Lane

This alternative would build a new transit lane in the unused space adjacent to the SR 85 median between I-280 and SR 87. Median stations would be located at Stevens Creek Boulevard, Saratoga Avenue and Bascom Avenue. An on-ramp/off-ramp station would be located at El Camino Real. Public transit buses are also envisioned to serve the existing Ohlone-Chynoweth Light Rail Station.

Alternative 3-5: Long Shoulder (Median)

This alternative would widen the median shoulder to provide enough space to accommodate bus operations. Physical changes would include building a more durable shoulder to support the increased use and weight of buses and restriping lanes.

Stations would be located at El Camino Real, Stevens Creek Boulevard, Saratoga Avenue, Bascom Avenue, and the existing Ohlone-Chynoweth Light Rail Station at Santa Teresa Boulevard.

Alternative 3-6: Long Shoulder (Right-side)

This alternative would widen the right-side shoulder to provide enough space to accommodate bus operations. Physical changes would include building a more durable shoulder to support the increased use and weight of buses and restriping lanes.

On-ramp/off-ramp stations would be located at El Camino Real, Stevens Creek Boulevard, Saratoga Avenue and Bascom Avenue. Public transit buses are also envisioned to serve the existing Ohlone-Chynoweth Light Rail Station at Santa Teresa Boulevard.

ALTERNATIVES REMOVED FROM FURTHER CONSIDERATION

During the course of this SR 85 Transit Guideway Study and presentations to the State Route 85 Corridor Policy Advisory Board, which preceded the current study, several additional alternatives were considered, but ultimately removed from further consideration. These included:

- Adding one new transit lane (in each direction) in the median without stations and retaining the HOV lanes.
- Adding one new transit lane (in each direction) in the median without stations and replacing the HOV lane with one express lane in each direction.
- Adding one new transit lane in the median (in each direction) with stations and park-and-ride lots and retaining the HOV lanes.
- Adding a new LRT line in the median and retaining the HOV lanes.
- Adding a new LRT line in the median and replacing the HOV lane with one express lane (in each direction).
- Constructing reversible lanes in the median of SR 85 using movable barriers to separate the directional traffic or retractable gates to regulate how vehicles enter and exit a dedicated reversible roadway.

Physical Construction Scenarios

From an engineering design perspective, the 10 alternatives can be grouped into four physical construction scenarios.

- Scenario A—Limited Physical Change
  - Alternative 1-1: No Build
  - Alternative 1-2: HOV to Express Lane Conversion

No freeway widening occurs with either alternative. Investment is limited to the addition of tolling infrastructure including toll gantries with transponder readers and high-speed digital cameras, directional and informational signage, dynamic message signs, closed circuit television coverage of the entire corridor, and duct bank installation for power supply and fiber optic communications.

- Scenario B—Freeway Widening without Transit Stations
  - Alternative 2-1: Express Lane Project
  - Alternative 2-2: Long Express Lanes

Alternative 2-1, Dual Express Lanes, between I-280 and SR 87 is a subset of Alternative 2-2. Tolling infrastructure identified for Alternative 1-2 applies to both Scenario B alternatives.

- Scenario C—Freeway Widening with Transit Stations
  - Alternative 3-1: Long Transit Lane (Median Adjacent Lane)
  - Alternative 3-2: Long Transit Lane (Right-side Lane)
  - Alternative 3-4: Short Transit Lane

The footprint of the freeway widening is similar to Scenario B. With median stations, the freeway mainline is bowed to create space for the stations depending on station design. For right-side running, stations can be constructed on line, or along off- or on-ramps. Commuter buses which do not stop at the stations are provided with a bypass lane. Alternative 3-4 is a subset of Alternative 3-1 or 3-2.

- Scenario D—Part-time Shoulder Use (Bus on Shoulder)
  - Alternative 3-5: Long Shoulder (Median)
  - Alternative 3-6: Long Shoulder (Right-side)

These alternatives include the installation of HOV to Express Lane Conversion (Alternative 1-2) tolling infrastructure plus the reconstruction and widening of the median shoulder or the right-side shoulder with full depth PCC or AC pavement. Stations, similar to those considered under the Transit Lane Alternatives, would also be included.

Alternative 3-3, Long Transit Lane Hybrid, is a mix and match by freeway segment option of Scenarios C and D elements. This alternative will be further defined once the other alternatives are evaluated insofar as traffic and transit operations.

SCENARIO A—LIMITED PHYSICAL CHANGE

Alternative 1-2: HOV to Express Lane Conversion

Mainline Improvements

- Convert existing HOV lane in each direction from Bernal Road, near U.S. 101 in south San Jose to Moffett Boulevard, near U.S. 101 in Mountain View, a distance of 23.2 miles.
- Provide continuous access to express lane from the adjacent general-purpose lanes.
- Install toll infrastructure in median to support express lanes.
- Reconstruct concrete median barrier south of Santa Teresa Boulevard and north of Stelling Road to accommodate toll gantries and dynamic message signs.
- Widen paved median shoulder to 14 feet in both directions from Santa Teresa Boulevard to South Stelling Road (excepting structures) to provide continuous CHP enforcement area.

- Widen right-side shoulders to meet Highway Design Manual standards (10 feet). Relocate drainage inlets as needed to the outside edge of shoulder.
- Install high mast lighting at SR 17 and I-280 interchanges as needed to supplement existing (optional improvement).

Interchange Improvements
No ramp improvements are required to implement this alternative. Conversion of the SR 85 interchange at SR 82/El Camino Real from a cloverleaf Type L-10 ramp configuration to a spread diamond Type L-2 ramp configuration is an optional improvement for consideration.

Local Street Improvements
No streets crossing under or over SR 85 would be reconstructed to accommodate the HOV to express lane conversion. Conversion of the SR 85 interchange at SR 82/El Camino Real from a Type L-10 to a Type L-2, as an optional improvement, would require reconstruction of the ramp terminal intersections, installation of traffic signals, removal of a portion of the raised median and landscaping, and pavement signing and striping to accommodate dual left-turn lanes to the northbound and southbound on-ramps. No widening of El Camino Real would be required.

Conversion of the HOV lane to an express lane would allow for improved enforcement, a reduction in the proportion of HOV2+ “cheaters,” and improved managed use to achieve speeds of 45 mph or higher in the express lane.

The HOV to Express Lane Conversion alternative would not yield additional vehicle throughput, however. The HOV and general-purpose lanes each accommodate roughly 1,500 vehicles per hour per lane (vphpl) during peak hours in the peak direction. The capacity of the express lane at level of service (LOS) C is 1,600 vphpl. While the volume of vehicles will likely remain unchanged, the speed of the vehicles using the express lane will likely increase, encouraging more single occupant vehicle (SOV) drivers to carpool and/or utilize commuter buses, if available.

With mainline traffic volumes expected to remain unchanged from no build conditions, no impacts to local streets would be expected.

Railroad Involvement
Six (6) railroad crossings over or under SR 85 occur within the project limits.

1. VTA light rail tracks (Guadalupe Corridor) under southbound SR 85 at PM 1.33.
2. VTA light rail tracks (Guadalupe Corridor) under northbound SR 85 at PM 5.27, just west of Santa Teresa Boulevard.
3. VTA light rail track under SR 85 adjacent to Winfred Boulevard at PM 5.59.
4. Union Pacific track over SR 85 adjacent to Winchester Boulevard at PM 10.98.
5. Caltrain Peninsula Commuter tracks under SR 85 adjacent to Evelyn Avenue at PM 22.63.
6. VTA light rail tracks under SR 85 adjacent to Central Expressway at PM 22.63.

None of these crossings would require bridge work to accommodate the proposed HOV to Express Lane Conversion.

Structure Improvements
Including the Bernal Road and Moffett Boulevard undercrossings at the two ends of the corridor, there are 63 structures which could be affected by the build alternatives. None of these structures would require widening or replacing as a result of implementing the HOV to Express Lane Conversion alternative.

Drainage Improvements
Storm runoff is collected by inlets located along the outside edge of the right-side shoulders and in the center of the median. North of I-280, the right side-shoulders range in width from 4 to 10 feet. To meet the HDM standards for shoulder width, the AC paved shoulders would need to be widened, generally to 10 feet, and drainage inlets relocated to the outside edge of the shoulder.

Utilities

The project area contains overhead electric and communications lines and underground electric, gas, sanitary sewer, water, reclaimed water, communications, and fiber optic lines. Utility providers in the project area are listed below by category.

- Gas and electric—PG&E
- Communications—AT&T, Comcast, Level 3, Verizon, Nextlink, and MCI
- Water—San Jose Water Company, Santa Clara Valley Water District, California Water Service Company, Great Oaks Water Company, City of Sunnyvale Water Division, and City of Mountain View Water Division
- Sanitary—City of San Jose, West Valley Sanitation District, City of Cupertino, and City of Mountain View.

The project would not require utility relocations. Utility impacts would be limited to the extension of casings (protective pipes or channels) for existing underground facilities whose casings do not extend through the right-of-way. All other existing utilities would be protected in place.

Express Lane Begin/End Transitions

The SR 85 express lanes would extend from U.S. 101 in south San Jose to U.S. 101 in Mountain View. The existing HOV direct-connector ramps at both ends of SR 85 would be converted to express lane connectors.

Express Lane Buffer

No buffer is proposed between the express lane and the adjacent general-purpose lanes. A single, white-striped lane line would separate the lanes and continuous access between the lanes would be permitted.

California Highway Patrol Observation/Enforcement Areas and Emergency Refuge Areas

State-of-the-art toll infrastructure will be installed to reduce the need for CHP observation areas given the right-of-way constraints north of South Stelling Road.

Pending future agreements, it is anticipated that the CHP will be contracted to provide toll enforcement including express lane eligibility violations.

Inside median shoulders will be widened south of Stelling Road to Santa Teresa Boulevard to 14 feet in both directions to provide a continuous CHP enforcement area. At structures such as bridges and undercrossings, existing shoulders will be maintained and structures will not be widened for this purpose.

Emergency refuge areas (pullouts for stopped vehicles) along the outside shoulders would be unaffected by the HOV to express lane conversion alternatives.

Toll Infrastructure

The express lane facility would incorporate various toll infrastructure including toll gantries with transponder readers and high-speed digital cameras (49), directional and informational signage, dynamic message signs to communicate real-time toll rates to drivers (25), complete closed circuit television coverage of the entire express lanes corridor, and fiber optics linking the infrastructure to a centralized toll operations office. Toll equipment would meet Title 21 specification and national protocol, as well as interoperability with other toll facilities in California.

The Metropolitan Transportation Commission has prepared a simple fact sheet to further explain toll infrastructure components. This fact sheet is reproduced in whole as Exhibit 1 along with photographs of express lane construction work along I-680 in Walnut Creek and Concord.

The Operations Center mentioned in Exhibit 1 is assumed to be funded by a separate project and not a component of cost for the Route 85 Transit Guideway Project.

Exhibit 1A

3. System Technology and Elements

MTC Express Lanes are implemented by overlaying communications equipment on new and existing freeway infrastructure. Express lanes implementation requires four discrete elements that are integrated through design, construction and operations, including:

Civil Infrastructure (Highway Modifications)

For lane conversions, the civil infrastructure consists of sign structures, sign panels, lane striping, and conduit work for power and communications. For gap closure and extension projects, the civil infrastructure includes highway widening to add lanes as well as the signage and communications equipment required for conversions.

The civil contractor will put in place the foundations and structures upon which the toll systems contractor will install the toll equipment. In addition, the civil contractor will construct the infrastructure necessary to provide power and communications to the toll system.

Toll System

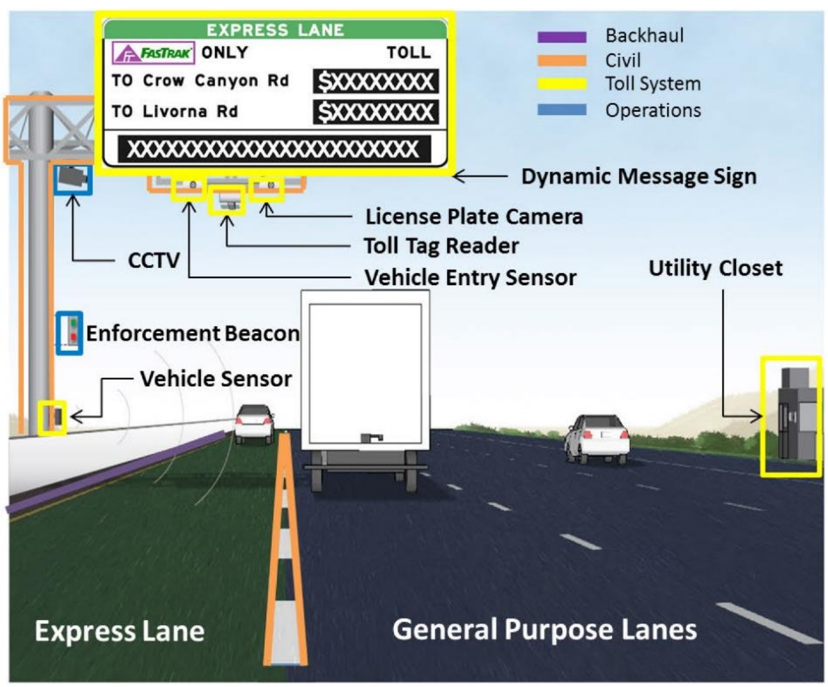
The toll system consists of two components, the in-lane system and the back-end "host" system. The lane system consists of all the equipment on the highway needed to operate the toll system including toll tag readers, cameras and vehicle detection. The host system serves as the brain of the toll system, which collects and processes all the data from the highway and sends it to the regional customer service center for billing.

Backhaul Communications Network

The backhaul network is the communication line along which data collected in the lanes is sent to the toll host system, operations center and regional customer service center. The backhaul contractor will install new conduit and communications fiber as well as utilize existing Caltrans, BART and other infrastructure to build the network. The backhaul network is being designed with the expectation that it will become part of a broader regional communications network.

Operations

The operations element consists of everything that is needed to successfully operate the express lanes including: an operations center, the regional customer service center, enforcement, public outreach, performance monitoring and ongoing maintenance. An express lanes Regional Operations Center will be established in the Bay Area Metrocenter building in San Francisco where operators will actively monitor the condition of the lanes and coordinate with Caltrans and the California Highway Patrol to ensure that the lanes operate efficiently.

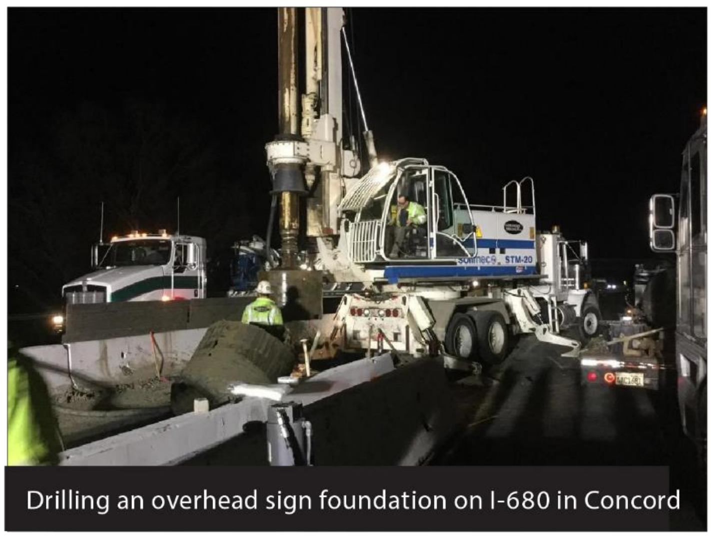


For illustrative purposes only

Source: MTC Express Lanes Program Quarterly Report/1st Quarter 2019

Exhibit 1B

Installing drainage on I-680 in Walnut Creek



Drilling an overhead sign foundation on I-680 in Concord

Extending PG&E service connections on I-680 in Concord

Source: MTC Express Lanes Program Quarterly Report/1st Quarter 2019

Tolling Policies

A *Concept of Operations Report* will be prepared to address various tolling policies under which the express lanes will be operated. This report will provide preliminary information regarding the type of tolling, toll exemption or rate reduction for HOVs, maximum target volume to maintain speed and minimize congestion in the express lanes, method for determining toll amount, methods for toll collection and toll enforcement, penalty rates for toll violations, and provision of supplemental service patrol. The items listed below represent key policies which have been assumed for the SR 85 express lanes; however, they are subject to change pending further studies.

- The express lanes are anticipated to operate part-time during peak hours, Monday through Friday.
- It is anticipated that HOVs with two or more occupants (HOV2+) will be allowed to use the express lanes toll-free. Single-occupancy vehicles will be allowed to use the express lanes for a toll.
- Motorcycles will be allowed to travel in the express lanes toll-free and are not required to have a transponder.
- Exempted vehicles including emergency response vehicles, highway maintenance vehicles serving the express lanes facility, and CHP vehicles assigned to patrol the express lane facility will have toll-free access to the express lanes, by registering these vehicles as toll exempt in the License Plate Recognition system.
- Clean air vehicles with valid clean air vehicle decals will be able to use the express lanes for a toll discount, assumed to 15 percent.
- Tolling is anticipated to be dynamic pricing based on real-time traffic levels to ensure peak period speed of no less than 45 mph.

Additional studies will be performed to establish the operating policies and business rules and determine pricing structures and toll violation rates.

Toll Operations and Maintenance

The institutional arrangements for operation and maintenance of the express lanes will be consistent with those implemented by VTA for the express lane system in Santa Clara County.

Express Lanes Incident Responses

At this time, it is anticipated that Freeway Service Patrol will be contracted to provide incident response for the express lanes similar to the current arrangement in the HOV and general-purpose lanes. It is currently planned to have dedicated roving Freeway Service Patrol patrolling the express lanes during hours of peak congestion, to respond to incidents that might affect the express lanes including clearing of debris, towing disabled vehicles, and minor auto repairs.

Conceptual Engineering Plans

Geometric cross sections for mainline segments and alignment plans **have not been developed** for this alternative. Physical changes include installing toll infrastructure in the median barrier south of Santa Teresa Boulevard and north of Stelling Road to accommodate toll gantries and dynamic message signs and widening the paved median shoulder to 14 feet in both directions from Santa Teresa Boulevard to South Stelling Road.

Right-of-Way Requirements

The HOV to Express Lane conversion project would be constructed entirely within the existing right-of-way.

SCENARIO B—FREEWAY WIDENING WITHOUT TRANSIT STATIONS

Alternative 2-1 and 2-2: Dual Express Lanes

Mainline Improvements

- Add one express lane in each direction from Almaden Expressway to Moffett Boulevard to operate jointly with existing HOV lanes as two express lanes in each direction.
- Convert existing HOV lane in each direction from U.S. 101 (southern end of SR 85) to Almaden Expressway to operate as one express lane in each direction.
- Provide continuous access to the express lane(s) from the adjacent general-purpose lanes.

- Extend existing auxiliary lane on northbound SR 85 from the South De Anza Boulevard northbound on-ramp to 0.2 mile south of the Stevens Creek Boulevard off-ramp.
- Provide CHP enforcement/observation areas in the median at selected locations along the corridor.
- Install double-luminaire mast arm lighting at 250- to 400-foot intervals from PM 6.00 (Almaden Expressway) to PM 17.70 (Stevens Creek Boulevard) and from PM 18.86 (Homestead Road) to PM 23.44 (Moffett Boulevard) as an optional improvement.
- Install high mast lighting at SR 17 and I-280 interchanges as needed to supplement existing as an optional improvement.

Interchange Improvements

Ramp improvements are required to implement this alternative. Conversion of the SR 85 interchange at SR 82/El Camino Real from a cloverleaf Type L-10 ramp configuration to a spread diamond Type L-2 ramp configuration is an optional improvement for consideration.

Partial realignment of ramps is proposed at the interchanges listed in Table 3. A diagram showing the relative location of the ramps is attached to this document as Attachment 1.

Local Street Improvements

No streets crossing under or over SR 85 would be reconstructed to accommodate the dual express lanes alternative. Conversion of the SR 85 interchange at SR 82/El Camino Real from a Type L-10 to a Type L-2, as an optional improvement, would require reconstruction of the ramp terminal intersections, installation of traffic signals, removal of a portion of the raised median and landscaping, and pavement signing and striping to accommodate dual left-turn lanes to the northbound and southbound on-ramps. No widening would be required along El Camino Real.

Table 3 Alternative 2-1 Ramp Improvements

Interchange Name	Ramp No.	Description	Ramp Improvement Partial	Full	None
South De Anza Boulevard	51	South De Anza Boulevard northbound on-ramp	X		
Stevens Creek Boulevard	54	Stevens Creek Boulevard northbound off-ramp			X
	55	Stevens Creek Boulevard southbound on-ramp	X		
	56	Stevens Creek Boulevard southbound off-ramp			X
I-280	57	I-280 northbound off-ramp			X
	58	I-280 northbound loop on-ramp	X		
	59	I-280 northbound on-ramp	X		
	60	I-280 southbound on-ramp			X
	61	I-280 southbound loop on-ramp	X		
	62	I-280 southbound off-ramp	X		
Homestead Road	63	Homestead Road northbound on-ramp	X		
	64	Homestead Road southbound off-ramp	X		
Fremont Avenue	65	Fremont Avenue northbound off-ramp			X
	66	Fremont Avenue northbound on-ramp	X		
	67	Fremont Avenue southbound on-ramp	X		
	68	Fremont Avenue southbound off-ramp	X		
SR 82/El Camino Real	69	SR 82/El Camino Real northbound off-ramp	X		
	70	SR 82/El Camino Real northbound loop on-ramp	X		
	71	SR 82/El Camino Real northbound loop off-ramp	X		
	72	SR 82/El Camino Real northbound on-ramp	X		
	73	SR 82/El Camino Real southbound on-ramp	X		
	74	SR 82/El Camino Real southbound loop off-ramp	X		
	75	SR 82/El Camino Real southbound on-ramp	X		
SR 237	76	SR 237 northbound off-ramp	X		
	77	SR 237 northbound on-ramp	X		
	78	SR 237 southbound on-ramp	X		
	79	SR 237 southbound off-ramp			X
Evelyn Avenue	80	Evelyn Avenue northbound off-ramp	X		
	81	Evelyn Avenue southbound on-ramp	X		

Table 3 Alternative 2-1 Ramp Improvements

Interchange Name	Ramp No.	Description	Ramp Improvement Partial	Full	None
Central Expressway	82	Central Expressway northbound on-ramp	X		
	83	Central Expressway southbound off-ramp	X		
Moffett Boulevard	84	Moffett Boulevard northbound off-ramp	X		
	85	Moffett Boulevard southbound on-ramp	X		

The dual express lane alternative would accommodate additional throughput on the mainline and additional traffic volumes on the off-ramps and on-ramps. An environmental document for express lanes on SR 85, similar in definition to this alternative, was prepared and circulated for public comment from December 30, 2013 until February 28, 2014. The document was an Initial Study (IS) with Negative Declaration/Environmental Assessment (EA) with Finding of No Significant Impact. The Draft IS/EA did not include an analysis of local roadways and arterials.

In response to comments from the City of Saratoga and City of Cupertino, a supplemental assessment of project-related traffic impacts on the local roadways was conducted for 19 intersections in Saratoga and Cupertino, including the intersections of local roadways with SR 85 ramps. Saratoga and Cupertino staff reviewed and provided comments on the assessment materials, and their comments were incorporated into the final IS/EA. The assessment showed that none of the studied intersections would be significantly impacted by the proposed project.

Should this alternative advance to a new environmental assessment of project impacts, the topic of local street improvements, particularly at ramp terminal and adjacent intersections, will need to be revisited.

Railroad Involvement

Six (6) railroad crossings over or under SR 85 occur within the project limits.

1. VTA light rail tracks (Guadalupe Corridor) under southbound SR 85 at PM 1.33.
2. VTA light rail tracks (Guadalupe Corridor) under northbound SR 85 at PM 5.27, just west of Santa Teresa Boulevard.
3. VTA light rail track under SR 85 adjacent to Winfred Boulevard at PM 5.59.
4. Union Pacific track over SR 85 adjacent to Winchester Boulevard at PM 10.98.
5. Caltrain Peninsula Commuter tracks under SR 85 adjacent to Evelyn Avenue at PM 22.63.
6. VTA light rail tracks under SR 85 adjacent to Central Expressway at PM 22.63.

None of these crossings would require bridge work to accommodate the proposed freeway widening for the addition of one express lane in each direction.

Structure Improvements

The dual express lane alternative would necessitate the widening of nine bridge or undercrossing structures, the replacement of embankments with retaining walls at two overcrossings, and the replacement of one pedestrian overcrossing. Table 4 summarizes the proposed structure improvements under Alternative 2-2.

Table 4 Alternative 2-2 Structure Improvements

Structure No.	Postmile	Structure Name	Type*	Structure Improvement No Work	Widen	Replace
1	0.20	Bernal Road	Undercrossing	X		
2	0.29	Monterey Road/Union Pacific/Great Oaks Boulevard	Undercrossing/overpass	X		
3	1.22	Via Del Oro	Undercrossing	X		
4	1.33	VTA Light Rail	Overpass	X		
5	1.97	Cottle Road	Overcrossing	X		
6	2.73	Lean Avenue	Overcrossing	X		
7	3.48	Snell Avenue	Overcrossing	X		
8	3.93	Blossom Hill Road	Overcrossing	X		
9	4.28	Canoas Creek	Bridge	X		
10	4.50	Cahalan Avenue	Pedestrian undercrossing	X		
11	4.84	Southbound SR 87 to southbound SR 85	Overcrossing	X		

Table 4 Alternative 2-2 Structure Improvements

Structure No.	Postmile	Structure Name	Type*	Structure Improvement: No Work	Widen	Replace
12	5.20	Santa Teresa Boulevard	Undercrossing	X		
13	5.27	VTA Light Rail	Overpass	X		
14	5.31	Southbound SR 85 to northbound SR 87	Overcrossing	X		
15	5.59	Winfred Blvd/Guadalupe River/Sanchez Drive	Bridge	X		
16	6.00	Almaden Expressway	Undercrossing		X	
17	6.46	Russo Drive	Pedestrian overcrossing	X		
18	7.30	Meridian Avenue	Overcrossing	X		
19	7.50	Dent Avenue	Pedestrian overcrossing	X		
20	8.11	Camden Avenue	Undercrossing		X	
21	8.77	Leigh Avenue	Overcrossing	X		
22	9.28	Union Avenue	Overcrossing	X		
23	9.93	Samaritan Place	Pedestrian overcrossing	X		
24	10.23	Bascom Avenue	Overcrossing	X		
25	10.40	Southbound SR 17 to southbound SR 85	Undercrossing	X		
26	10.48	SR 17	Separation	X		
27	10.60	Oka Road	Undercrossing		X	
28	10.80	Los Gatos Creek	Bridge		X	
29	10.90	Winchester Boulevard	Underpass	X		
30	11.00	Winchester Boulevard	Overcrossing	X		
31	11.97	Pollard Road	Undercrossing		X	
32	12.45	More Avenue	Pedestrian overcrossing	X		
33	12.68	San Tomas Aquino Creek	Bridge		X	
34	12.91	Quito Road	Overcrossing	X		
35	13.73	Saratoga Avenue	Undercrossing		X	
36	13.91	Saratoga Creek	Bridge		X	
37	14.28	Cox Avenue	Overcrossing	X		
38	14.31	Cox Avenue utility	Overcrossing	X		
39	14.73	Scully Avenue utility	Overcrossing	X		
40	14.84	Blue Hills	Pedestrian overcrossing	X		
41	15.27	Prospect Road	Overcrossing	X		
42	15.40	Calabazas Creek	Bridge		X	
43	15.87	South De Anza Boulevard	Overcrossing	X		
44	16.61	South Stelling Road	Overcrossing		X	
45	17.17	McClellan Road	Overcrossing		X	
46	17.70	Stevens Creek Boulevard	Overcrossing	X		
47	18.35	Southbound/eastbound I-280	Undercrossing	X		
48	18.41	SR 85/I-280	Separation	X		
49	18.43	Northbound/westbound I-280	Undercrossing	X		
50	18.86	Homestead Road	Overcrossing	X		
51	19.39	The Dalles	Pedestrian overcrossing			X
52	19.86	Fremont Avenue	Undercrossing	X		
53	20.02	Stevens Creek	Bridge	X		
54	20.37	Hawkins Drive	Right-of-way	X		
55	20.69	Permanente Creek Diversion Channel	Culvert	X		
56	21.10	Stevens Creek Trail/Dale Avenue	Pedestrian overcrossing	X		
57	21.75	SR 82/SR 85/El Camino Real	Separation	X		
58	22.13	SR 85/SR 237	Separation	X		
59	22.43	Dana Street	Overcrossing	X		
60	22.63	Evelyn Avenue/Caltrain/Light Rail/Central Expressway	Undercrossing/overpass	X		
61	22.95	Stevens Creek	Bridge	X		
62	23.19	Middlefield Road	Overcrossing	X		
63	23.44	Moffett Boulevard	Undercrossing	X		

*Type:
- Undercrossing = local road under State highway
- Overcrossing = local road over State highway
- Pedestrian overcrossing = Pedestrian crossing over State highway
- Separation = State highway crossing
- Underpass = State highway under railroad
- Overpass = State highway over railroad
- Right-of-way = right-of-way required

The bridge and undercrossing widening would close the existing spaces between the separate northbound and southbound structures by installing new bridge decking in the median. At each location, the bridge decks would be extended using precast, prestressed concrete beams supported by new abutments and columns. Bridge crossings of creeks are assumed to be free span between the abutments at each end of the bridge, except for the Los Gatos Creek bridge which has two spans. Table 5 provides more specific information regarding the nine bridge and undercrossing structures that would be widened.

An existing auxiliary lane would be extended along a 1.1-mile segment of northbound SR 85 between the existing South De Anza Boulevard northbound on-ramp and 0.2 mile south of the Stevens Creek Boulevard northbound off-ramp where the auxiliary lane currently begins. The existing pavement would be widened by up to 14 feet to the outside (northeast). To accommodate the auxiliary lane, sections of the existing abutments at South Stelling Road and McClellan Road overcrossings adjacent to northbound SR 85 would be removed and replaced by new retaining walls to support the embankments behind them.

Table 5 Alternative 2-2 Structure Improvements

Structure No.	Postmile	Name	Type	Length (feet)	Spans (existing)	Minimum Vertical Clearances (feet)	Widening (feet)
16	6.0	Almaden Expressway	Undercrossing	238	2	19.16	50
20	8.11	Camden Avenue	Undercrossing	210	2	15.49	45
27	10.60	Oka Road	Undercrossing	102	1	16.31	33
28	10.80	Los Gatos Creek	Bridge	178	2	–	29
31	11.97	Pollard Road	Undercrossing	196	1	16.47	23
33	12.68	San Tomas Aquino Creek	Bridge	105	1	–	23
35	13.73	Saratoga Avenue	Undercrossing	192	2	16.67	23
36	13.91	Saratoga Creek	Bridge	100	1	–	23
42	15.40	Calabazas Creek	Bridge	156	2	–	22

The segment of northbound SR 85 where the extended auxiliary lane is proposed is up to 25 feet lower in elevation than surrounding development. In the majority of this segment, retaining walls extend along the toe of the slope by approximately 14 feet beyond the northbound shoulder, and sound walls exist at the top of the slope along the edge of the right-of-way. Widening for the proposed auxiliary lane would occur in the area between the northbound shoulder and the retaining walls or toe of the slope. The new retaining walls at the South Stelling Road and McClellan Road overcrossings would replace existing slope areas adjacent to northbound SR 85.

Drainage Improvements

Storm runoff is collected by inlets located along the outside edge of the right-side shoulders and in the center of the median. The dual express lane alternative will widen the travelway by adding one lane in each direction in the median. The elevation of the inlets located in the median may need to be adjusted (raised) to meet the plane of the widened travelway.

North of I-280, the right-side shoulders range in width from 4 to 10 feet. To meet the HDM standards for shoulder width, the AC paved shoulders would need to be widened, generally to 10 feet, and drainage inlets relocated to the outside edge of the shoulder.

Utilities

The project area contains overhead electric and communications lines and underground electric, gas, sanitary sewer, water, reclaimed water, communications, and fiber optic lines. Utility providers in the project area are listed below by category.

- Gas and electric—PG&E
- Communications—AT&T, Comcast, Level 3, Verizon, Nextlink, and MCI

- Water—San Jose Water Company, Santa Clara Valley Water District, California Water Service Company, Great Oaks Water Company, City of Sunnyvale Water Division, and City of Mountain View Water Division
- Sanitary—City of San Jose, West Valley Sanitation District, City of Cupertino, and City of Mountain View.

The project would not require utility relocations. Utility impacts would be limited to the extension of casings (protective pipes or channels) for existing underground facilities whose casings do not extend through the right-of-way. All other existing utilities would be protected in place.

Express Lane Begin/End Transitions

The SR 85 express lanes would extend from U.S. 101 in south San Jose to U.S. 101 in Mountain View. The existing HOV direct-connector ramps at both ends of SR 85 would be converted to express lane connectors. North of the northbound and southbound mainline bridges spanning Winfred Boulevard, Guadalupe River, and Sanchez Drive, a second express lane would be added in the median traveling northbound and dropped traveling southbound.

At the north end of SR 85, the second express lane would be added in the median immediately south of the southbound U.S. 101 to southbound SR 85 express lane (converted HOV lane) direct-connector ramp. Northbound, the inside express lane would connect directly with the northbound SR 85 to northbound U.S. 101 express lane (converted HOV lane) direct-connector ramp. The remaining express lane would continue as a general-purpose lane.

Express Lane Buffer

No buffer is proposed between the dual express lanes and the adjacent general-purpose lanes. A single, white striped lane line would separate the lanes and continuous access between the lanes would be permitted.

California Highway Patrol Observation/Enforcement Areas and Emergency Refuge Areas

State-of-the-art toll infrastructure will be installed to reduce the need for CHP observation areas given the right-of-way constraints north of South Stelling Road.

Pending future agreements, it is anticipated that the CHP will be contracted to provide toll enforcement including express lane eligibility violations.

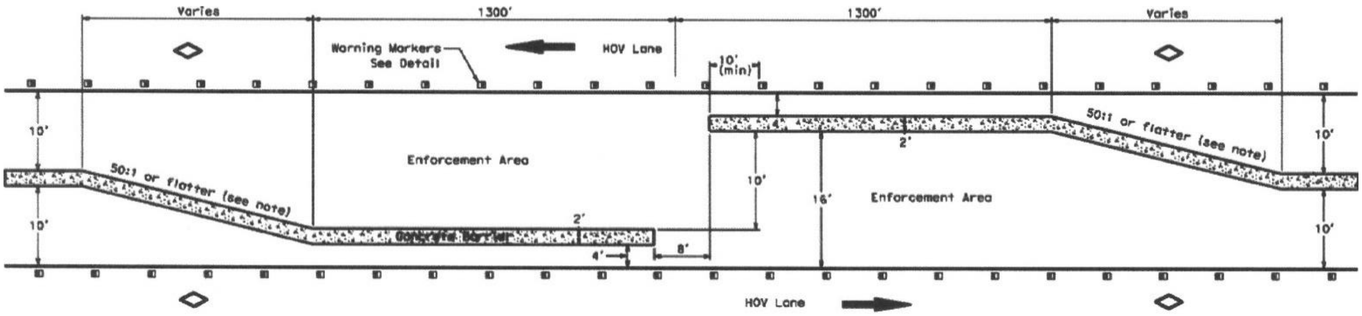
Existing emergency refuge areas (ERA) and proposed CHP observation/enforcement areas are listed in Table 6.

Table 6 Existing Emergency Refuge Areas and Proposed CHP Observation/Enforcement Areas

Northbound		Southbound	
1. Cottle Road	PM 1.97	1. Cottle Road	PM 1.97
2. Blossom Hill Road	PM 3.93	2. Blossom Hill Road	PM 3.93
3. Santa Teresa Boulevard	PM 5.20	*Rimwood Drive CHP*	*PM 6.72*
4. Almaden Expressway	PM 5.98	3. North of Russo Drive	PM 6.78
5. Almaden Expressway	PM 6.02	4. North of Leigh Avenue	PM 8.80
Rimwood Drive CHP	*PM 6.72*	5. North of Union Avenue	PM 9.66
6. North of Dent Avenue	PM 7.65	*Mulberry Drive CHP*	*PM 11.60*
7. North of Union Avenue	PM 9.34	6. South of Pollard Road	PM 11.71
8. North of Union Avenue	PM 9.50	7. More Avenue pedestrian overcrossing	PM 12.45
9. South of SR 17	PM 10.38	8. San Tomas Aquino Creek	PM 12.69
10. North of SR 17	PM 10.57	9. North of Saratoga Creek	PM 14.05
Mulberry Drive CHP	*PM 11.60*	10. Cox Avenue utility	PM 14.31
11. More Avenue pedestrian overcrossing	PM 12.45	*Hollanderry Place CHP*	*PM 16.23*
12. San Tomas Aquino Creek	PM 12.67	11. South of El Camino Real	PM 21.68
13. North of Saratoga Creek	PM 14.05	12. North of El Camino Real	PM 21.80
14. Cox Avenue utility	PM 14.31	13. North of El Camino Real	PM 21.84
Hollanderry Place CHP	*PM 16.23*		
15. South of Homestead Road	PM 18.80		
16. South of El Camino Real	PM 21.66		

Exhibit 2 illustrates a suggested layout for the proposed CHP observation/enforcement areas.

Exhibit 2. Bidirectional Enforcement Areas for Wide Medians



Toll Infrastructure

The express lane facility would incorporate various toll infrastructure including toll gantries with transponder readers and high-speed digital cameras (49), directional and informational signage, dynamic message signs to communicate real-time toll rates to drivers (25), complete closed circuit television coverage of the entire express lanes corridor, and fiber optics linking the infrastructure to a centralized toll operations office. Toll equipment would meet Title 21 specification and national protocol, as well as interoperability with other toll facilities in California.

Trenching would be conducted along the outside edge of pavement for installation of conduits. The depth of trenching would be 3 to 5 feet below the roadway surface. Conduits would be jacked across the freeway to the median where needed to provide power and communication feeds to the new overhead signs and toll structures.

The project would install new overhead and barrier-mounted signs, including dynamic message signs. The overhead signs would be installed in the median on cantilever structures supported on piles.

In some locations the express lane signs would replace existing signs or be added to existing sign structures, but most would be at new locations along SR 85. The exact number and locations of these features will be determined during the project design phase in coordination with the toll system design.

Please see Exhibit 1A, which further clarifies toll infrastructure components.

Tolling Policies

A *Concept of Operations Report* will be prepared to address various tolling policies under which the express lanes will be operated. This report will provide preliminary information regarding the type of tolling, toll exemption or rate reduction for HOVs, maximum target volume to maintain speed and minimize congestion in the express lanes, method for determining toll amount, methods for toll collection and toll enforcement, penalty rates for toll violations, and provision of supplemental service patrol. The items listed below represent key policies which have been assumed for the SR 85 express lanes; however, they are subject to change pending further studies.

- The express lanes are anticipated to operate part-time during peak hours, Monday through Friday.
- It is anticipated that HOVs with two or more occupants (HOV2+) will be allowed to use the express lanes toll-free. Single-occupancy vehicles will be allowed to use the express lanes for a toll.
- Motorcycles will be allowed to travel in the express lanes toll-free and are not required to have a transponder.
- Exempted vehicles including emergency response vehicles, highway maintenance vehicles serving the express lanes facility, and CHP vehicles assigned to patrol the express lane facility will have toll-free access to the express lanes, by registering these vehicles as toll exempt in the License Plate Recognition system.
- Clean air vehicles with valid clean air vehicle decals will be able to use the express lanes for a toll discount, assumed to 15 percent.
- Tolling is anticipated to be dynamic pricing based on real-time traffic levels to ensure peak period speed of no less than 45 mph.

Additional studies will be performed to establish the operating policies and business rules and determine pricing structures and toll violation rates.

Toll Operations and Maintenance

The institutional arrangements for operation and maintenance of the express lanes will be consistent with those implemented by VTA for the express lane system in Santa Clara County.

Express Lanes Incident Responses

At this time, it is anticipated that Freeway Service Patrol will be contracted to provide incident response for the express lanes similar to the current arrangement in the HOV and general-purpose lanes. It is currently planned to have dedicated roving Freeway Service Patrol patrolling the express lanes during hours of peak congestion, to respond to incidents that might affect the express lanes including clearing of debris, towing disabled vehicles, and minor auto repairs.

Conceptual Engineering Plans

Geometric cross sections for mainline segments and segments passing structures with restrictive widths are provided in Attachment 2.

Alignment plans for the dual express lane alternative are provided in Attachment 3 for the mainline segment from Prospect Road (PM 15.27) to just south of U.S. 101 in Mountain View (PM 23.70). Plan sheets are also provided for the segment from Almaden Boulevard to Santa Teresa Boulevard where the express lanes transition from one to two lanes in each direction.

Right-of-Way Requirements

South of I-280, in segments 1 and 2 of the corridor, the project would be constructed entirely within the existing right-of-way.

North of I-280, in segment 3 of the corridor, the alignment plans provided in Attachment 3 indicate that the pedestrian overcrossing at The Dalles (PM 19.39), illustrated on Sheet 17, will need to be relocated. This relocation will likely require new right-of-way to the east of SR 85 if the pedestrian overcrossing is reconstructed at this location.

A potential right-of-way impact is illustrated on Sheet 14 in Attachment 3 at PM 20.37 where the right-side shoulder narrows to six feet. A Design Standards Decision Document will need to be prepared and approved by Caltrans Division of Design Chief to avoid acquiring right-of-way and relocating the adjacent sound wall at this location.

SCENARIO C—FREEWAY WIDENING WITH TRANSIT STATIONS

Alternative 3-1 (Median) and Alternative 3-2 (Right-side)

Mainline Improvements

- Convert existing HOV lane in each direction from U.S. 101 (southern end of SR 85) to U.S. 101 in Mountain View to operate as a single express lane in each direction.
- Add one lane in each direction from Almaden Expressway to Evelynn Avenue or Moffett Boulevard. The added lane would be positioned in the existing median as the number 1 (inside) lane.
- With Alternative 3-1, the transit lane would occupy the number 1 lane position. With Alternative 3-2, the transit lane would occupy the number 4 (outside) lane position.
- Provide a buffer to separate the transit lane from the adjacent express lane (Alternative 3-1) or general-purpose lane (Alternative 3-2).
- Provide continuous access to the express lane(s) from the adjacent general-purpose lanes.
- Extend existing auxiliary lane on northbound SR 85 from the South De Anza Boulevard northbound on-ramp to 0.2 mile south of the Stevens Creek Boulevard off-ramp.
- Provide CHP enforcement/observation areas in the median at selected locations along the corridor.

- Install double-luminaire mast arm lighting at 250- to 400-foot intervals from postmile (PM) 6.00 (Almaden expressway) to PM 17.70 (Stevens Creek Boulevard) and from PM 18.86 (Homestead Road) to PM 23.44 (Moffett Boulevard) as an optional improvement.
- Install high mast lighting at SR 17 and I-280 interchanges as needed to supplement existing lighting as an optional improvement.

Interchange Improvements

Ramp improvements are required to implement this alternative. Conversion of the SR 85 interchange at SR 82/El Camino Real from a cloverleaf Type L-10 ramp configuration to a spread diamond Type L-2 ramp configuration is required to enable the provision of a transit station at this location.

Partial realignment of ramps is proposed at the interchanges listed in Table 7. A diagram showing the relative location of the ramps is attached to this document as Attachment 1.

Table 7 Alternative 3-2 Structure Improvements

			Ramp Improvement			
Interchange Name	**Ramp No.**	**Description**	**Partial**	**Full**	**Remove**	**None**
South De Anza Boulevard	51	South De Anza Boulevard northbound on-ramp	X			
Stevens Creek Boulevard	54	Stevens Creek Boulevard northbound off-ramp	X			
	55	Stevens Creek Boulevard southbound on-ramp	X			
	56	Stevens Creek Boulevard southbound off-ramp	X			
I-280	57	I-280 northbound off-ramp	X			
	58	I-280 northbound loop on-ramp				X
	59	I-280 northbound on-ramp	X			
	60	I-280 southbound on-ramp				X
	61	I-280 southbound loop on-ramp				X
	62	I-280 southbound off-ramp	X			
Homestead Road	63	Homestead Road northbound on-ramp	X			
	64	Homestead Road southbound off-ramp	X			
Fremont Avenue	65	Fremont Avenue northbound off-ramp				X
	66	Fremont Avenue northbound on-ramp	X			
	67	Fremont Avenue southbound on-ramp	X			
	68	Fremont Avenue southbound off-ramp	X			
SR 82/El Camino Real	69	SR 82/El Camino Real northbound off-ramp		X		
	70	SR 82/El Camino Real northbound loop on-ramp			X	
	71	SR 82/El Camino Real northbound loop off-ramp			X	
	72	SR 82/El Camino Real northbound on-ramp		X		
	73	SR 82/El Camino Real southbound on-ramp	X			
	74	SR 82/El Camino Real southbound loop off-ramp			X	
	75	SR 82/El Camino Real southbound on-ramp			X	
SR 237	76	SR 237 northbound off-ramp	X			
	77	SR 237 northbound on-ramp	X			
	78	SR 237 southbound on-ramp	X			
	79	SR 237 southbound off-ramp				X
Evelyn Avenue	80	Evelyn Avenue northbound off-ramp	X			
	81	Evelyn Avenue southbound on-ramp	X			
Central Expressway	82	Central Expressway northbound on-ramp	X			
	83	Central Expressway southbound off-ramp	X			
Moffett Boulevard	84	Moffett Boulevard northbound off-ramp	X			
	85	Moffett Boulevard southbound on-ramp	X			

The “Mainline Improvements” listed above indicated that the one lane added in each direction would extend from Almaden Expressway to Evelyn Avenue or Moffett Boulevard. As an option, Alternative 3-1 (Median) Long Transit Lane could include a drop ramp from the median of SR 85 to Evelyn Avenue in lieu of continuing the transit lanes to Moffett Boulevard.

Figure 3 illustrates a conceptual alignment plan for this option. The median direct connector ramp is facilitated by the freeway mainline rising by 16 feet between Dana Street and Evelyn Avenue, while the median transit lanes drop in elevation by 12 feet to meet the grade of Evelyn Avenue (see Figure 4). To construct the drop ramp, a tunnel could be "jacked" under the northbound travel lanes without the need to temporarily close the freeway (see Exhibit 3). Commuter buses not using the median drop lane could continue north to Moffett Boulevard and U.S. 101 using the adjacent express lane. Alternative 3-2 (Right-side) Long Transit Lane would allow VTA buses to utilize the right-side off-ramp and on-ramp to and from Evelyn Avenue while also allowing the transit lane to continue north to Moffett Boulevard for use by commuter buses.

Local Street Improvements

No streets crossing under or over SR 85 would be reconstructed to accommodate the transit lanes alternatives. Conversion of the SR 85 interchange at SR 82/El Camino Real from a Type L-10 cloverleaf layout to a Type L-2 spread diamond layout would require reconstruction of the ramp terminal intersections, installation of traffic signals, removal of a portion of the raised median and landscaping, and pavement signing and striping to accommodate dual left-turn lanes to the northbound and southbound on-ramps. No widening of El Camino Real would be required.

Conversion of the HOV lane to an express lane would allow for improved enforcement, a reduction in the proportion of HOV2+ "cheaters," and improved managed use to achieve speeds of 45 mph or higher in the express lane.

The HOV to Express Lane Conversion aspect of this alternative would not yield additional vehicle throughput, however. The HOV and general-purpose lanes each accommodate roughly 1,500 vehicles per hour per lane (vphpl) during peak hours in the peak direction. The capacity of the express lane at LOS C is 1,600 vphpl. While the volume of vehicles will likely remain unchanged, the speed of the vehicles using the express lane will likely increase, encouraging more SOV drivers to carpool and/or utilize commuter buses, if available.

With mainline traffic volumes expected to remain unchanged from no build conditions, no impacts to local streets would be expected.

Railroad Involvement

Six (6) railroad crossings over or under SR 85 occur within the project limits.

1. VTA light rail tracks (Guadalupe Corridor) under southbound SR 85 at PM 1.33.
2. VTA light rail tracks (Guadalupe Corridor) under northbound SR 85 at PM 5.27, just west of Santa Teresa Boulevard.
3. VTA light rail track under SR 85 adjacent to Winfred Boulevard at PM 5.59.
4. Union Pacific track over SR 85 adjacent to Winchester Boulevard at PM 10.98.
5. Caltrain Peninsula Commuter tracks under SR 85 adjacent to Evelyn Avenue at PM 22.63.
6. VTA light rail tracks under SR 85 adjacent to Central Expressway at PM 22.63.

None of these crossings would require bridge work to accommodate the proposed freeway widening for the addition of one transit lane in each direction.

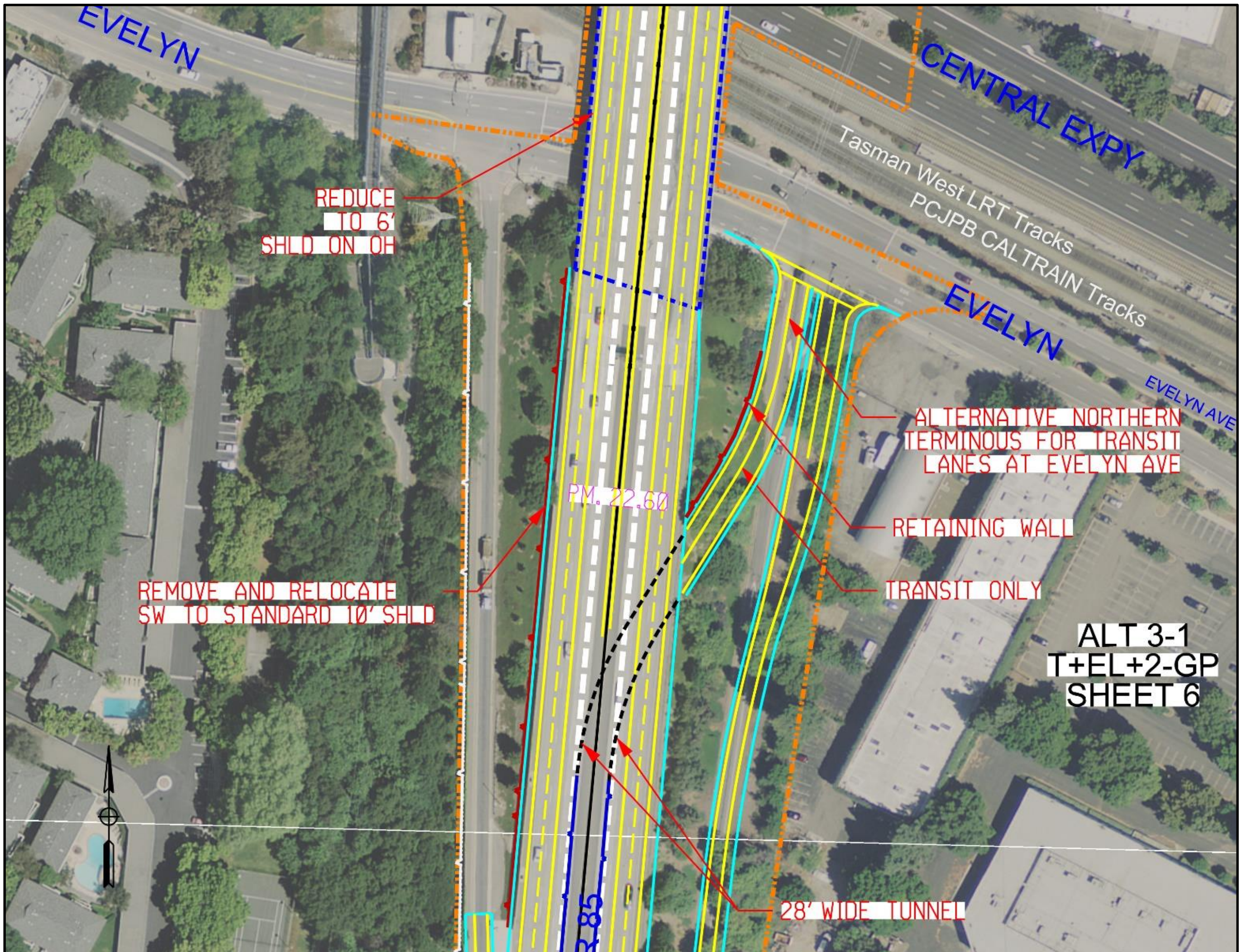


Figure 3 Alternative 3-1 Conceptual Alignment Plan for Direct Connector Drop Ramp to Evelyn Avenue

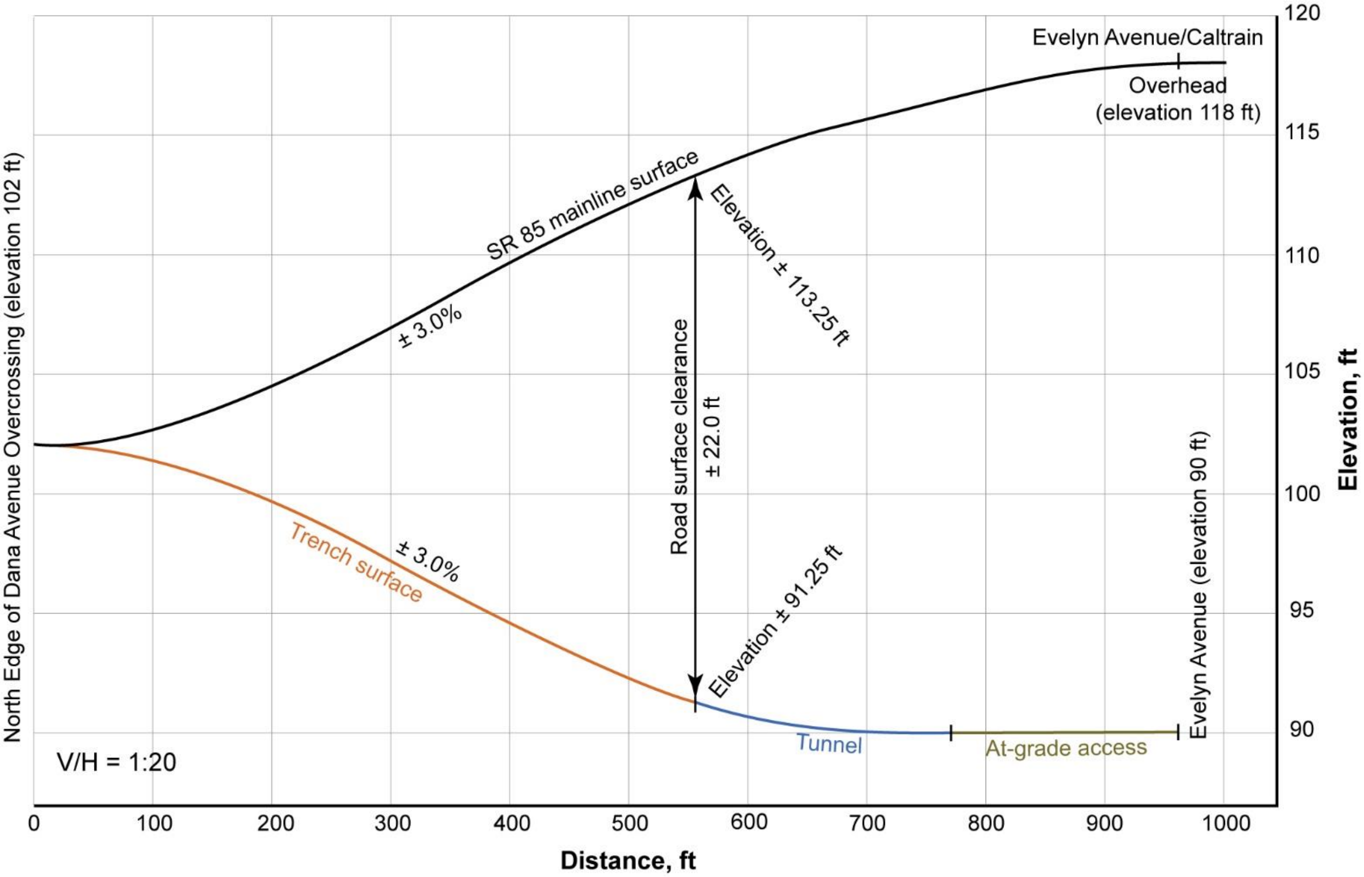
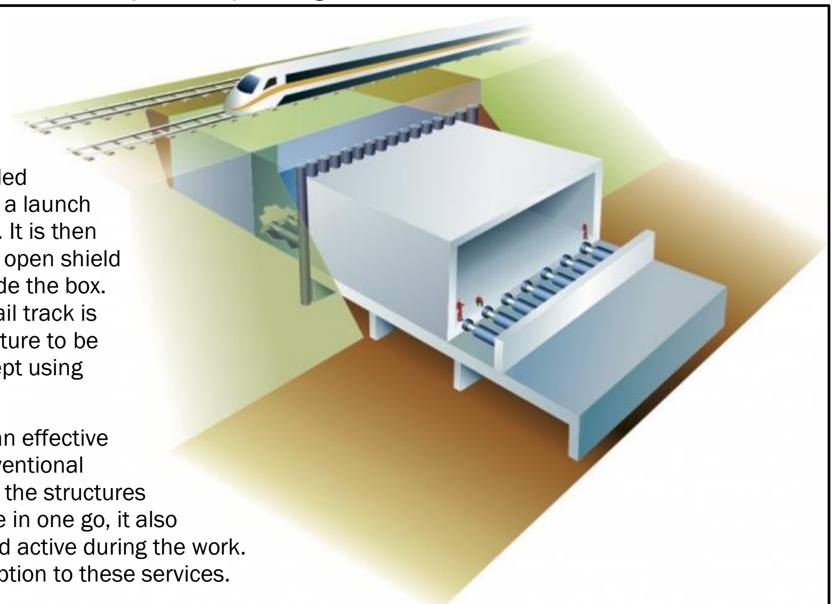


Figure 4 Conceptual Vertical Profile for Direct Connector Drop Ramp to Evelyn Avenue

Exhibit 3. Box (or Tunnel) Jacking

BOX JACKING



Box jacking, also known as Tunnel Jacking, involves the advancement of a site cast rectangular or other shaped sections using high capacity hydraulic jacks. The structure to be installed is constructed, normally in reinforced concrete, on a launch pad at site adjacent to where it has to be installed. It is then thrust forward horizontally using advance support, open shield and jacking technology with taking place from inside the box. This is frequently used where an existing road or rail track is on an embankment and space exists for the structure to be cast at the side. There are variations on this concept using short pre-cast units to form the box.

The main benefit of this approach is that it offers an effective alternative to disruptive open cut techniques, conventional tunneling methods being inappropriate so close to the structures above. Tunnel jacking can install the final structure in one go, it also allows the above infrastructure to remain "live" and active during the work. This obviously significantly reduces potential disruption to these services.

A number of installations have been made where the top of the box is immediately below the track. The system is designed for the track loads to be picked up by the box roof as it advances.

Source: Jacked Structures, Cheshire, United Kingdom

Structure Improvements

The transit lane alternatives would necessitate the widening of nine bridge or undercrossing structures, the replacement of embankments with retaining walls at three overcrossings, and the replacement of one pedestrian overcrossing. Table 8 summarizes the proposed structure improvements under Alternatives 3-1 and 3-2.

Table 8 Long Transit Lane Alternatives Structure Improvements

Structure No.	Postmile	Structure Name	Type*	Structure Improvement No Work	Structure Improvement Widen	Structure Improvement Replace
1	0.20	Bernal Road	Undercrossing	X		
2	0.29	Monterey Road/Union Pacific/Great Oaks Boulevard	Undercrossing/overpass	X		
3	1.22	Via Del Oro	Undercrossing	X		
4	1.33	VTA Light Rail	Overpass	X		
5	1.97	Cottle Road	Overcrossing	X		
6	2.73	Lean Avenue	Overcrossing	X		
7	3.48	Snell Avenue	Overcrossing	X		
8	3.93	Blossom Hill Road	Overcrossing	X		
9	4.28	Canoas Creek	Bridge	X		
10	4.50	Cahalan Avenue	Pedestrian undercrossing	X		
11	4.84	Southbound SR 87 to southbound SR 85	Separation	X		
12	5.20	Santa Teresa Boulevard	Undercrossing	X		
13	5.27	VTA Light Rail	Overpass	X		
14	5.31	Southbound SR 85 to northbound SR 87	Separation	X		
15	5.59	Winfred Blvd/Guadalupe River/Sanchez Drive	Bridge	X		
16	6.00	Almaden Expressway	Undercrossing		X	
17	6.46	Russo Drive	Pedestrian overcrossing	X		
18	7.30	Meridian Avenue	Overcrossing	X		
19	7.50	Dent Avenue	Pedestrian overcrossing	X		
20	8.11	Camden Avenue	Undercrossing	X	X	
21	8.77	Leigh Avenue	Overcrossing	X		
22	9.28	Union Avenue	Overcrossing	X		
23	9.93	Samaritan Place	Pedestrian overcrossing	X		
24	10.23	Bascom Avenue	Overcrossing	X		
25	10.40	Southbound SR 17 to southbound SR 85	Separation	X		
26	10.48	SR 17	Separation	X		
27	10.60	Oka Road	Undercrossing		X	
28	10.80	Los Gatos Creek	Bridge		X	
29	10.90	Winchester Boulevard	Underpass	X		
30	11.00	Winchester Boulevard	Overcrossing	X		
31	11.97	Pollard Road	Undercrossing		X	
32	12.45	More Avenue	Pedestrian overcrossing	X		
33	12.68	San Tomas Aquino Creek	Bridge		X	
34	12.91	Quito Road	Overcrossing	X		
35	13.73	Saratoga Avenue	Undercrossing		X	
36	13.91	Saratoga Creek	Bridge		X	
37	14.28	Cox Avenue	Overcrossing	X		
38	14.31	Cox Avenue utility	Overcrossing	X		
39	14.73	Scully Avenue utility	Overcrossing	X		
40	14.84	Blue Hills	Pedestrian overcrossing	X		
41	15.27	Prospect Road	Overcrossing	X		
42	15.40	Calabazas Creek	Bridge		X	
43	15.87	South De Anza Boulevard	Overcrossing	X		
44	16.61	South Stelling Road	Overcrossing		X	
45	17.17	McClellan Road	Overcrossing		X	
46	17.70	Stevens Creek Boulevard	Overcrossing		X	
47	18.35	Southbound/eastbound I-280	Separation	X		
48	18.41	SR 85/I-280	Separation	X		
49	18.43	Northbound/westbound I-280	Separation	X		
50	18.86	Homestead Road	Overcrossing	X		
51	19.39	The Dalles	Pedestrian overcrossing			X

Table 8 Long Transit Lane Alternatives Structure Improvements

Structure No.	Postmile	Structure Name	Type*	Structure Improvement No Work	Widen	Replace
52	19.86	Fremont Avenue	Undercrossing	X		
53	20.02	Stevens Creek	Bridge	X		
54	20.37	Hawkins Drive	Right-of-way	X		
55	20.69	Permanente Creek Diversion Channel	Culvert	X		
56	21.10	Stevens Creek Trail/Dale Avenue	Pedestrian overcrossing	X		
57	21.75	SR 82/SR 85/El Camino Real	Separation	X		
58	22.13	SR 85/SR 237	Separation	X		
59	22.43	Dana Street	Overcrossing	X		
60	22.63	Evelyn Avenue/Caltrain/Light Rail/Central Expressway	Undercrossing/overpass	X		
61	22.95	Stevens Creek	Bridge	X		
62	23.19	Middlefield Road	Overcrossing	X		
63	23.44	Moffett Boulevard	Undercrossing	X		

*Type:
- Undercrossing = local road under State highway
- Overcrossing = local road over State highway
- Pedestrian overcrossing = Pedestrian crossing over State highway
- Separation = State highway crossing
- Underpass = State highway under railroad
- Overpass = State highway over railroad
- Right-of-way = right-of-way required

The bridge and undercrossing widening would close the existing spaces between the separate northbound and southbound structures by installing new bridge decking in the median. At each location, the bridge decks would be extended using precast, prestressed concrete beams supported by new abutments and columns. Bridge crossings of creeks are assumed to be free span between the abutments at each end of the bridge, except for the Los Gatos Creek bridge which has two spans. **Table 5**, reported earlier, provides more specific information regarding the nine bridge and undercrossing structures that would be widened.

An existing auxiliary lane would be extended along a 1.1-mile segment of northbound SR 85 between the existing South De Anza Boulevard northbound on-ramp and 0.2 mile south of the Stevens Creek Boulevard northbound off-ramp where the auxiliary lane currently begins. The existing pavement would be widened by up to 14 feet to the outside (northeast). To accommodate the auxiliary lane, sections of the existing abutments at South Stelling Road and McClellan Road overcrossings adjacent to northbound SR 85 would be removed and replaced by new retaining walls to support the embankments behind them.

The segment of northbound SR 85 where the extended auxiliary lane is proposed is up to 25 feet lower in elevation than surrounding development. In the majority of this segment, retaining walls extend along the toe of the slope by approximately 14 feet beyond the northbound shoulder, and sound walls exist at the top of the slope along the edge of the right-of-way. Widening for the proposed auxiliary lane would occur in the area between the northbound shoulder and the retaining walls or toe of the slope. The new retaining walls at the South Stelling Road and McClellan Road overcrossings would replace existing slope areas adjacent to northbound SR 85.

Drainage Improvements

Storm runoff is collected by inlets located along the outside edge of the right-side shoulders and in the center of the median. The transit lane alternatives will widen the travelway by adding one lane in each direction in the median. The elevation of the inlets located in the median may need to be adjusted (raised) to meet the plane of the widened travelway.

North of I-280, the right-side shoulders range in width from 4 to 10 feet. To meet the HDM standards for shoulder width, the AC paved shoulders would need to be widened, generally to 10 feet, and drainage inlets relocated to the outside edge of the shoulder.

Utilities

The project area contains overhead electric and communications lines and underground electric, gas, sanitary sewer, water, reclaimed water, communications, and fiber optic lines. Utility providers in the project area are listed below by category.

- Gas and electric—PG&E
- Communications—AT&T, Comcast, Level 3, Verizon, Nextlink, and MCI
- Water—San Jose Water Company, Santa Clara Valley Water District, California Water Service Company, Great Oaks Water Company, City of Sunnyvale Water Division, and City of Mountain View Water Division
- Sanitary—City of San Jose, West Valley Sanitation District, City of Cupertino, and City of Mountain View.

The project would not require utility relocations. Utility impacts would be limited to the extension of casings (protective pipes or channels) for existing underground facilities whose casings do not extend through the right-of-way. All other existing utilities would be protected in place.

Transit and Express Lane Begin/End Transitions

The SR 85 express lanes would extend from U.S. 101 in south San Jose to U.S. 101 in Mountain View. The existing direct-connector ramps at both ends of SR 85 would be converted to express lane connectors. North of Santa Teresa Boulevard, the northbound and southbound mainline bridges spanning Winfred Boulevard, Guadalupe River, and Sanchez Drive, a second lane would be added in the median traveling northbound and dropped traveling southbound.

At the north end of SR 85, the second lane would be added in the median immediately south of the southbound U.S. 101 to southbound SR 85 express lane (converted HOV lane) direct-connector ramp. Northbound, the inside lane would connect directly with the northbound SR 85 to northbound U.S. 101 express lane (converted HOV lane) direct-connector ramp. The remaining lanes would continue as general-purpose lanes.

With Alternative 3-1, the number 1 one lane will be designated and signed for transit use plus qualifying first responder and CHP use. With Alternative 3-2, the number 4 lane will be designated for these uses along with users of the general-purpose lanes who are exiting or entering the freeway to off-ramps and on-ramps, respectively.

Express Lane Buffer

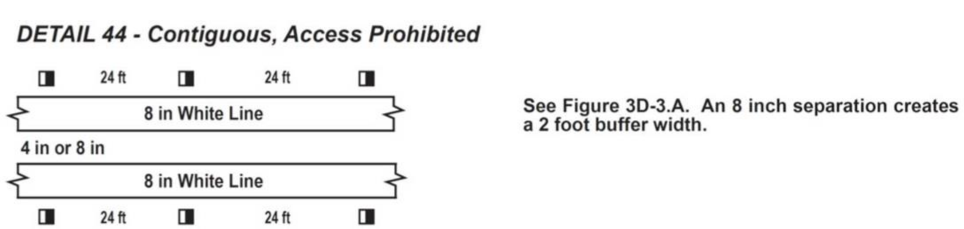
No buffer is proposed between the express lane and the adjacent general-purpose lanes. A single, white striped lane line would separate the lanes and continuous access between the lanes would be permitted.

Transit Lane Buffer

The proposed transit lanes would be located in lane 1 nearest the median or lane 4 nearest the right-side shoulder of the widened SR 85 freeway. The transit lanes are proposed to be buffer-separated from the adjacent express lane or general-purpose lanes.

A minimum buffer width of two feet is proposed. The diagram below presents the anticipated striping detail for the 2-foot buffer, which is Detail 44 with an 8-inch separation per the 2014 California MUTCD Revision 4, effective March 29, 2019.

Figure 3A-113 (CA). Examples of Preferential Lane Lines

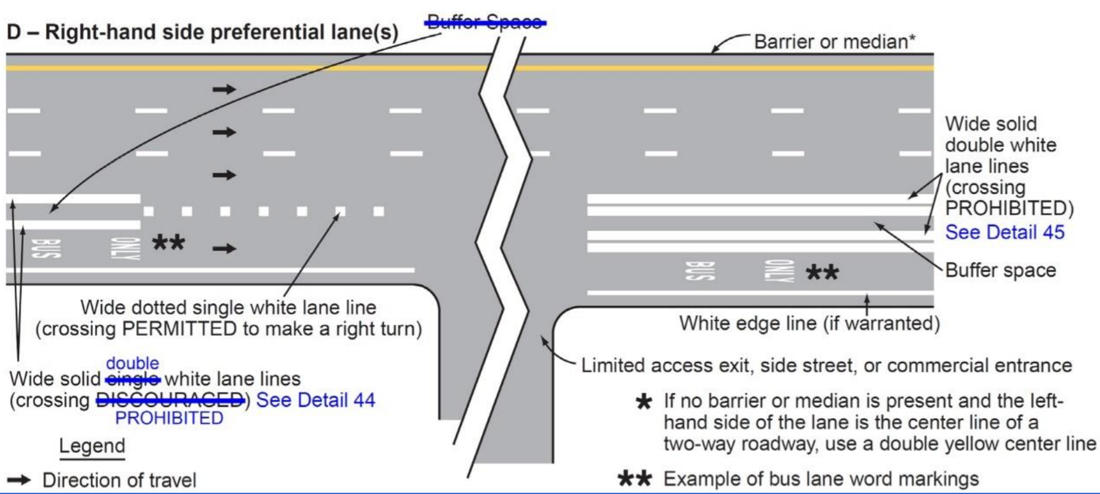


Source: California Manual on Uniform Traffic Control Devices, 2014 Edition, Revision 4 (March 29, 2019), California State Transportation Agency, 2019

Transit Lane Intermediate Access Points

Intermediate access points for the transit lanes will be identified once transit routing plans are refined during the PA/ED phase of project development. In the case of Alternative 3-2, access through the striped buffer to off-ramps and from on-ramps will be as defined by the CA MUTCD in Figure 3D-2D, Right-hand Side Preferential Lane(s), shown below.

Figure 3D-2D. Right-hand side Preferential Lane(s)



Source: California Manual on Uniform Traffic Control Devices, 2014 Edition, Revision 4 (March 29, 2019), California State Transportation Agency, 2019

California Highway Patrol Observation/Enforcement and Emergency Refuge Areas

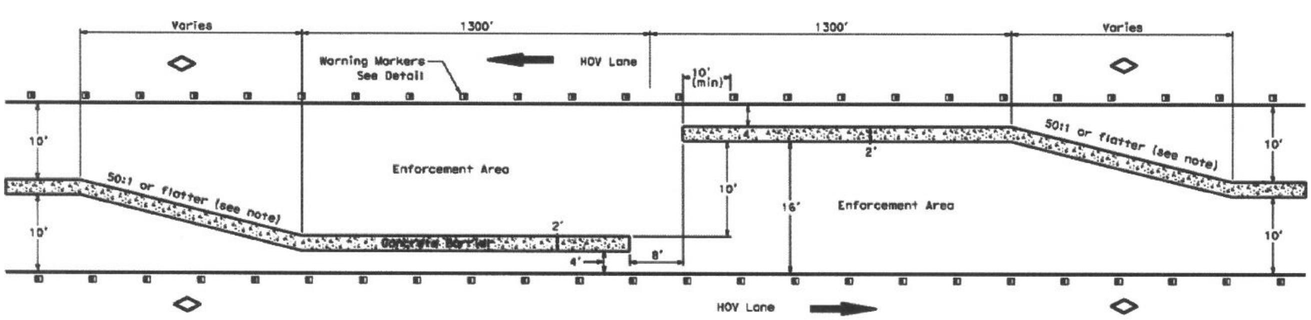
State-of-the-art toll infrastructure will be installed to reduce the need for CHP observation areas given the right-of-way constraints north of South Stelling Road.

Pending future agreements, it is anticipated that the CHP will be contracted to provide toll enforcement including express lane eligibility violations.

California Highway Patrol observation/enforcement areas are proposed at locations where the width of the median and separation between upstream and downstream structures will permit the design guidance illustrated as Figure 6.1 of Caltrans' High-Occupancy Vehicle Guidelines dated January 2018 to be implemented. Figure 6.1 is illustrated below for reference.

Figure 6.1 Bi-directional Enforcement Areas for Wide Medians

NOT TO SCALE



Source: High-Occupancy Vehicle Guidelines for Planning, Design and Operations, California State Transportation Agency, January 2018

The locations which permit the installation of these bi-directional CHP enforcement areas are:

- Rimwood Drive (north of Almaden Expressway at PM 6.72)
- Mulberry Drive (north of Winchester Boulevard at PM 11.60)
- Hollanderry Place (north of De Anza Boulevard at PM 16.23).

The CHP is anticipated to be contracted to conduct routine and supplemental enforcement services on SR 85 express lanes.

The locations of emergency refuge areas were listed previously on Table 6. All of the emergency refuge areas would be retained with this alternative.

Toll Infrastructure

The express lane facility would incorporate various toll infrastructure including toll gantries with transponder readers and high-speed digital cameras (49), directional and informational signage, dynamic message signs to communicate real-time toll rates to drivers (25), complete closed circuit television coverage of the entire express lanes corridor, and fiber optics linking the infrastructure to a centralized toll operations office. Toll equipment would meet Title 21 specification and national protocol, as well as interoperability with other toll facilities in California. Please see Exhibit 1A, displayed previously, for an illustration of the tolling infrastructure.

Trenching would be conducted along the outside edge of pavement for installation of conduits. The depth of trenching would be 3 to 5 feet below the roadway surface. Conduits would be jacked across the freeway to the median where needed to provide power and communication feeds to the new overhead signs and toll structures.

The project would install new overhead and barrier-mounted signs, including dynamic message signs. The overhead signs would be installed in the median on cantilever structures supported on piles.

In some locations the express lane signs would replace existing signs or be added to existing sign structures, but most would be at new locations along SR 85. The exact number and locations of these features will be determined during the project design phase in coordination with the toll system design.

Tolling Policies

A *Concept of Operations Report* will be prepared to address various tolling policies under which the express lanes will be operated. This report will provide preliminary information regarding the type of tolling, toll exemption or rate reduction for HOVs, maximum target volume to maintain speed and minimize congestion in the express lanes, method for determining toll amount, methods for toll collection and toll enforcement, penalty rates for toll violations, and provision of supplemental service patrol. The items listed below represent key policies which have been assumed for the SR 85 express lanes; however, they are subject to change pending further studies.

- The express lanes are anticipated to operate part-time during peak hours, Monday through Friday.
- It is anticipated that HOVs with two or more occupants (HOV2+) will be allowed to use the express lanes toll-free. Single-occupancy vehicles will be allowed to use the express lanes for a toll.
- Motorcycles will be allowed to travel in the express lanes toll-free and are not required to have a transponder.
- Exempted vehicles including emergency response vehicles, highway maintenance vehicles serving the express lanes facility, and CHP vehicles assigned to patrol the express lane facility will have toll-free access to the express lanes, by registering these vehicles as toll exempt in the License Plate Recognition system.
- Clean air vehicles with valid clean air vehicle decals will be able to use the express lanes for a toll discount, assumed to 15 percent.
- Tolling is anticipated to be dynamic pricing based on real-time traffic levels to ensure peak period speed of no less than 45 mph.

Additional studies will be performed to establish the operating policies and business rules and determine pricing structures and toll violation rates.

Toll Operations and Maintenance

The institutional arrangements for operation and maintenance of the express lanes will be consistent with those implemented by VTA for the express lane system in Santa Clara County.

Express Lanes Incident Responses

At this time, it is anticipated that Freeway Service Patrol will be contracted to provide incident response for the express lanes similar to the current arrangement in the HOV and general-purpose lanes. It is currently planned to have dedicated roving Freeway Service Patrol patrolling the express lanes during hours of peak congestion, to respond to incidents that might affect the express lanes including clearing of debris, towing disabled vehicles, and minor auto repairs.

Conceptual Engineering Plans

Conceptual cross sections for mainline segments and segments passing structures with restrictive widths are provided in Attachment 2.

Alignment plans for the transit lane alternatives are provided in Attachment 3 for the mainline segment from Prospect Road (PM 15.27) to just south of U.S. 101 in Mountain View (PM 23.70). Plan sheets are also provided for segments including transit stations at El Camino Real, Stevens Creek Boulevard, Saratoga Avenue and Bascom Avenue.

Right-of-Way Requirements

South of I-280, in segments 1 and 2 of the corridor, the project would be constructed entirely within the existing right-of-way.

North of I-280, in segment 3 of the corridor, the alignment plans provided in Attachment 3 indicate that the pedestrian overcrossing at The Dalles (PM 19.39) illustrated on Sheet 17, will need to be relocated. This relocation will likely require new right-of-way to the east of SR 85 if the pedestrian overcrossing is reconstructed at this location.

A potential right-of-way impact is illustrated on Sheet 14 in Attachment 3 at PM 20.37 where the right-side shoulder narrows to six feet. A Design Standards Decision Document will need to be prepared and approved by Caltrans Division of Design Chief to avoid acquiring right-of-way and relocating the adjacent sound wall at this location.

Transit Lane Stations

Stations are proposed along the Route 85 Transit Guideway at the following locations.

- Ohlone-Chynoweth Light Rail Station at Santa Teresa Boulevard
- Bascom Avenue
- Saratoga Avenue
- Stevens Creek Boulevard
- SR 82/El Camino Real

These station locations are preliminary and representative of different right-of-way availability, mainline and median conditions, and interchange configurations. The locations of the stations proposed for proof of concept evaluation are illustrated on Figure 5.

The conceptual design options for these stations are presented later in this document following the discussion of engineering features for Scenario D, Part-time Shoulder Use.

SCENARIO D—PART-TIME SHOULDER USE (BUS ON SHOULDER)

Alternative 3-5 (Long Shoulder—Median) and Alternative 3-6 (Long Shoulder—Right Side)

These alternatives include utilizing the median shoulder (Alternative 3-5) or the right-side shoulder (Alternative 3-6) for bus on shoulder transit operations.

The Federal Highway Administration defines part-time shoulder use as a transportation system management and operation strategy for addressing congestion and reliability issues within the transportation system. There are many forms of part-time shoulder use or "shoulder running"; however, they all involve use of the left or right shoulders of an existing roadway for temporary travel during certain hours of the day. Part-time shoulder use has primarily been used in locations where there is recurring congestion due to lack of peak period capacity through the corridor.

Part-time shoulder use is primarily used on freeways. There are multiple examples of how highway agencies have used the shoulders of roadways to address congestion and reliability needs and to improve overall system performance. These options vary in terms of the location of the shoulder (left/right shoulder options) used, vehicle-use options [e.g., bus only, HOV only, all vehicles except trucks], operating schedule, and special speed controls. In all of these options, the use is "temporary" for part of the day, and the lane continues to operate as a refuge shoulder when not being used for these travel purposes.

Traffic Considerations

Peak period traffic volumes for three representative locations are reported in Table 9. The table indicates that traffic demand accommodated by the existing facility is highly directional, northbound in the morning and southbound in the afternoon/evening. Segment travel speed data further emphasizes the directional nature of peak period traffic.

Figure 6 illustrates a five-minute slice of traffic speeds along SR 85 at 7:30 a.m. The top portion of the graphic illustrates northbound speeds in the two general-purpose lanes and the adjacent HOV lane. In segment 2 of the corridor, from SR 87 to I-280, speeds drop below 35 mph, which indicates "significant congestion." Southbound during the same 5-minute slice of time, motorists travel at or above the speed limit of 65 mph.

Similar speed profiles exist for the afternoon peak hours. Figure 7 illustrates speeds during the 5:30 p.m. 5-minute slice of time.

More extensive analysis of existing traffic conditions and congestion is presented in the Traffic Study Report prepared for this SR 85 Transit Guideway Study.

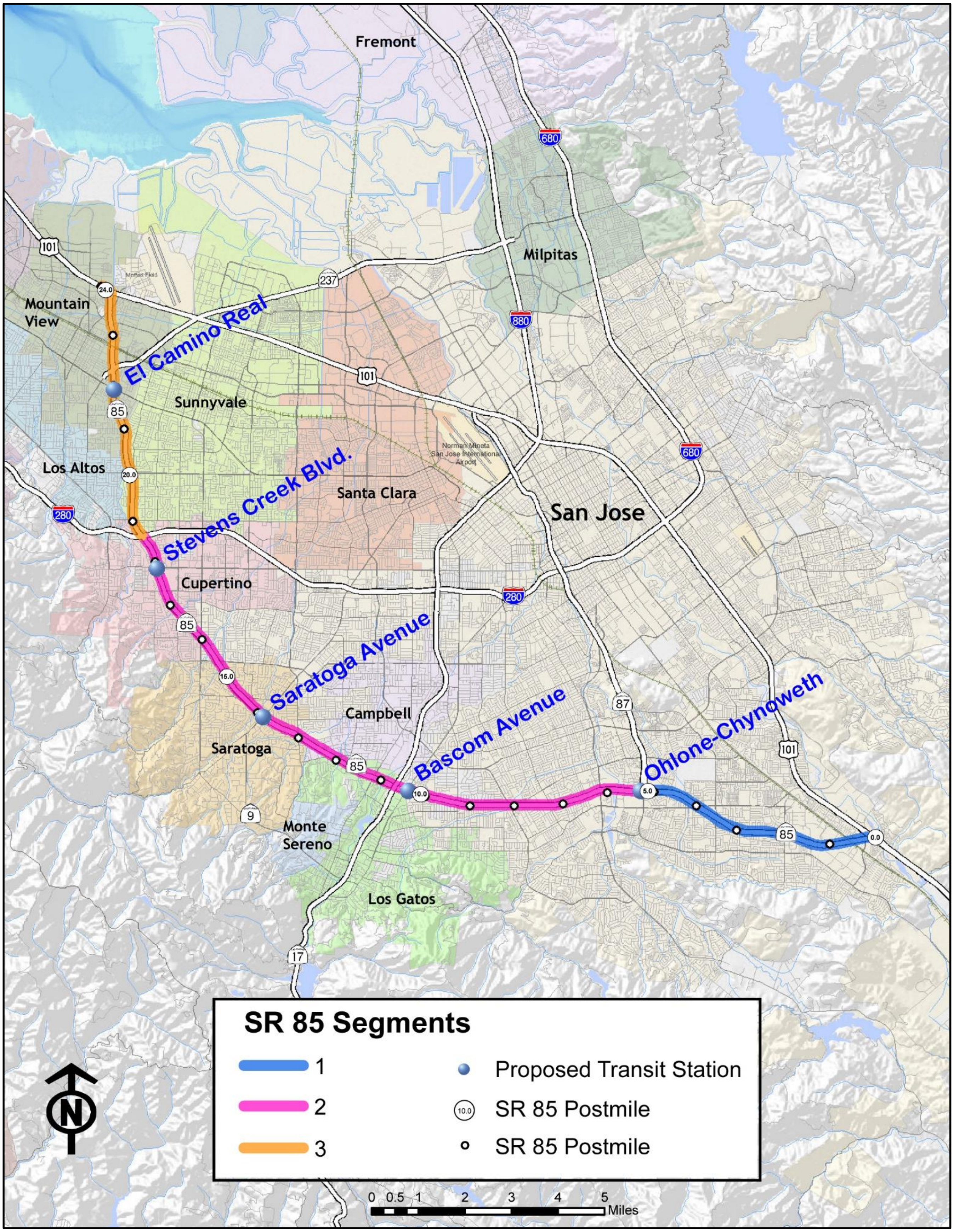


Figure 5 Transit Lane Station Locations

Table 9 State Route 85 Peak Period Hourly Traffic Volumes

	Northbound Throughput (vehicles/hour) at Location		
AM Peak Hour	❶	❷	❸
0600	1,871	2,824	5,309
0700	3,098	3,535	5,849
0800	4,612	3,961	5,162
0900	3,995	3,711	4,760
1000	4,154	3,638	4,542
PM Peak Hour	❶	❷	❸
1400	4,930	3,536	3,300
1500	4,737	3,553	3,634
1600	5,024	3,673	3,571
1700	5,634	4,101	3,868
1800	5,154	3,702	3,741
1900	4,043	2,860	2,933
Daily Total	**71,841**	**58,934**	**71,641**

	Southbound Throughput (vehicles/hour) at Location		
AM Peak Hour	❶	❷	❸
0600	963	936	1,170
0700	2,600	2,329	2,736
0800	3,445	2,824	3,077
0900	2,970	2,453	2,686
1000	2,597	2,182	2,427
PM Peak Hour	❶	❷	❸
1400	4,367	4,086	4,968
1500	5,985	4,504	4,476
1600	6,357	4,726	4,630
1700	6,177	4,710	4,749
1800	5,677	4,448	4,619
1900	4,405	3,992	4,735
Daily Total	**63,356**	**53,925**	**59,823**

Locations:

❶ Camden Avenue to Union Avenue

❷ Saratoga Avenue to De Anza Boulevard

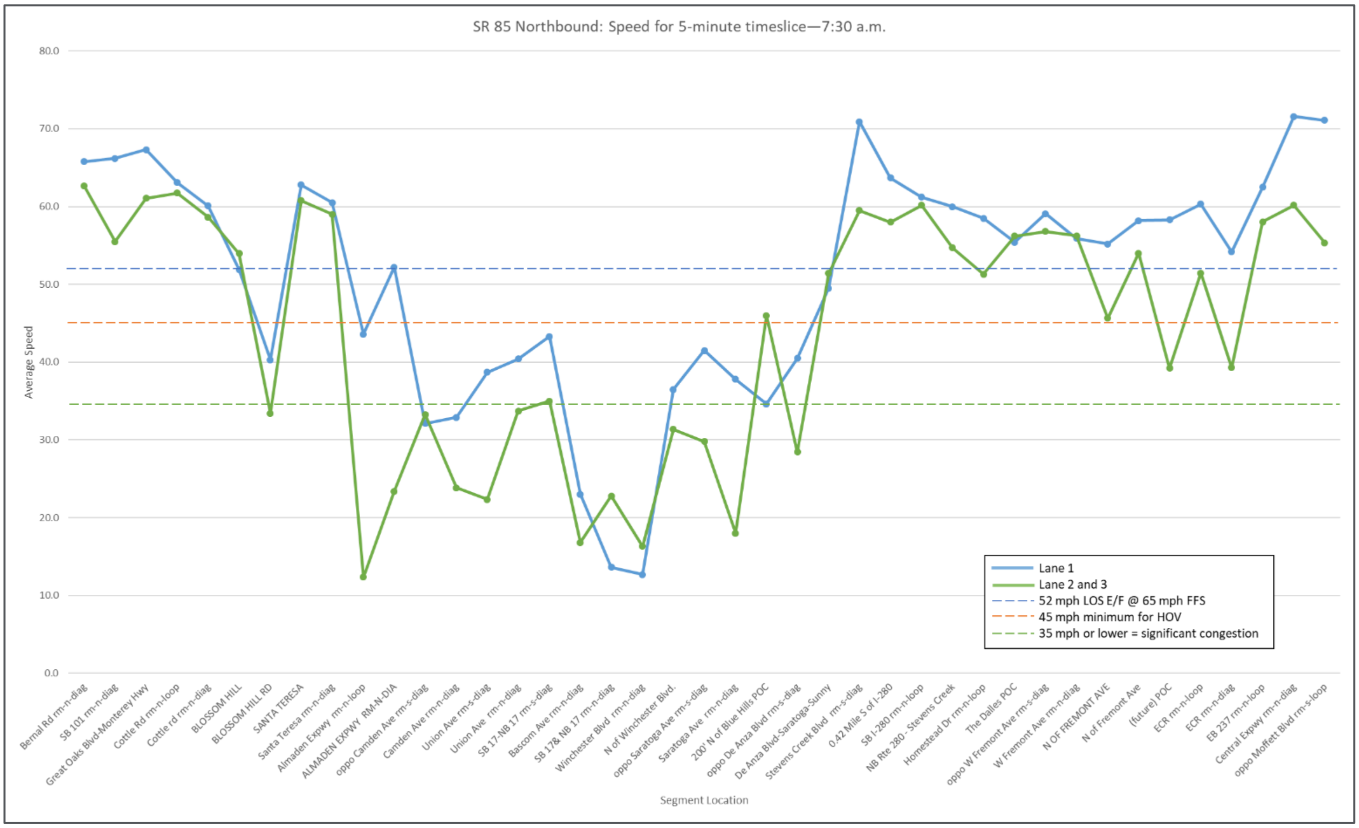
❸ Fremont Avenue to El Camino Real

Mainline Improvements

- Includes all elements of Alternative 1-2, HOV to Express Lane Conversion
  - Convert existing HOV lane in each direction from Bernal Road, near U.S. 101 in south San Jose to Moffett Boulevard, near U.S. 101 in Mountain View, a distance of 23.2 miles.
  - Provide continuous access to express lane from the adjacent general-purpose lanes.
  - Install toll infrastructure in median to support express lanes.
  - Reconstruct concrete median barrier south of Santa Teresa Boulevard and north of Stelling Road to accommodate toll gantries and dynamic message signs.
  - Widen paved median shoulder to 14 feet in both directions from Santa Teresa Boulevard to South Stelling Road (excepting structures) to provide continuous CHP enforcement area.
  - Widen right-side shoulders to meet Highway Design Manual standards (10 feet). Relocate drainage inlets as needed to the outside edge of shoulder.
  - Install high mast lighting at SR 17 and I-280 interchanges as needed to supplement existing (optional improvement).
- For Alternative 3-5, the median shoulder is assumed to be paved with full depth AC or PCC to provide a 12-foot-wide part-time travel lane and a total shoulder width of 14 feet where space permits (from Santa Teresa Boulevard to South Stelling Road, excepting structures).
- For Alternative 3-6, the right-side shoulder is assumed to be paved with full depth AC or PCC to provide a 12-foot-wide part-time travel lane and a total width of 14 feet where space permits. In many to most cases, widening the right-side shoulders will involve widening the median shoulder with full depth PCC and relocating the lane markings and delineators. This will avoid the need for retaining the side slopes, reconstructing existing retaining walls and/or soundwalls.
- At structures, shoulders used by buses will be a minimum of 11.5 feet wide.

Interchange Improvements

Conversion of the SR 85 interchange at SR 82/El Camino Real from a cloverleaf Type L-10 ramp configuration to a spread diamond Type L-2 ramp configuration is a required improvement for these alternatives.



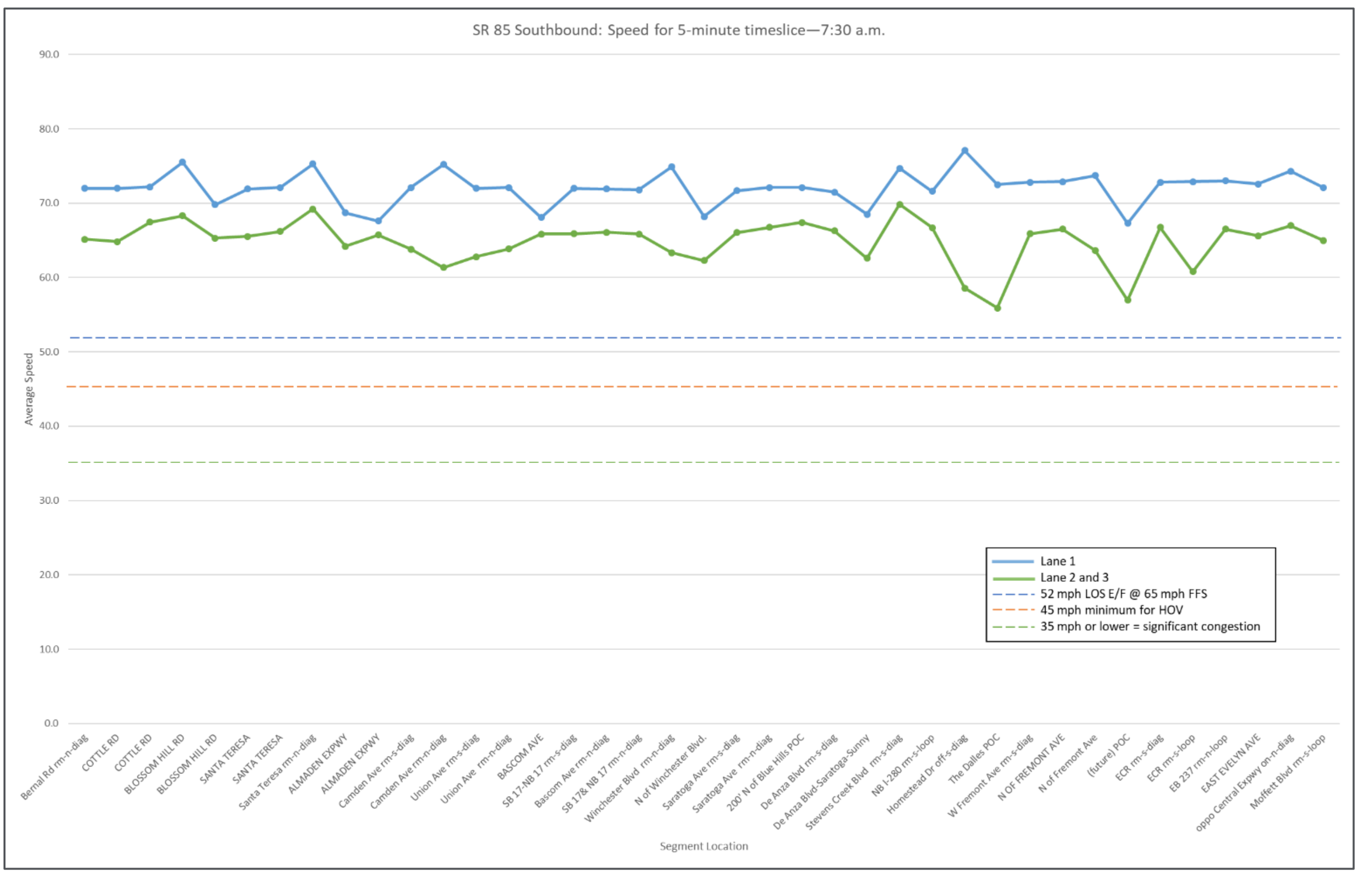
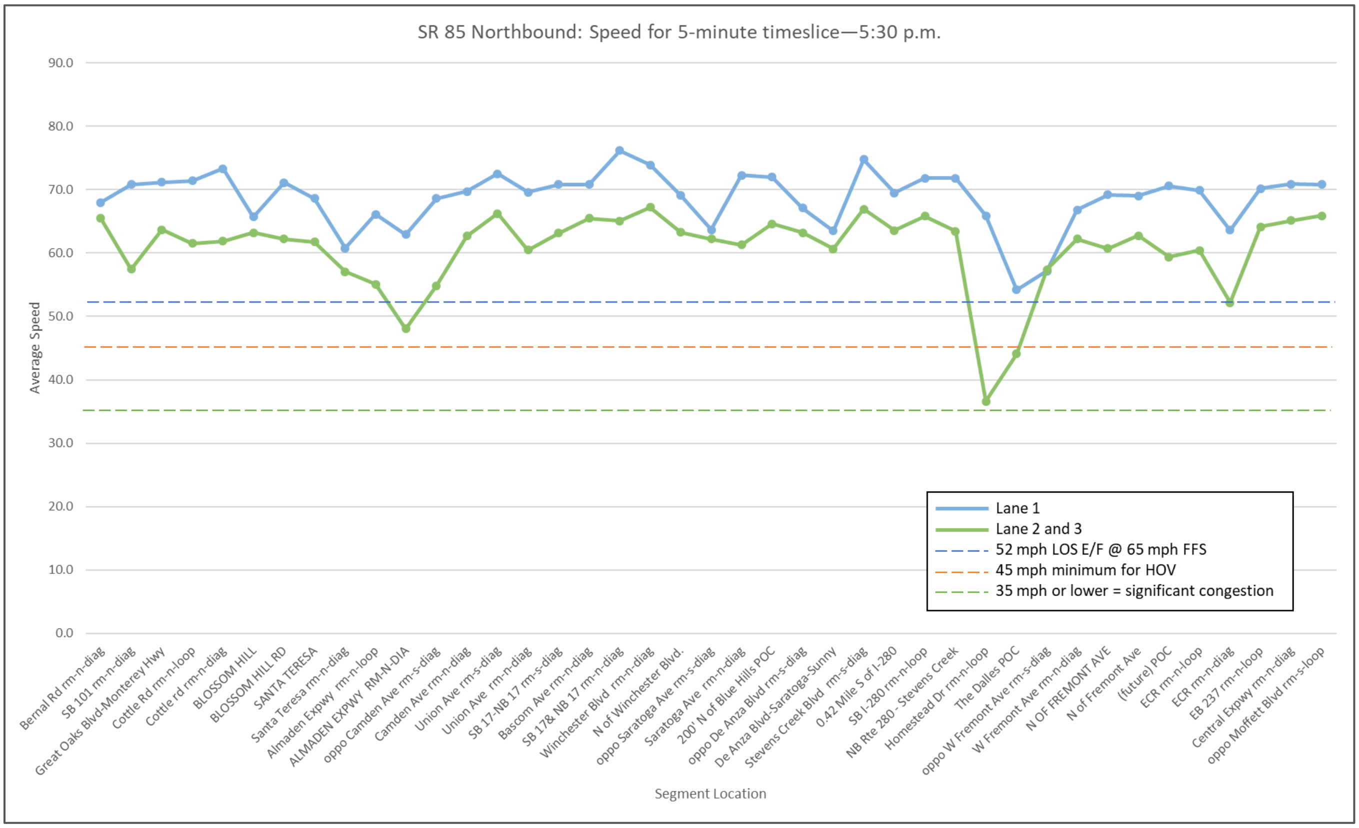


Figure 6 State Route 85 AM Peak Period 5-minute Timeslice



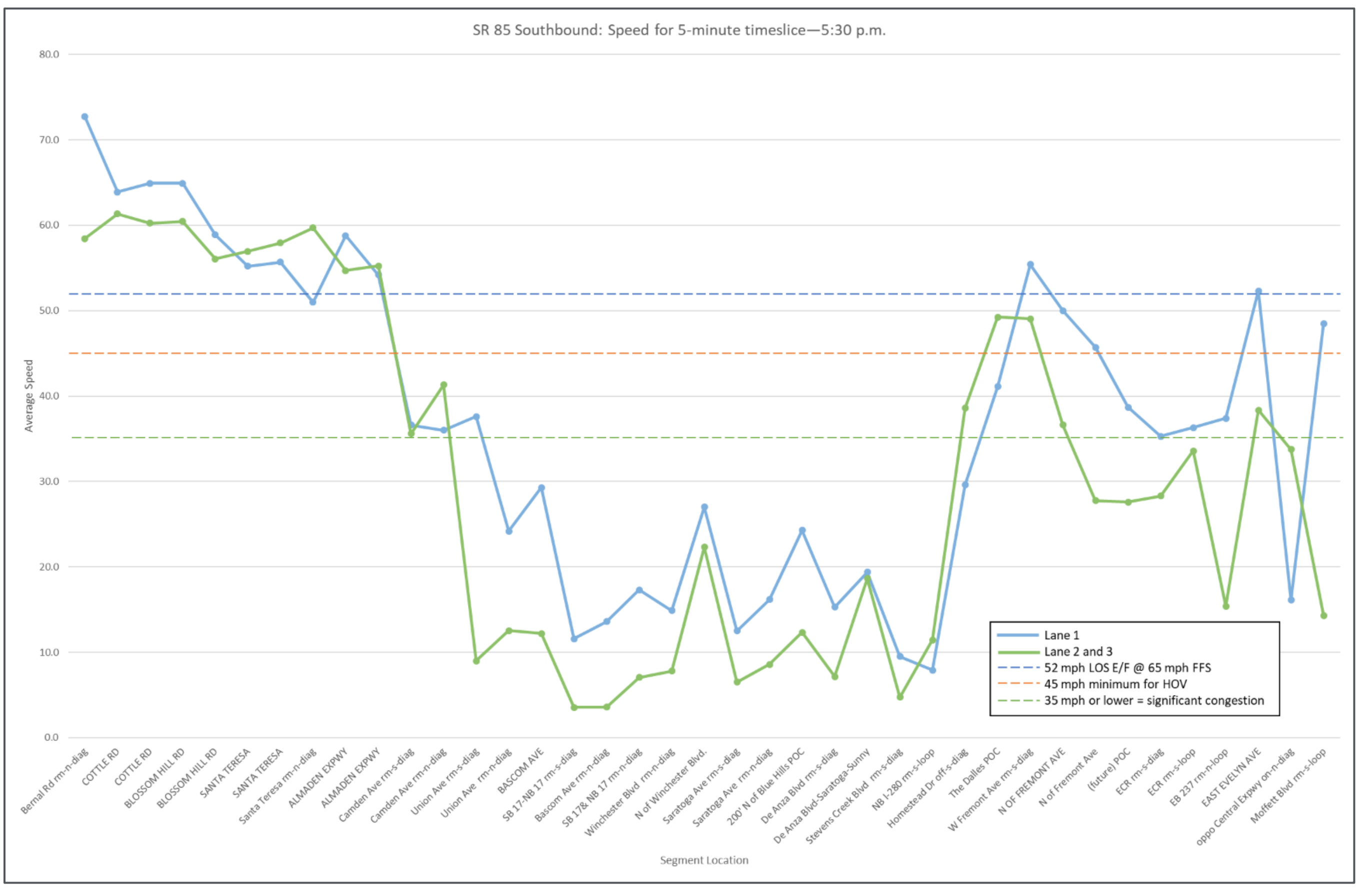


Figure 7 State Route 85 PM Peak Period 5-minute Timeslice

Local Street Improvements

No streets crossing under or over SR 85 would be reconstructed to accommodate the HOV to express lane conversion or bus on shoulder operations. Conversion of the SR 85 interchange at SR 82/El Camino Real from a Type L-10 to a Type L-2 will require reconstruction of the ramp terminal intersections, installation of traffic signals, removal of a portion of the raised median and landscaping, and pavement signing and striping to accommodate dual left-turn lanes to the northbound and southbound on-ramps. No widening of El Camino Real will be required.

Conversion of the HOV lane to an express lane would allow for improved enforcement, a reduction in the proportion of HOV2+ “cheaters,” and improved managed use to achieve speeds of 45 mph or higher in the express lane.

The HOV to Express Lane Conversion element of these alternatives would not yield additional vehicle throughput, however. The HOV and general-purpose lanes each accommodate roughly 1,500 vehicles per hour per lane (vphpl) during peak hours in the peak direction. The capacity of the express lane at LOS C is 1,600 vphpl. While the volume of vehicles will likely remain unchanged, the speed of the vehicles using the express lane will likely increase, encouraging more SOV drivers to carpool and/or utilize commuter buses, if available.

With mainline traffic volumes expected to remain unchanged from no build conditions, no impacts to local streets would be expected.

Railroad Involvement

Six (6) railroad crossings over or under SR 85 occur within the project limits.

1. VTA light rail tracks (Guadalupe Corridor) under southbound SR 85 at PM 1.33.
2. VTA light rail tracks (Guadalupe Corridor) under northbound SR 85 at PM 5.27, just west of Santa Teresa Boulevard.
3. VTA light rail track under SR 85 adjacent to Winfred Boulevard at PM 5.59.
4. Union Pacific track over SR 85 adjacent to Winchester Boulevard at PM 10.98.
5. Caltrain Peninsula Commuter tracks under SR 85 adjacent to Evelyn Avenue at PM 22.63.
6. VTA light rail tracks under SR 85 adjacent to Central Expressway at PM 22.63.

None of these crossings would require bridge work to accommodate the proposed HOV to express lane conversion or bus on shoulder operations.

Structure Improvements

Including the Bernal Road and Moffett Boulevard undercrossings at the two ends of the corridor, there are 63 structures which could be affected by the build alternatives. One of these structures at Saratoga Avenue would require widening to accommodate a median station as a result of implementing bus on shoulder operations with Alternative 3-5. The replacement of embankments with retaining walls to accommodate a median station at Stevens Creek Boulevard would also be required for Alternative 3-5.

Drainage Improvements

Storm runoff is collected by inlets located along the outside edge of the right-side shoulders and in the center of the median. North of I-280, the right side-shoulders range in width from 4 to 10 feet. To meet the HDM standards for shoulder width, the AC paved shoulders would need to be widened, generally to 10 feet, and drainage inlets relocated to the outside edge of the shoulder. In the case of Alternative 3-6, the right-side shoulder will need to be repaved with full depth AC or PCC and widened to 14 feet, except at structures.

Utilities

The project area contains overhead electric and communications lines and underground electric, gas, sanitary sewer, water, reclaimed water, communications, and fiber optic lines. Utility providers in the project area are listed below by category.

- Gas and electric—PG&E
- Communications—AT&T, Comcast, Level 3, Verizon, Nextlink, and MCI
- Water—San Jose Water Company, Santa Clara Valley Water District, California Water Service Company, Great Oaks Water Company, City of Sunnyvale Water Division, and City of Mountain View Water Division
- Sanitary—City of San Jose, West Valley Sanitation District, City of Cupertino, and City of Mountain View.

The project would not require utility relocations. Utility impacts would be limited to the extension of casings (protective pipes or channels) for existing underground facilities whose casings do not extend through the right-of-way. All other existing utilities would be protected in place.

Express Lane Begin/End Transitions

The SR 85 express lanes would extend from U.S. 101 in south San Jose to U.S. 101 in Mountain View. The existing HOV direct-connector ramps at both ends of SR 85 would be converted to express lane connectors.

Bus on Shoulder Limits of Operation

Bus on shoulder operations will extend from Almaden Expressway to Moffett Boulevard.

Bus on Shoulder Access

Continuous access between the adjacent travel lanes and the shoulder is assumed.

Express Lane Buffer

No buffer is proposed between the express lane and the adjacent general-purpose lanes. A single, white-striped lane line would separate the lanes and continuous access between the lanes would be permitted.

California Highway Patrol Observation/Enforcement Areas and Emergency Refuge Areas

State-of-the-art toll infrastructure will be installed to reduce the need for CHP observation areas given the right-of-way constraints north of South Stelling Road.

Pending future agreements, it is anticipated that the CHP will be contracted to provide toll enforcement including express lane eligibility violations.

Inside median shoulders will be widened south of Stelling Road to Santa Teresa Boulevard to 14 feet in both directions to provide a continuous CHP enforcement area. In the case of Alternative 3-5, the median shoulder will need to be repaved with full depth AC or PCC. At structures such as bridges and undercrossings, existing shoulders will be maintained and structures will not be widened for this purpose.

Emergency refuge areas along the outside shoulders would be unaffected by the part-time shoulder operations.

Toll Infrastructure

The express lane facility would incorporate various toll infrastructure including toll gantries with transponder readers and high-speed digital cameras (49), directional and informational signage, dynamic message signs to communicate real-time toll rates to drivers (25), complete closed circuit television coverage of the entire express lanes corridor, and fiber optics linking the infrastructure to a centralized toll operations office. Toll equipment would meet Title 21 specification and national protocol, as well as interoperability with other toll facilities in California.

The Metropolitan Transportation Commission has prepared a simple fact sheet to further explain toll infrastructure components. This fact sheet is reproduced in whole as Exhibit 1A along with photographs of express lane construction work along I-680 in Walnut Creek and Concord.

The Operations Center mentioned in Exhibit 1A is assumed to be funded by a separate project and not a component of cost for the Route 85 Transit Guideway Project.

Tolling Policies

A *Concept of Operations Report* will be prepared to address various tolling policies under which the express lanes will be operated. This report will provide preliminary information regarding the type of tolling, toll exemption or rate reduction for HOVs, maximum target volume to maintain speed and minimize congestion in the express lanes, method for determining toll amount, methods for toll collection and toll enforcement, penalty rates for toll violations, and provision of supplemental service patrol. The items listed below represent key policies which have been assumed for the SR 85 express lanes; however, they are subject to change pending further studies.

- The express lanes are anticipated to operate part-time during peak hours, Monday through Friday.
- It is anticipated that HOVs with two or more occupants (HOV2+) will be allowed to use the express lanes toll-free. Single-occupancy vehicles will be allowed to use the express lanes for a toll.
- Motorcycles will be allowed to travel in the express lanes toll-free and are not required to have a transponder.
- Exempted vehicles including emergency response vehicles, highway maintenance vehicles serving the express lanes facility, and CHP vehicles assigned to patrol the express lane facility will have toll-free access to the express lanes, by registering these vehicles as toll exempt in the License Plate Recognition system.
- Clean air vehicles with valid clean air vehicle decals will be able to use the express lanes for a toll discount, assumed to 15 percent.
- Tolling is anticipated to be dynamic pricing based on real-time traffic levels to ensure peak period speed of no less than 45 mph.

Additional studies will be performed to establish the operating policies and business rules and determine pricing structures and toll violation rates.

Toll Operations and Maintenance

The institutional arrangements for operation and maintenance of the express lanes will be consistent with those implemented by VTA for the express lane system in Santa Clara County.

Express Lanes Incident Responses

At this time, it is anticipated that Freeway Service Patrol will be contracted to provide incident response for the express lanes similar to the current arrangement in the HOV and general-purpose lanes. It is currently planned to have dedicated roving Freeway Service Patrol patrolling the express lanes during hours of peak congestion, to respond to incidents that might affect the express lanes including clearing of debris, towing disabled vehicles, and minor auto repairs.

Conceptual Engineering Plans

Geometric cross sections for mainline segments and segments passing structures with restrictive widths are provided in Attachment 2.

Alignment plans for bus-on-shoulder alternatives are not provided in Attachment 3, except for the median crossover station option at El Camino Real for Alternative 3-5.

Right-of-Way Requirements

South of I-280, in segments 1 and 2 of the corridor, the project would be constructed entirely within the existing right-of-way.

North of I-280, in segment 3 of the corridor, the project would also be constructed within the existing right-of-way and the pedestrian overcrossing at The Dalles (PM 19.39), would not need to be relocated.

Bus on Shoulder Stations

Stations are proposed along the Route 85 Transit Guideway at the following locations.

- Ohlone-Chynoweth Light Rail Station at Santa Teresa Boulevard

- Bascom Avenue
- Saratoga Avenue
- Stevens Creek Boulevard
- SR 82/El Camino Real

These station locations are preliminary and representative of different right-of-way availability, mainline and median conditions, and interchange configurations. The locations of the stations proposed for proof of concept evaluation were previously illustrated on Figure 5.

The conceptual design options for these stations are the same or similar to those proposed for the Scenario C, Freeway Widening with Transit Stations alternatives and are presented in the following section of this document.

Stations

Transit stations are proposed for the transit lane alternatives (3-1, 3-2, 3-3, and 3-4) and the bus on shoulder alternatives (3-3, 3-5, and 3-6). Alternative 3-3 is a hybrid alternative which could include dedicated transit lanes south of I-280 and bus on shoulder use north of I-280.

In all cases, the stations are proposed for the following locations for the purpose of this alternatives analysis investigation.

- Ohlone-Chynoweth Light Rail Station at Santa Teresa Boulevard
- Bascom Avenue
- Saratoga Avenue
- Stevens Creek Boulevard
- El Camino Real

Alternatives featuring left-side running in Lane 1 or the shoulder adjacent to lane 1 situate the station platform(s) in the median. Alternatives featuring right-side running in lane 4 or the shoulder adjacent to lane 3 situate the station platforms to the right of the transit lane or shoulder.

Right-side running alternatives could additionally or alternatively provide bus stops along on-ramps or off-ramps near the ramp terminal intersections with cross streets. The flexible routing capabilities of bus service also allow these transit vehicles to deviate from the freeway corridor altogether, to access nearby (but off-line) transit centers.

Design options are presented below for each of the five stations proposed to support the SR 85 Transit Guideway service.

The Concept of Operations Report, prepared by CDM Smith, provides additional insights regarding which types of transit services are most compatible with the different types of transit stations that are described below.

OHLONE-CHYNOWETH

State Route 85 buses serving the Ohlone-Chynoweth LRT is one example of an off-line transit station. All of the alternatives addressed by this assessment of engineering features assume that transit service provided by the Valley Transportation Authority will begin/end or stop off-line at this existing station. Access to SR 85 will be afforded by the on-ramp to northbound SR 85 and the off-ramp from southbound SR 85 at Santa Teresa Boulevard.

The Ohlone-Chynoweth station at Santa Teresa Boulevard serves the Guadalupe Corridor LRT line, the Almaden LRT spur line, and VTA bus routes 13 and 102. The adjacent park-and-ride lots provide 549 parking spaces. Figure 8 illustrates the bus route ingress and egress to this station from and returning to SR 85.

No construction is assumed at the Ohlone-Chynoweth LRT station to accommodate SR 85 bus service other than bus stop signage and information displays. The park-and-ride lots could become oversubscribed by the addition of SR 85 bus service, however. Construction of a parking structure or additional right-of-way acquisition for surface parking is not included in the scope of project definition.

No other design options have been investigated for this location.

BASCOM AVENUE

South Bascom Avenue is the next proposed station location, 5.0 miles north of the Ohlone-Chynoweth Station. The Good Samaritan Hospital complex is immediately adjacent along with the Los Gatos “North 40” specific plan development parcels. The freeway median is 66 to 68 feet wide at this location including the paved shoulders adjacent to the mainline travel lanes. South Bascom Avenue crosses over SR 85, and the arterial street’s name changes to Los Gatos Boulevard south of the freeway. VTA bus routes 49 and 61 operate along this road with Route 49 stopping both north and south of SR 85.

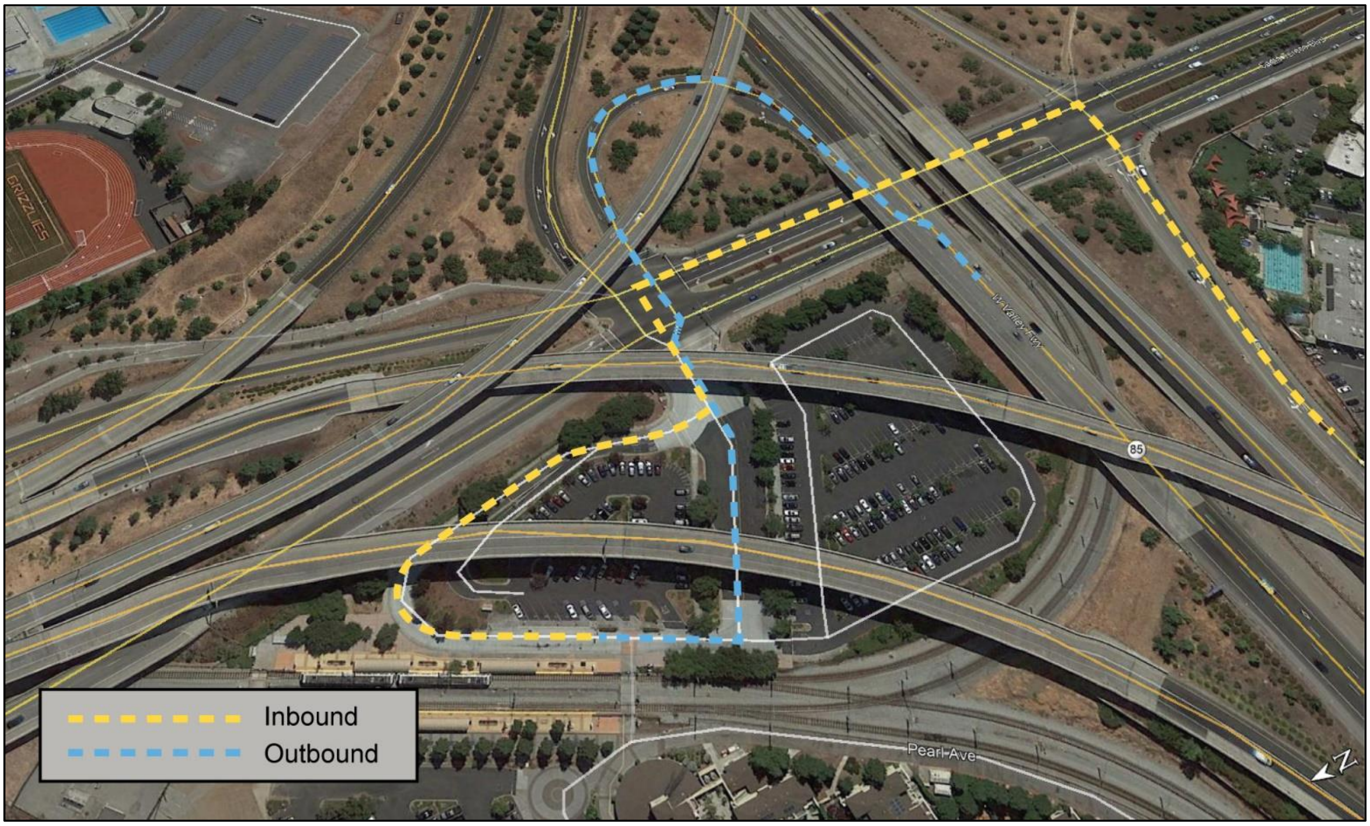


Figure 8 Bus Routing between Ohlone-Chynoweth Station and State Route 85

Station design options for the Bascom Avenue location include:

- Median crossover platform
- Median split platforms
- Side platforms
- On-ramp/off-ramp bus stops.

The median crossover platform option is discussed below. The other options will be discussed for the Saratoga Avenue Station and the Stevens Creek Boulevard station.

The **median crossover platform** option is modeled on the Minneapolis-Saint Paul Twin Cities Metro station on I-35W at 46th Street. The station is located between the northbound and southbound lanes of I-35W, which allows buses to pick up and drop off customers without leaving the freeway. Customers can board express or BRT buses on the freeway level or transfer to local buses on the 46th Street bridge, which crosses over I-35W. There are two stairway and elevator towers, one on each side of 46th Street, that provide movement between the upper-level bridge and lower-level freeway.

Freeway buses crossover from one side of the median platform to the other to permit boarding from the right side of the bus. Gates and traffic signals control movements of buses passing through the crossover maneuver.

Photographs of the I-35W/46th Street Station are provided as Exhibit 4. An aerial photograph of a median crossover platform station at this location is presented as Figure 9.

Geometric cross sections for several of the design options for a transit station at Bascom Avenue are presented as Figure 10.

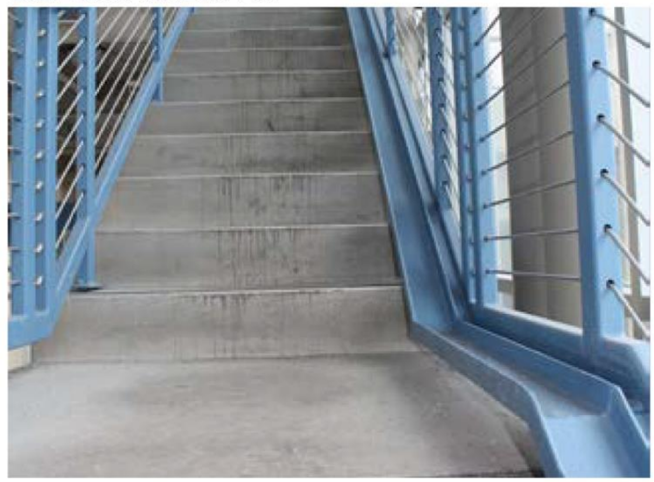
Exhibit 4. I-35W/46th Street Bus Rapid Transit Station in Minneapolis, Minnesota

46th: Existing BRT Station

46th: Entrance to BRT Station

46th: Lower level of BRT Station

46th: Stairs and Bike Rail



46th: Center Platform at BRT Station

46th: Real-time Information

Source: *Orange Line Bus Rapid Transit Existing Conditions Report,* Metro Transit, December 2013

Figure 9 Aerial View of Median Crossover Platform Station at I-35W/46th Street

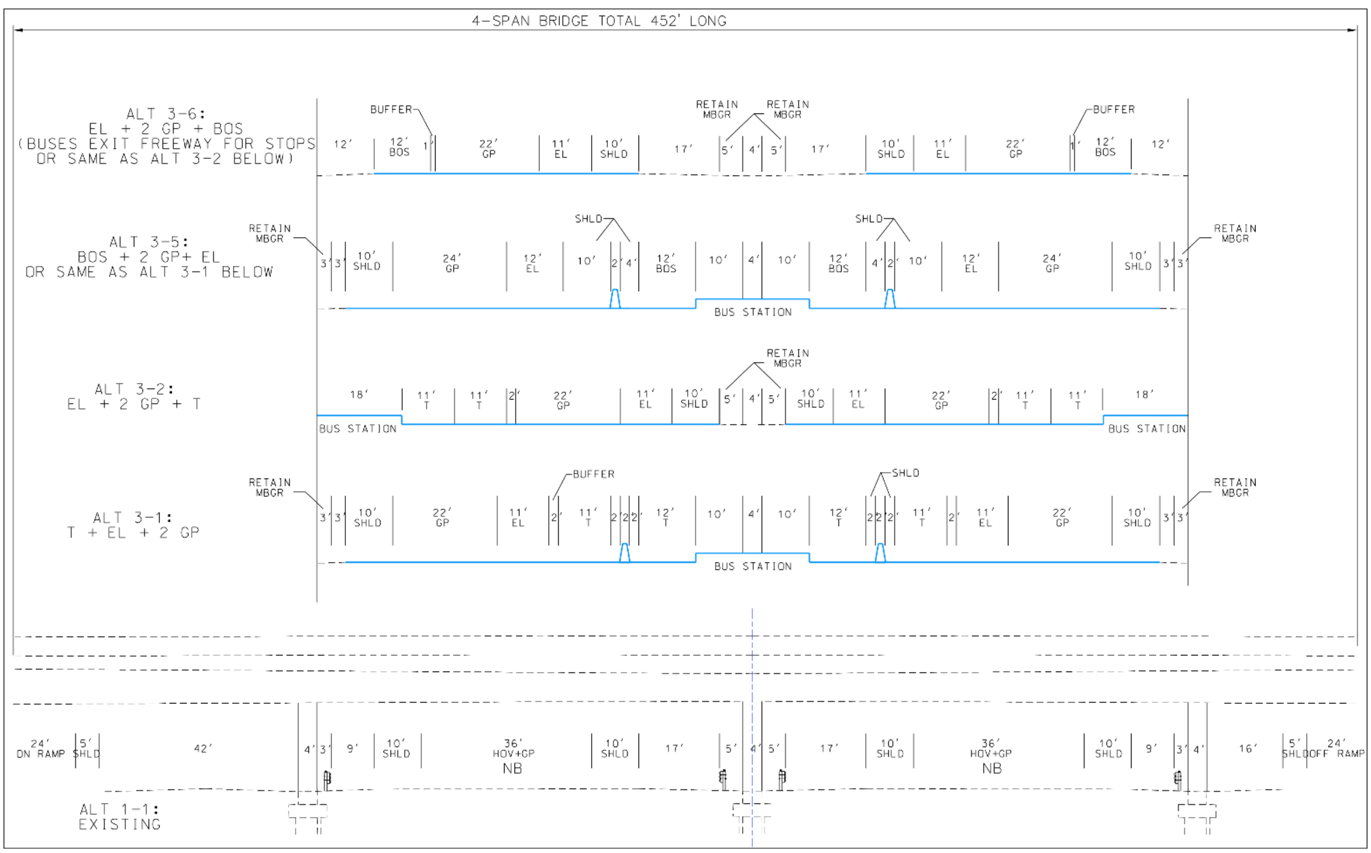


Figure 10 Bascom Avenue Transit Station Geometric Cross Sections

SARATOGA AVENUE

Saratoga Avenue is the next proposed station location, situated 3.5 miles north of South Bascom Avenue. Saratoga Avenue crosses under SR 85 with two through lanes, dual left-turn lanes, a bicycle lane and sidewalk in each direction. The twin SR 85 bridges crossing Saratoga Avenue are each 190 feet long on two spans and are each 60 feet wide. The bridges are box girders in which the main beams comprise girders in the shape of a hollow box composed of prestressed concrete.

The twin bridges are separated by a gap that is 22 feet wide. The gap would be filled by constructing a new box girder bridge between the two existing bridges. Station design options for the Saratoga Avenue location include:

- Median crossover platform
- Median split platforms
- Side platforms
- On-ramp/off-ramp bus stops.

A **median crossover platform for part-time shoulder** use is discussed below.

Exhibit 4 and Figure 9, presented previously, illustrate a median crossover platform designed for two-way, all-day use. Separate lanes for buses which do not stop at the station lay astride the station area in Lane 1 of the four travel lanes, in both directions.

A variation of the above would address the needs of Alternative 3-5, Bus on Median Shoulder. With part-time shoulder use, buses would utilize the shoulder adjacent to Lane 1 (the express lane) for northbound travel during the morning peak hours and southbound travel during the afternoon and early evening peak hours. During off-peak hours and in the off-peak direction of travel, buses would use express lanes or general-purpose lanes which are uncongested.

Figure 11 illustrates the movement of buses passing through a median crossover platform station being utilized for part-time shoulder use. The Santa Clara Valley Transportation Authority buses stopping at the station would cross from the right side of the platform to the left side of the platform so that customers can board from the right side of the buses.

Figure 11 Aerial View of Median Crossover Platform Station for Part-time Shoulder Use at I-35W/46th Street

Commuter shuttle buses which do not stop at the station would continue straight along the right side of the platform without stopping. Figure 12 illustrates the directionality of the bus flows during the AM and PM peak periods.

During off-peak times and/or directions, VTA buses would utilize bus stops located along the off-ramps or on-ramps at Saratoga Avenue.

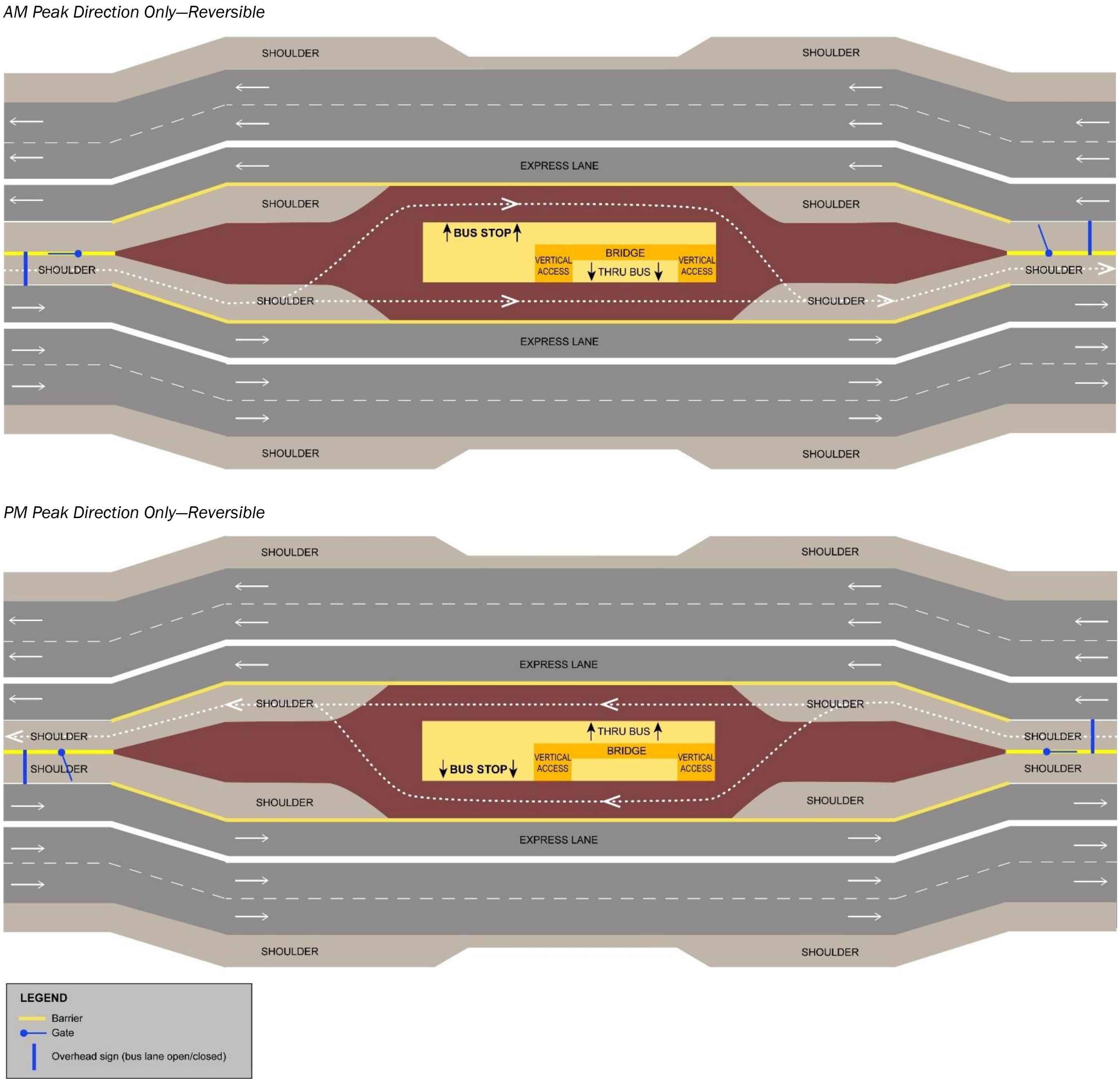


Figure 12 Conceptual View of Median Crossover Platform Station for Part-time Shoulder Use during Peak Periods

Figure 13 illustrates a variety of geometric cross sections for a potential transit station at Saratoga Avenue.

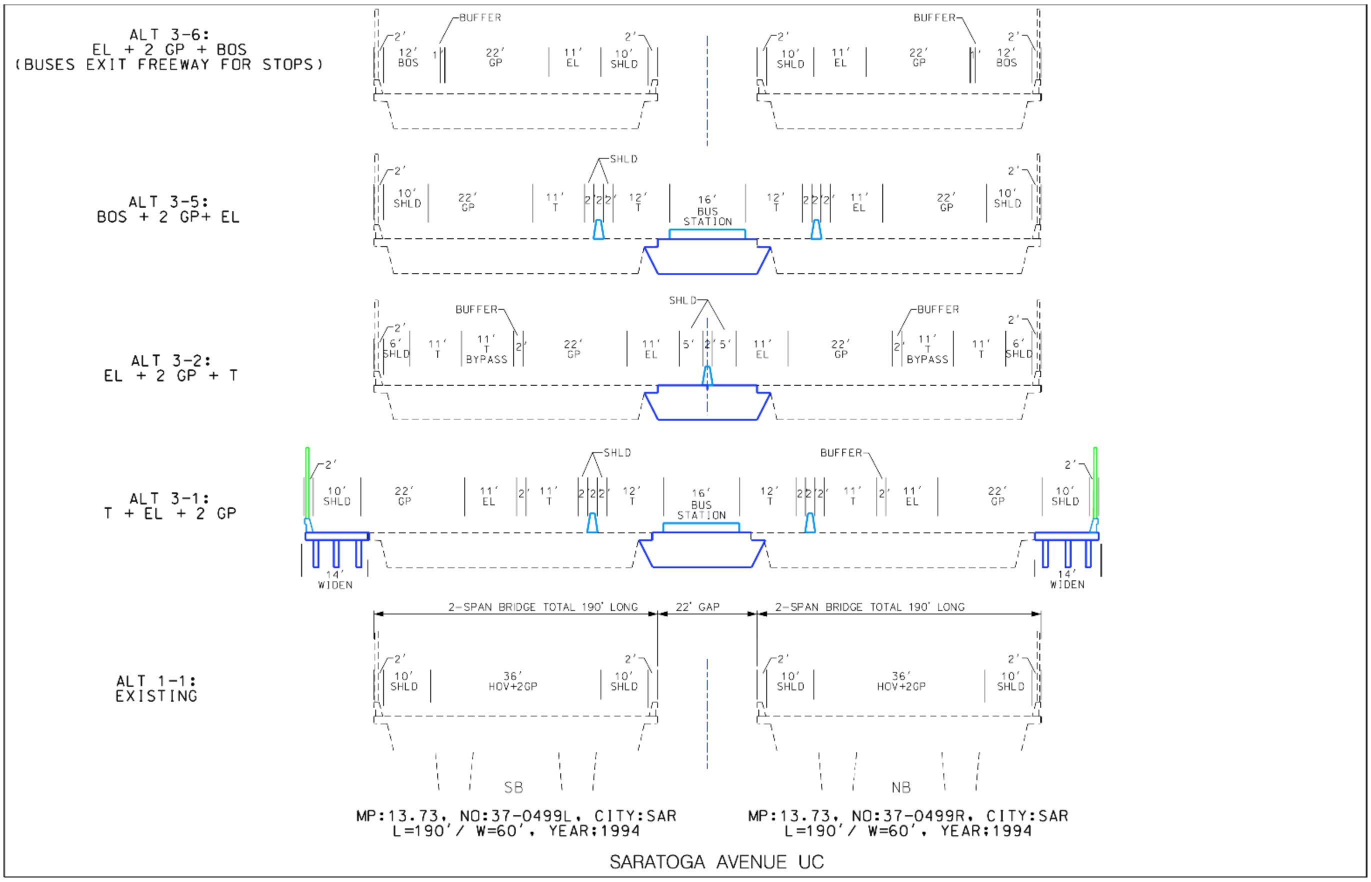


Figure 13 Saratoga Avenue Transit Station Geometric Cross Sections

STEVENS CREEK BOULEVARD

Whereas the median including inside shoulders is 44 feet wide at Saratoga Avenue, it begins to narrow north of South Stelling Road opposite Kenmore Court (PM 16.85). At Stevens Creek Boulevard, the median is approximately 24 feet wide including the paved shoulders and Type 60 concrete barrier. Four travel lanes lay astride the median in both directions.

Figure 14 illustrates a variety of cross sections for accommodating a bus station at this location. These include:

- Median crossover platform
- Side platforms
- On-ramp/off-ramp bus stops.

Figure 15 illustrates potential cross sections for a median split platform station option that is discussed below.

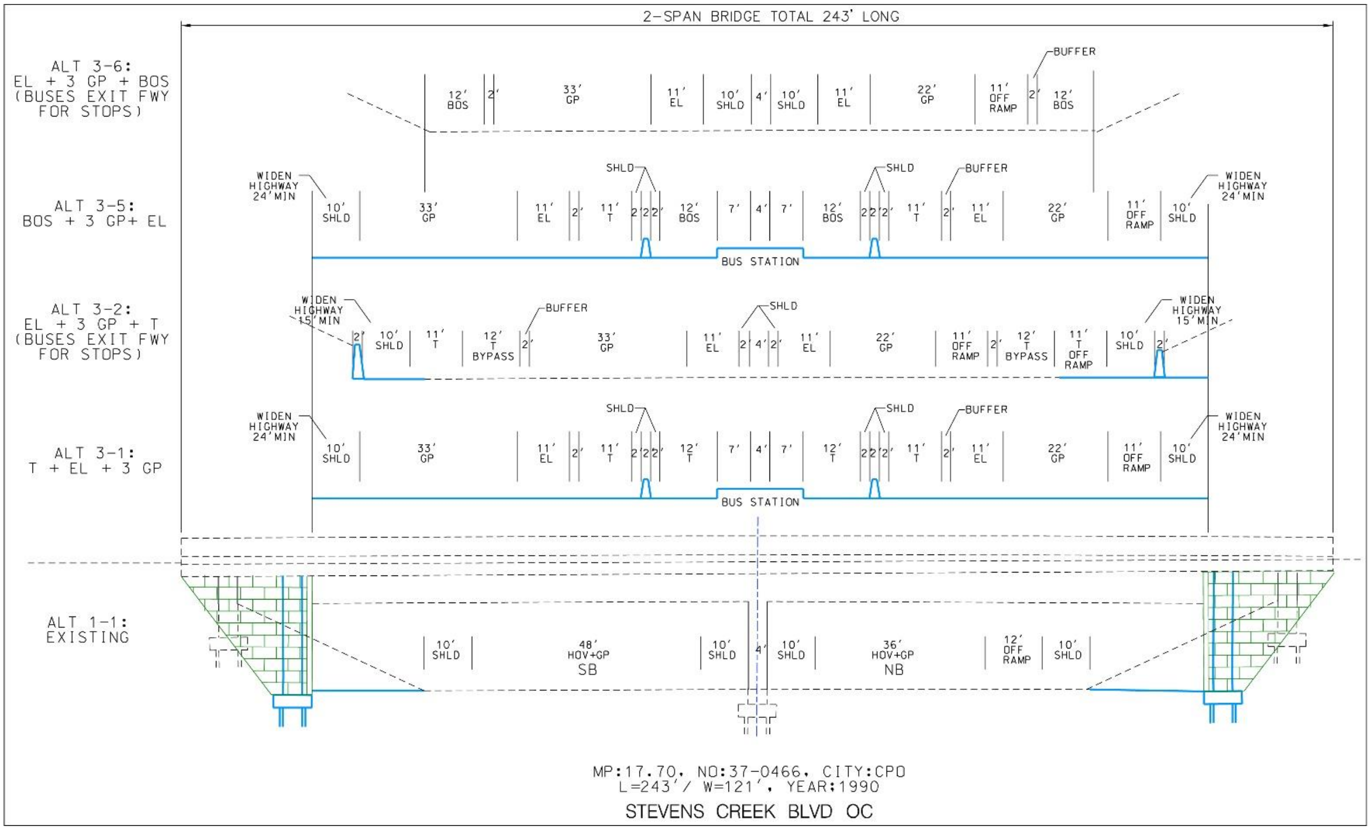


Figure 14 Stevens Creek Boulevard Transit Station Geometric Cross Sections

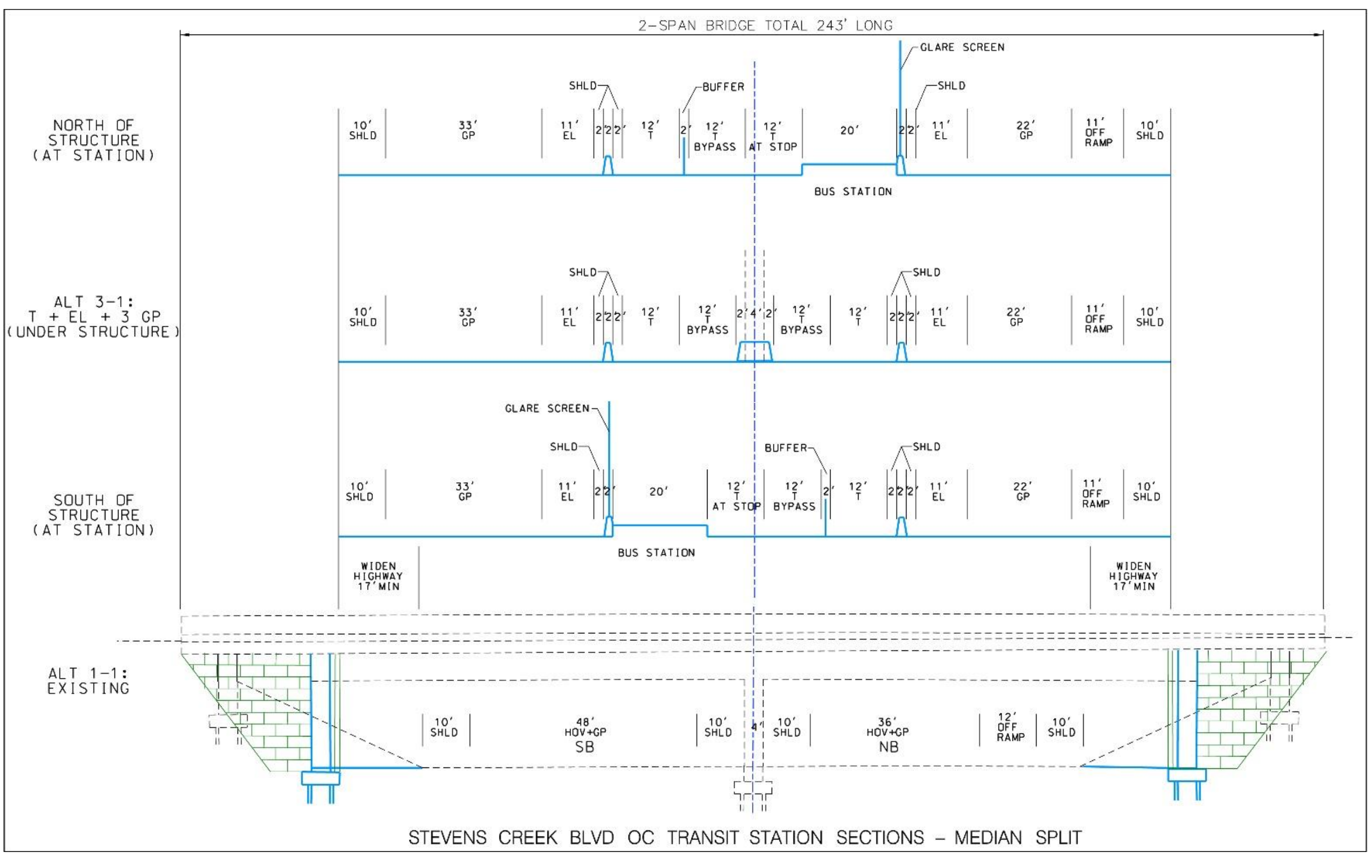


Figure 15 Median Split Platform Geometric Cross Sections

The **median split platforms option** is modeled on the San Diego Metropolitan Transit System (MTS) Bus Rapid Transit Stations on I-15 at University Avenue and at El Cajon Boulevard. These stations are approximately 0.4 mile apart. Both stations feature a bus plaza serving local buses at street level and freeway level split boarding platforms for passengers transferring to/from bus rapid transit vehicles. Each platform provides a stairway and elevator tower for movement between the upper-level bridge and lower-level freeway.

Photographs of these stations are provided as Exhibit 5. An aerial photograph of the split platform station at this location is presented as Figure 16.

Exhibit 5 San Diego MTS Bus Rapid Transit Stations: I-15 at University Avenue and at El Cajon Boulevard

Source: *How to Use Centerline Rapid Transit Stations,* San Diego MTS, March 12, 2018

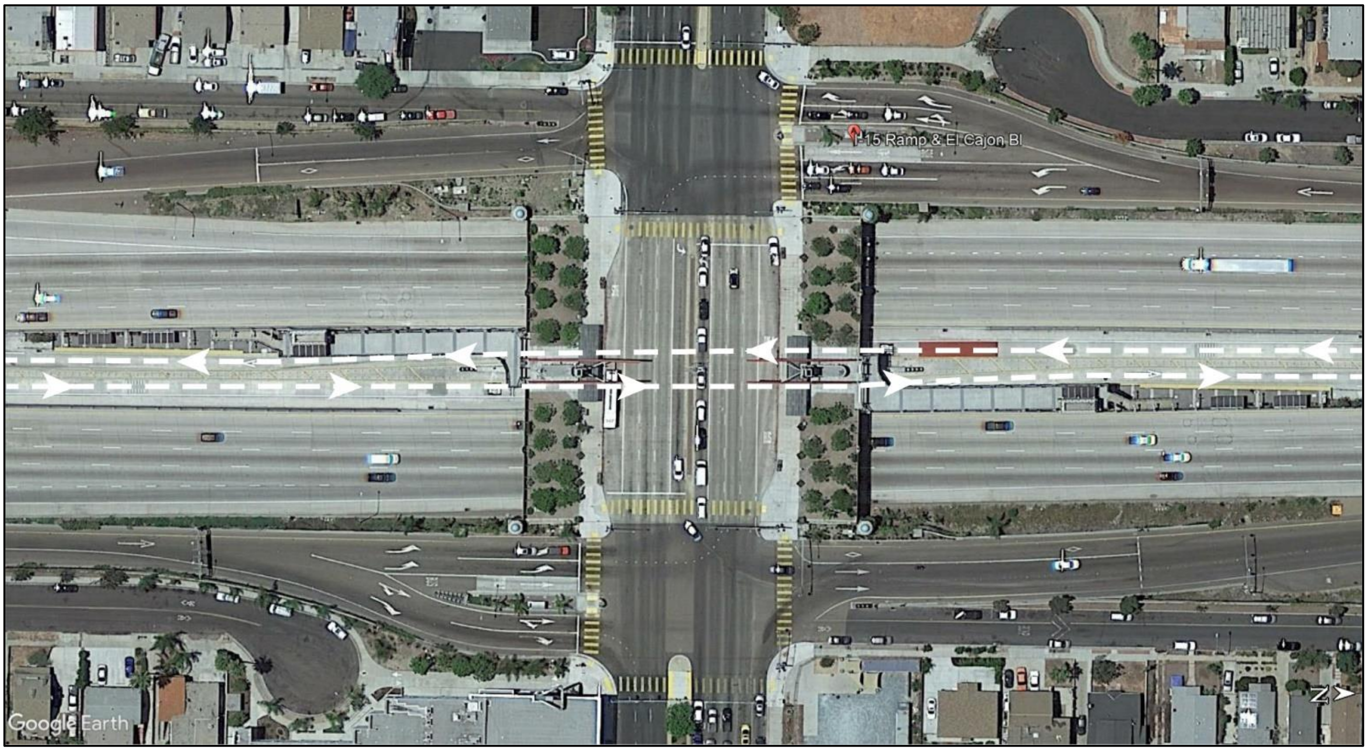


Figure 16 Aerial View of Split Platform Station at I-15 and El Cajon Boulevard

State Route 85 freeway buses will be able to stop at the far side platform or, in the case of commuter shuttles, use a bypass lane to avoid VTA buses which stop to pick up or discharge riders. In both cases, the speed limit passing through the station will be 25 mph due to the shift of the entering vs exiting lane alignments.

The width of the median required to accommodate this station design option is 60 feet as indicated on Figure 15. The width of the median required to accommodate the crossover median station, including the two transit lanes which bypass the station altogether, is 72 feet as depicted on Figure 14. The tradeoff between the two designs is the speed afforded to the commuter shuttle buses.

In both cases, the northbound and southbound freeway travel lanes will need to be spread to accommodate the transit station, as the median is only 24 feet wide at this location.

EL CAMINO REAL (SR 82)

El Camino Real is located four miles north of Stevens Creek Boulevard along SR 85. This state route crosses above SR 85 as a six-lane principal arterial. A four-quadrant cloverleaf (Type L-10) interchange connects the two roadways.

The median along SR 85 is 20 feet wide passing under SR 85, measured from the inside edges of the mainline PCC pavement. The cloverleaf ramps limit the width of the outside shoulders to six feet. To provide adequate width for a median station, the Type L-10 interchange will need to be reconfigured as a Type L-2 spread diamond interchange. The right side running transit lane (Alternative 3-2) would also require this same reconfiguration of the interchange.

Station design options for El Camino Real include:

- Median overpass platforms
- Median crossover platform
- Median split platforms
- Side platforms
- On-ramp/off-ramp bus stops.

These options are discussed below.

A **median overpass station** design could accompany Alternative 3-1, Long Transit Lane (Median Adjacent Lane). As envisioned for El Camino Real, northbound and southbound SR 85 would each provide a transit lane occupying the number 1 lane position, an express lane as the number 2 lane, and two general purpose lanes in the numbers 3 and 4 positions. Between the two transit lanes, a one-way reversible ramp would be constructed between the freeway median and the El Camino Real bridge crossing over SR 85. Far side bus stop platforms would be constructed at the top of the ramps adjacent to El Camino Real. The bus stop boarding platforms would cantilever over the transit lanes below. A traffic signal would be installed along El Camino Real where the VTA buses cross, northbound in the morning and southbound in the afternoon/early evening. The fourth lane (per direction) which currently exists on the bridge connecting the cloverleaf ramps would be repurposed as a bus stopping lane for VTA buses operating along El Camino Real (SR 82). The ramps up and down to the overcrossing bridge would each be 24 feet wide and approximately 500 feet long. During off-peak hours and off-peak directions, a second set of bus stops would be constructed at the freeway level, connected to El Camino Real above by stairs and an elevator tower.

Figure 17 presents a partial alignment plan for this station option paired with Alternative 3-1. An expanded view of the freeway widening needed to accommodate this design option can be viewed on sheets 8 through 10 of the portion of Attachment 3 illustrating the alignment plans for Alternative 3-1. Figure 18 provides an aerial view of a median overpass station constructed along I-405 at NE 128th Street in the Seattle metropolitan area. The I-405 example provides two-way ramps as more space is available compared with SR 85 at El Camino Real.

An alignment plan for a **median crossover station** is presented on Figure 19. This design option is appropriate for Alternative 3-5, Long Shoulder (Median) whereby VTA and commuter buses pass through the station during peak hours in the peak direction of travel. During off-peak hours and off-peak direction of travel, VTA buses stop at side platforms located at the freeway level. All platforms are connected to El Camino Real above via stairs and elevator towers located on both the north and south sides of the arterial street.

A **median split platform station** alignment plan is illustrated on Figure 20. All buses (VTA and commuter shuttles) pass through the station. Due to the shift in travel lane alignment between the south and north side of the bridge, speeds are limited to 25 mph. A traffic signal midblock would be installed along El Camino Real to allow bus passengers to cross the arterial as needed to board eastbound or westbound local buses.

Conceptual plans are provided at the end of the alignment plans for Alternative 3-5 or 3-1, respectively, for deploying these two design options at El Camino Real.

Alternatives 3-2, Long Transit Lane (Right-side Lane) and 3-6, Long Shoulder (Right-side) will utilize the number 4 outside right lane or the reconstructed and widened right-side shoulder adjacent to lane number 3. In either case, **side platforms** would be constructed at the freeway level with lanes for stopping to the right of the transit lane (Alternative 3-2) or shoulder (Alternative 3-6), respectively. An alignment plan displaying this side platform station configuration is presented as Figure 21. A more complete set of alignment plans for Alternative 3-2 is provided in Attachment 3, which additionally illustrate side platform stations at Stevens Creek Boulevard (sheet 22) and both Saratoga Avenue and Bascom Avenue (following sheet 29). Figure 22 provides an example of a side platform station along the I-10 express lanes serving the California State University, Los Angeles campus.

Utilization of **on-ramp or off-ramp bus stops** has been mentioned previously as a station design option for Bascom Avenue, Saratoga Avenue, and Stevens Creek Boulevard, for pairing typically with Alternative 3-6, Bus on Right-side Shoulder. At El Camino Real, a southbound off-ramp is typically missing from the Type L-2 spread diamond interchange plans proposed for this location, to replace the Type L-10 cloverleaf configuration which exists currently. For the right-side bus on shoulder alternative, it may be possible to include an auxiliary lane from the westbound SR 237 on-ramp to a new diagonal off-ramp to El Camino Real subject to further investigation and Caltrans approval of design exceptions. Inclusion of a southbound diagonal off-ramp would allow this on-ramp/off-ramp bus stop option to be worthy of consideration.

Figure 23 illustrates a prototypical freeway ramp bus stop proposed for implementation in Minneapolis/Saint Paul.

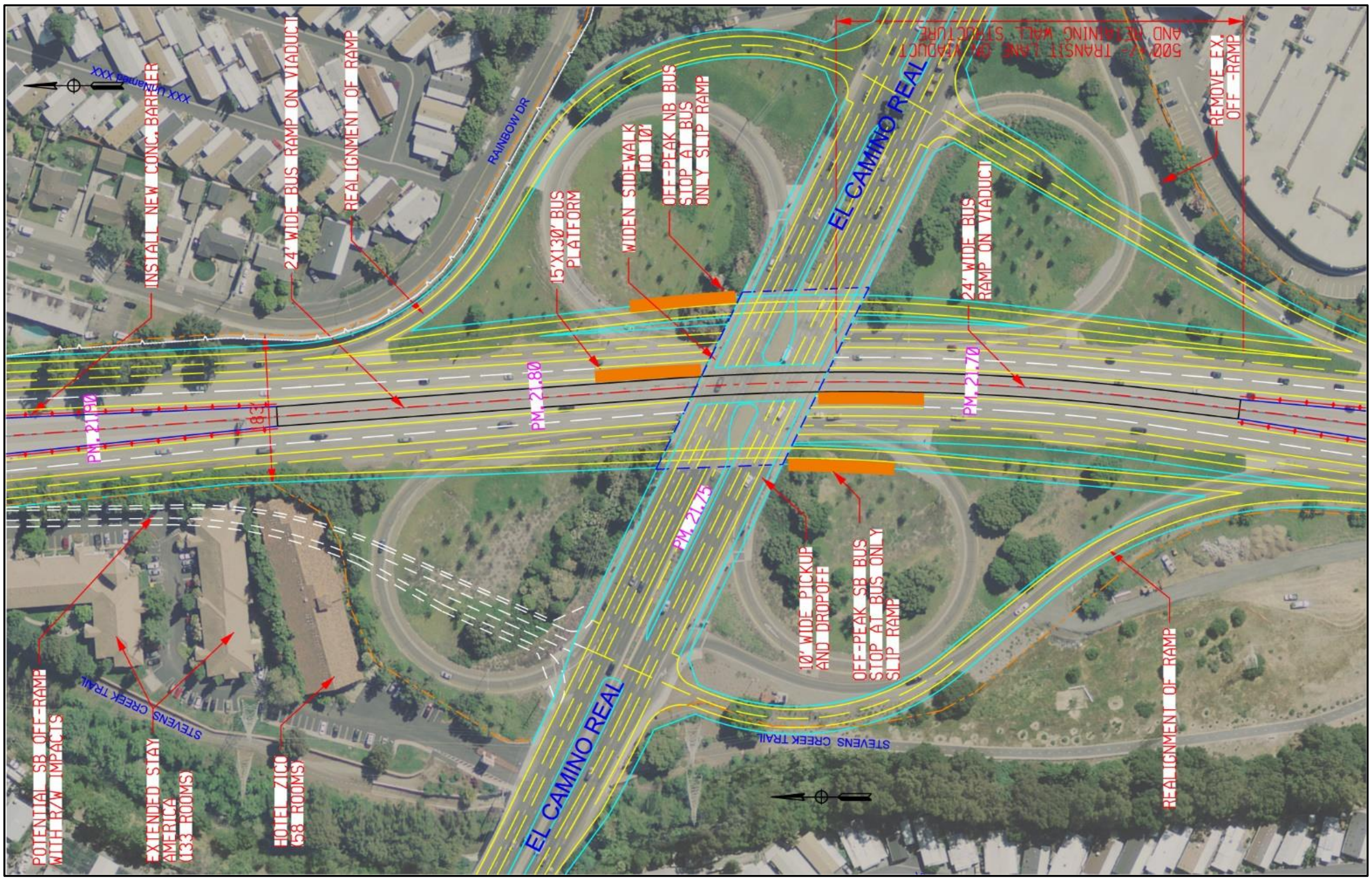


Figure 17 El Camino Real Station Partial Median Overpass Station Design

Figure 18 Aerial View of a Median Overpass Station along I-405 at NE 128th Street

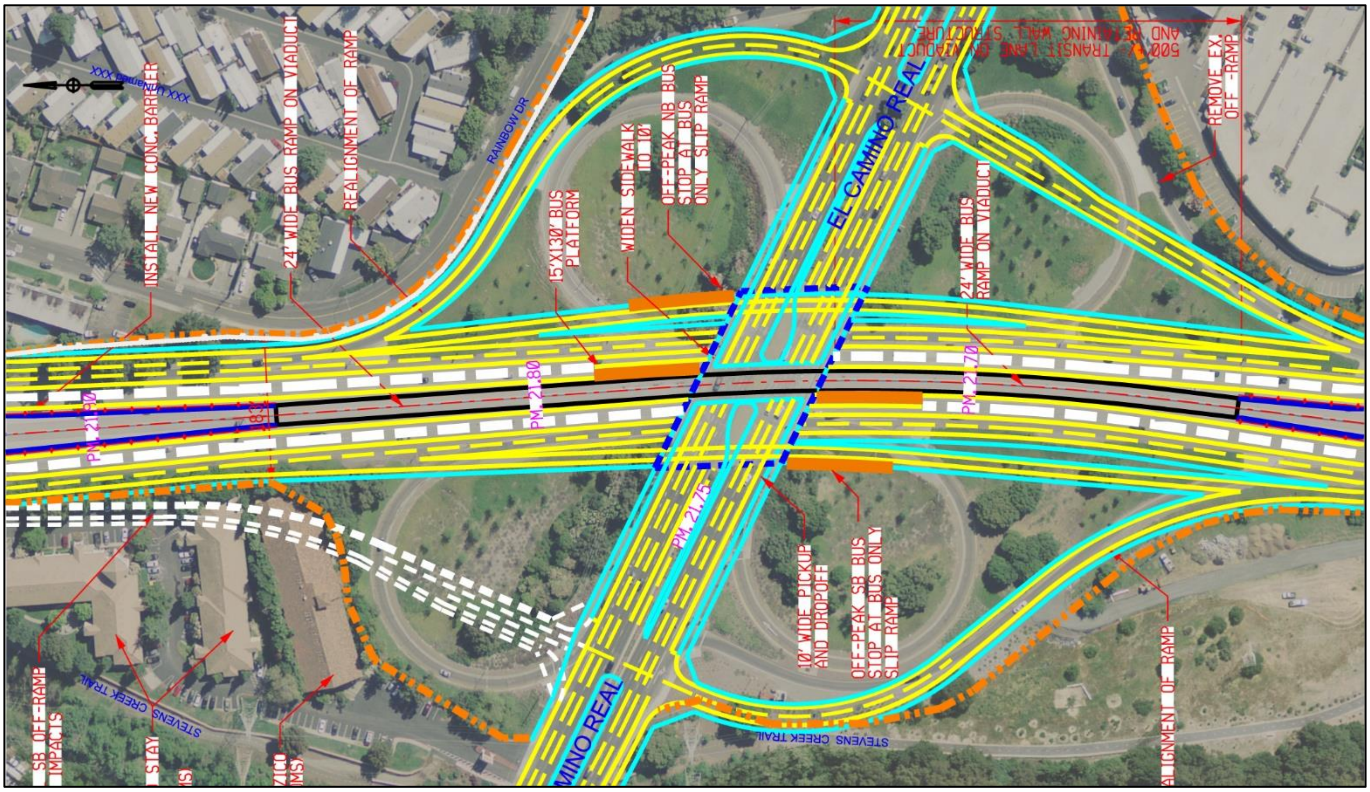


Figure 19 Median Crossover Station

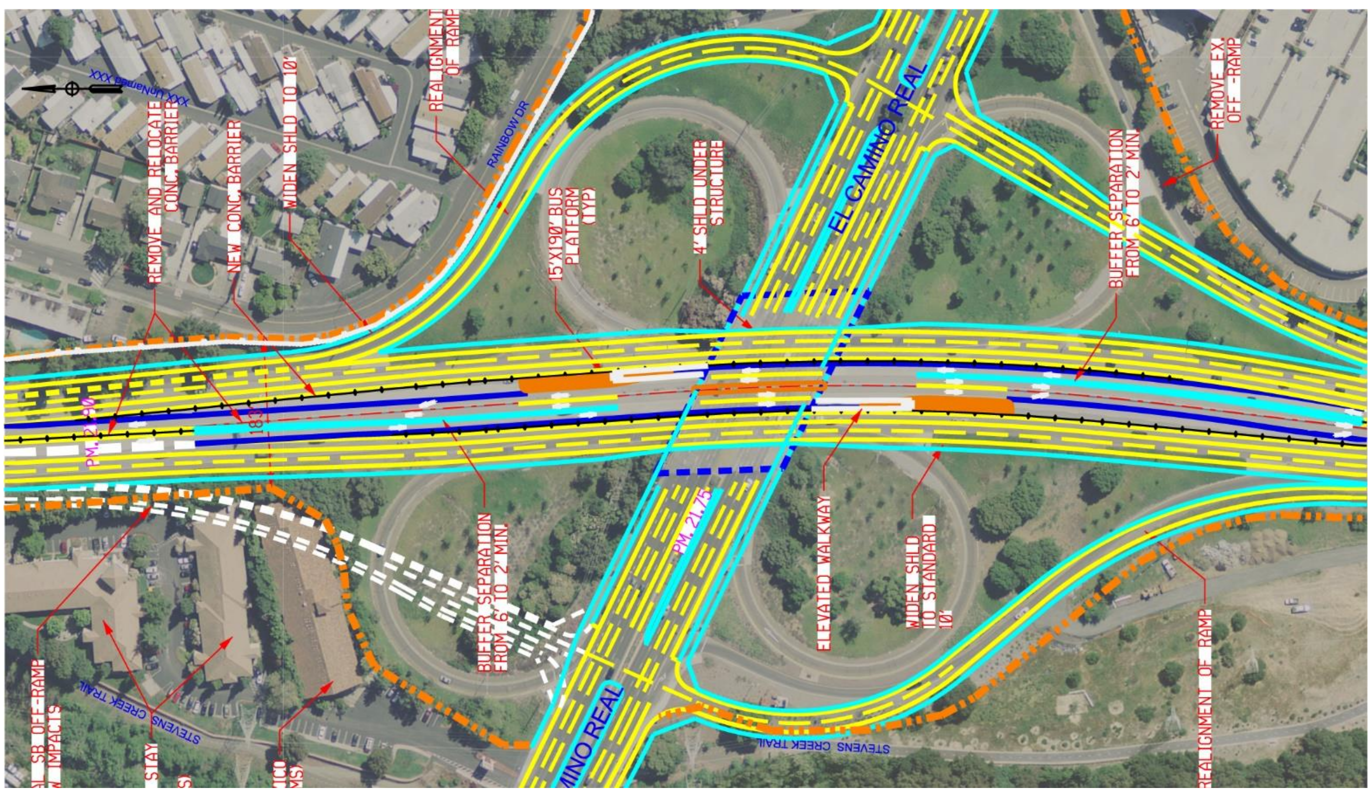


Figure 20 Median Split Platform Station

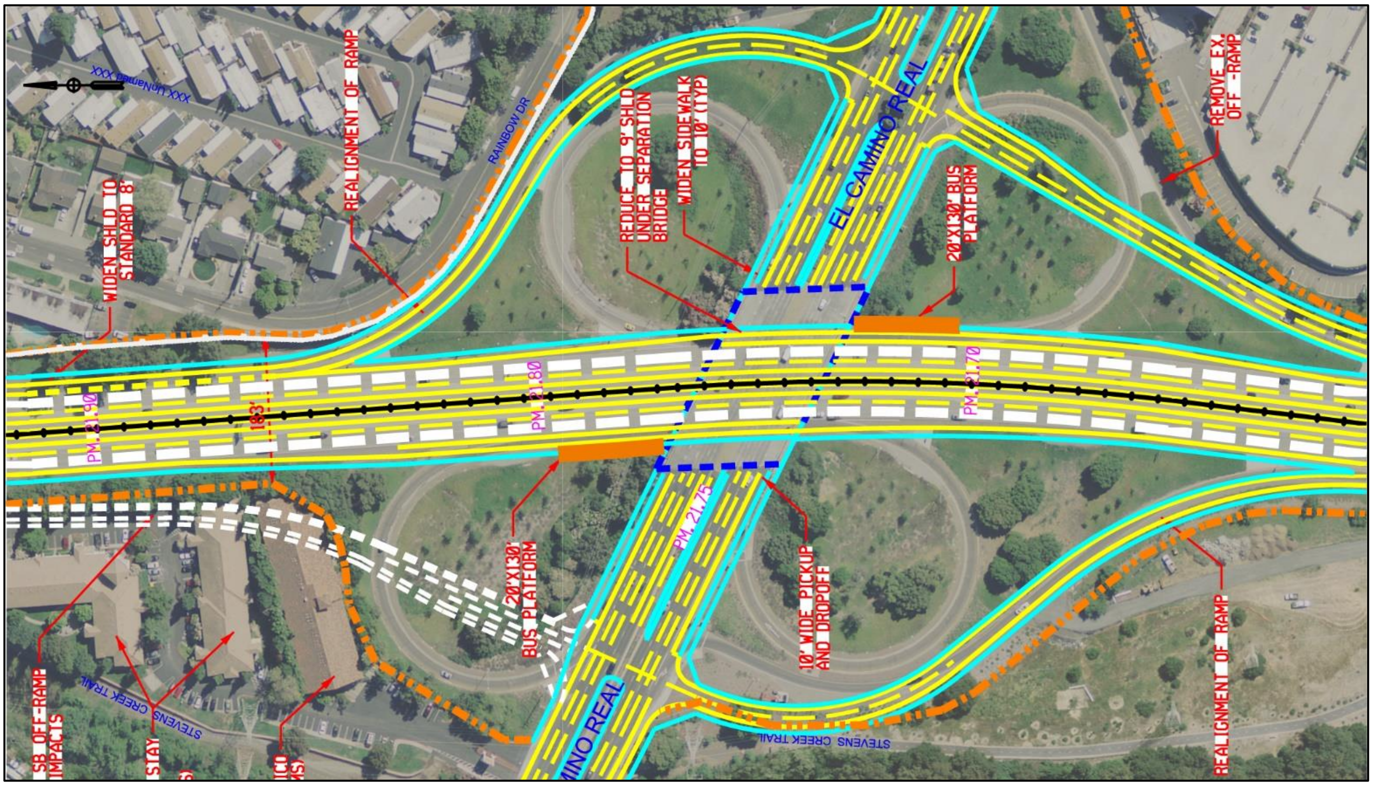
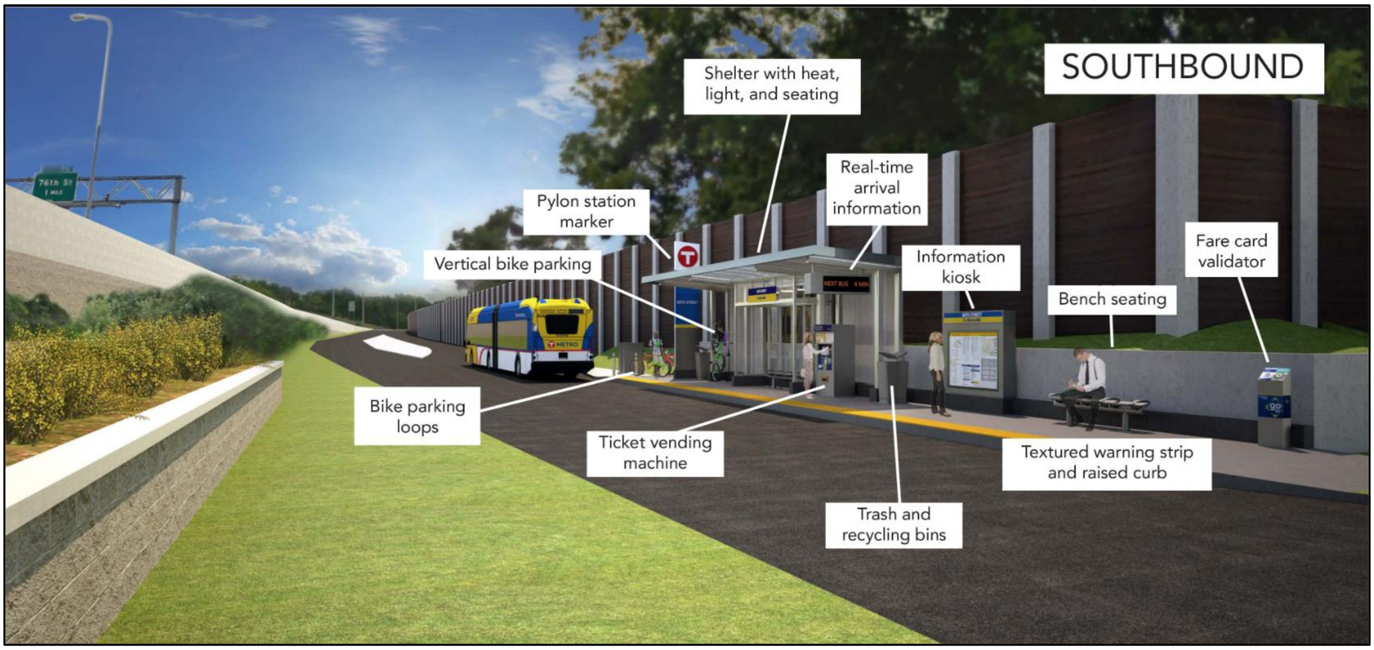


Figure 21 Side Platform Station at El Camino Real

Figure 22 Side Platform Station along I-10 at Cal State, Los Angeles



Source: Metro Transit, Minneapolis/St. Paul Area, I-35W & 66th St Station, Richfield, Metro Orange Line, https://www.metrotransit.org/orange-line-66th-street-station, downloaded 10/7/2019

Figure 23 Prototypical Freeway Ramp Bus Stop

Cross sections covering most of these station design options for El Camino Real are presented on Figure 24 and Figure 25.

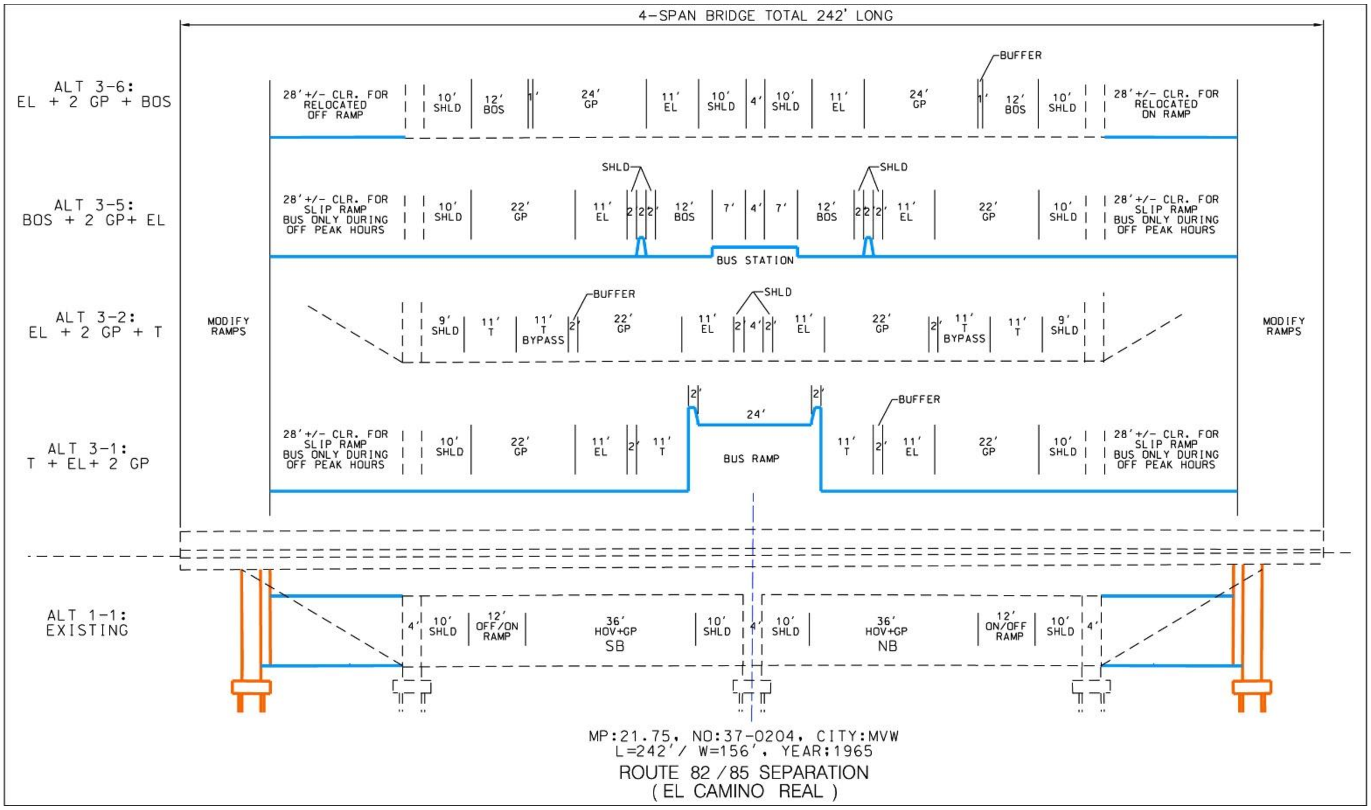


Figure 24 El Camino Real Transit Station Geometric Cross Sections

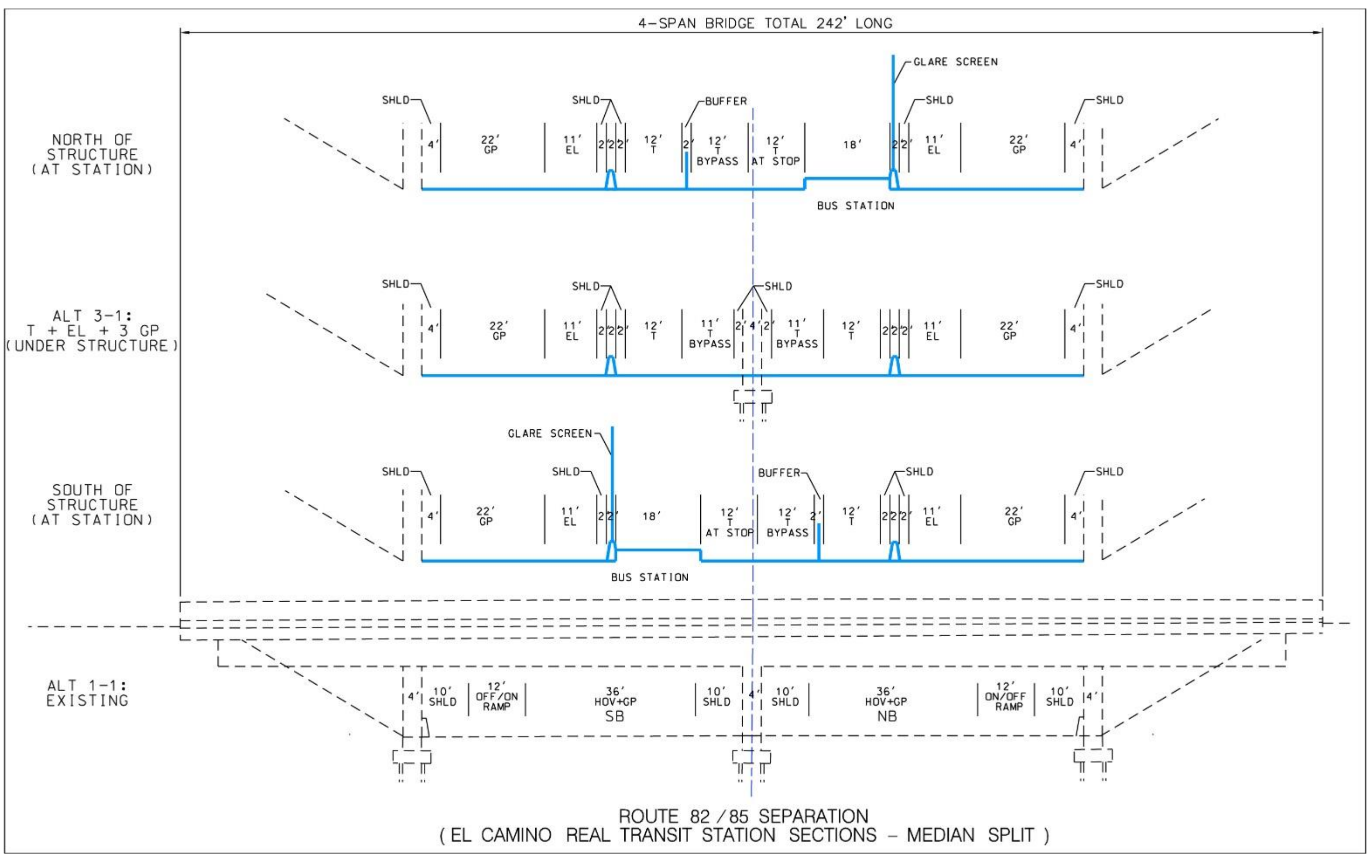


Figure 25 Median Split Platform Geometric Cross Sections at El Camino Real

Coordination with Other Potential Improvements

A number of transportation investments are planned for implementation along the SR 85 corridor. Several of these will be potentially impacted by one or more of the alternatives considered by this SR 85 Transit Guideway Study. Table 10 lists projects included in the Metropolitan Transportation Commission's *Plan Bay Area 2040* adopted on July 16, 2017 and those submitted by VTA to MTC in July/August 2019 for potential inclusion in the upcoming Plan Bay Area 2050 (PBA 2050).

Planned projects potentially impacted by the transit guideway are discussed following the table.

Table 10 PBA 2050 Regionally Significant Projects Potentially Impacted by SR 85 Transit Guideway Study Alternatives

	Alternative									
	1-1 No Build	1-2 HOV to Express Lane Conversion	2-1 Express Lanes Project	2-2 Long Express Lanes	3-1 Long Transit Lane in Median	3-2 Long Transit Lane on Right Side	3-3 Long Transit Lane Hybrid	3-4 Short Transit Lane	3-5 Long Bus on Median Shoulder	3-6 Long Bus on Right Shoulder
1. Extend light rail transit from Winchester Station to SR 85 (Vasona Junction)					X	X	X	X	X	X
2. Mountain View Transit Center improvements					X		X		X	
3. SR 85 NB to EB SR 237 connector ramp and NB SR 85 auxiliary lane										
4. SR 85/El Camino Real interchange improvements										
5. SR 237 WB to SB SR 85 connector ramp improvements				X	X	X	X		X	
6. SR 85/I-280/Homestead Road interchange improvements										
7. SR 85 soundwalls										
8. SR 85 to I-280 HOT direct connector	X			X	X	X	X		X	
9. SR 85 Express Lanes: U.S. 101 (south San Jose) to Mountain View	X				X	X	X	X	X	
10. SR 87 Express Lanes: I-880 to SR 85										
11. SR 85 corridor improvements—reserve amount	X									

1. Extend light rail transit from Winchester Station to SR 85. Winchester Boulevard lies 0.7 miles north of the proposed SR 85 Transit Guideway station at South Bascom Avenue. Approximately 2,000 persons are employed nearby at Netflix and VTA bus route 48 operates along Winchester Boulevard passing SR 85. Figure 26 provides an aerial view of the proposed Vasona Junction end-of-line LRT station and its adjacent park-and-ride lot with 108 to 135 spaces.

The median of SR 85 is 48 feet wide at Winchester Boulevard including two paved inside shoulders. This width is nearly sufficient to accommodate a number of station design options presented earlier. Given widening of the freeway mainline to spread the northbound and southbound travel lanes, a transit guideway station with pedestrian overcrossing bridge could be constructed to interconnect these two services. As an example, Figure 27 illustrates a median crossover station with a pedestrian overcrossing to an adjacent local bus transfer stop and park-and-ride lot along the Metro Red (BRT) Line in the Twin Cities at Route 77 and Cedar Grove.

2. Mountain View Transit Center Improvements. The City of Mountain View has nominated extensive improvements at the existing transit center adjacent to its downtown at Evelyn Avenue and Castro Street. Figure 3, presented previously,

Figure 26 Vasona Junction at SR 85

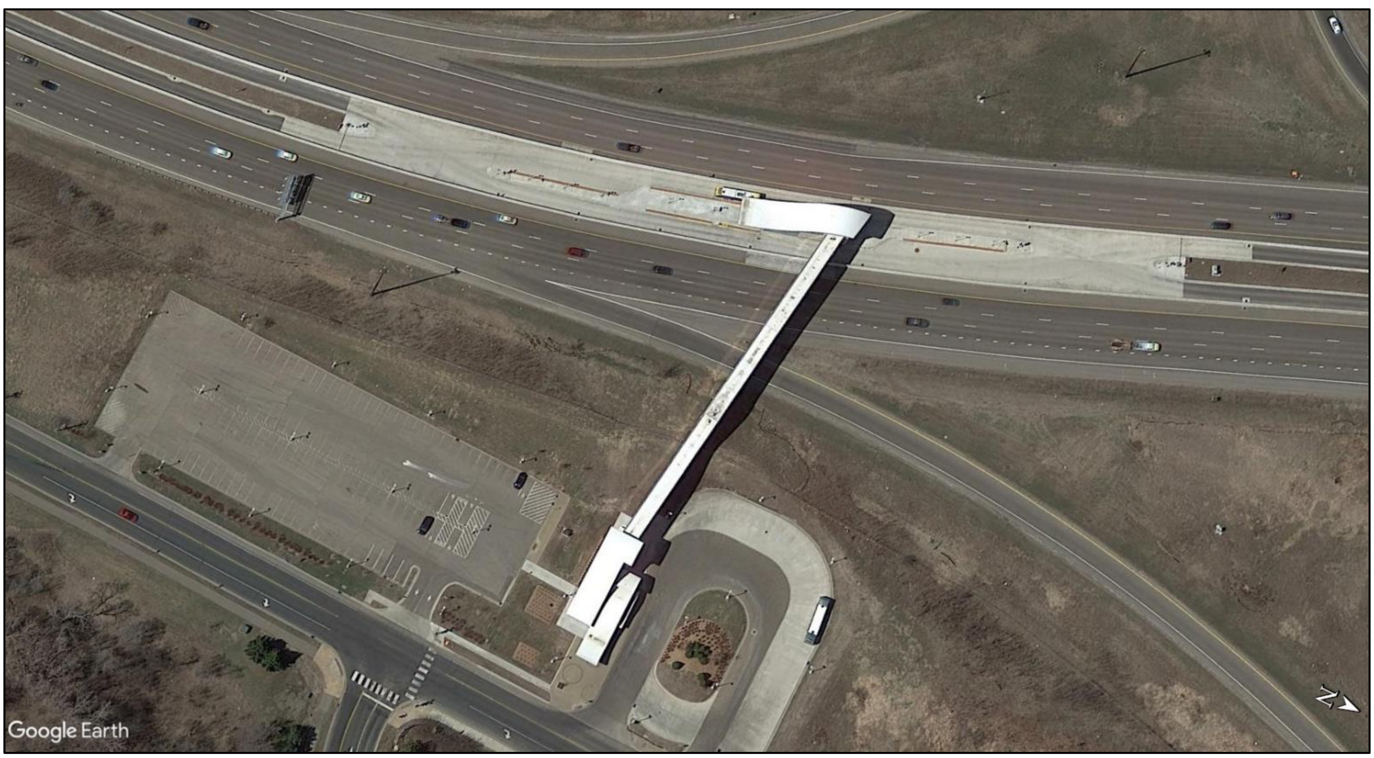


Figure 27 Cedar Grove Transit Station Median Crossover Platform with Pedestrian Overcrossing

illustrated a potential direct connector drop ramp to Evelyn Avenue from the median of SR 85. This optional ramp could be an element of all median running transit guideway alternatives (3-1, 3-3 potentially, and 3-5).

3. SR 85 Northbound to Eastbound SR 237 Connector Ramp and Northbound SR 85 Auxiliary Lane. A northbound SR 85 auxiliary lane from the El Camino Real interchange on-ramp to the SR 237 off-ramp is included with each of the alignment plan sets provided as Attachment 3 to this document (sheets 8 and 9) for alternatives 2-2, 3-1, and 3-2. Details for the connector ramp to eastbound SR 237 are not available. It should be noted that construction of any transit platform in the median of SR 85 at El Camino Real will constrain the space available along SR 85 for connector ramp improvements to SR 237.

4. SR 85/El Camino Real Interchange Improvements. Conversion of the SR 85 interchange at SR 82/El Camino Real from a cloverleaf Type L-10 ramp configuration to a spread diamond Type L-2 ramp configuration is an optional improvement for Scenario A—Limited Physical Change and Scenario B—Freeway Widening without Transit Stations; and required for Scenario C—Freeway Widening with Transit Stations and Scenario D—Part-time Shoulder Use (Bus on Shoulder).

Implementation of any of the Scenario B, C, or D alternatives limit the opportunity to provide a southbound diagonal off-ramp directly to El Camino Real without the need for potentially expensive right-of-way acquisition, or shifting the freeway mainline toward the east.

5. SR 237 Westbound to Southbound SR 85 Connector Ramp Improvements (including SR 85 Auxiliary Lane between El Camino Real and SR 237). The right-of-way along the west side of SR 85 is constrained from PM 21.85 (opposite the northbound on-ramp from El Camino Real) to PM 22.0 (opposite the off-ramp to eastbound SR 237). Two hotels with surface parking lots lay astride the west side of this pinch point. Widening the freeway to provide dual express lanes or the addition of a transit lane or the addition of a station for the bus on shoulder alternatives would preclude the inclusion of a southbound auxiliary lane between SR 237 and El Camino Real.

6. SR 85/I-280/Homestead Road Interchange Improvements. No conflicts with the SR 85 transit guideway alternatives identified for study are known to exist. All freeway widening alternatives under Scenario B and C should be monitored for potential conflicts with this interchange improvement.

7. SR 85 Soundwalls. Implementation of the transit guideway study alternatives are not anticipated to conflict with soundwall improvements implemented by others.

8. SR 85 to I-280 HOT Direct Connector. The "Long Transit Lane" alternatives will construct a new travel lane in each direction along SR 85 passing through the separation with I-280. Space in the median of SR 85 will not exist for the addition of a two-way direct connector ramp absent the widening of all SR 85 bridge structures (3) crossing over the I-280 mainline and connector ramps.

9. SR 85 Express Lanes: U.S. 101 (South San Jose to Mountain View. This project reflects Alternative 2-1 addressed by this transit guideway study. Implementation of the Transit Lane Alternatives would preclude this investment. The single lane HOV to express lane conversion (Alternative 1-2) would not conflict given prior planning for overhead sign and toll antenna cantilever structure foundations and lighting installed on mast-arm standards. Implementation of Alternative 3-6, Long Bus on Right-side Shoulder, could also be added to this project or precede it.

10. SR 87 Express Lanes: I-880 to SR 85. A modest budget of $41 million is identified for this HOV to express lane conversion; hence, no direct connector ramps to the express lanes along SR 85 appear to be envisioned. No conflict would occur by implementing any of the SR 85 Transit Guideway Study alternatives.

11. SR 85 Corridor Improvements—Reserve Amount. The Santa Clara Valley Transportation Authority has listed a budget of $400 million for this line item in its submittal to MTC for the PBA 2050 Regionally Significant Project List.

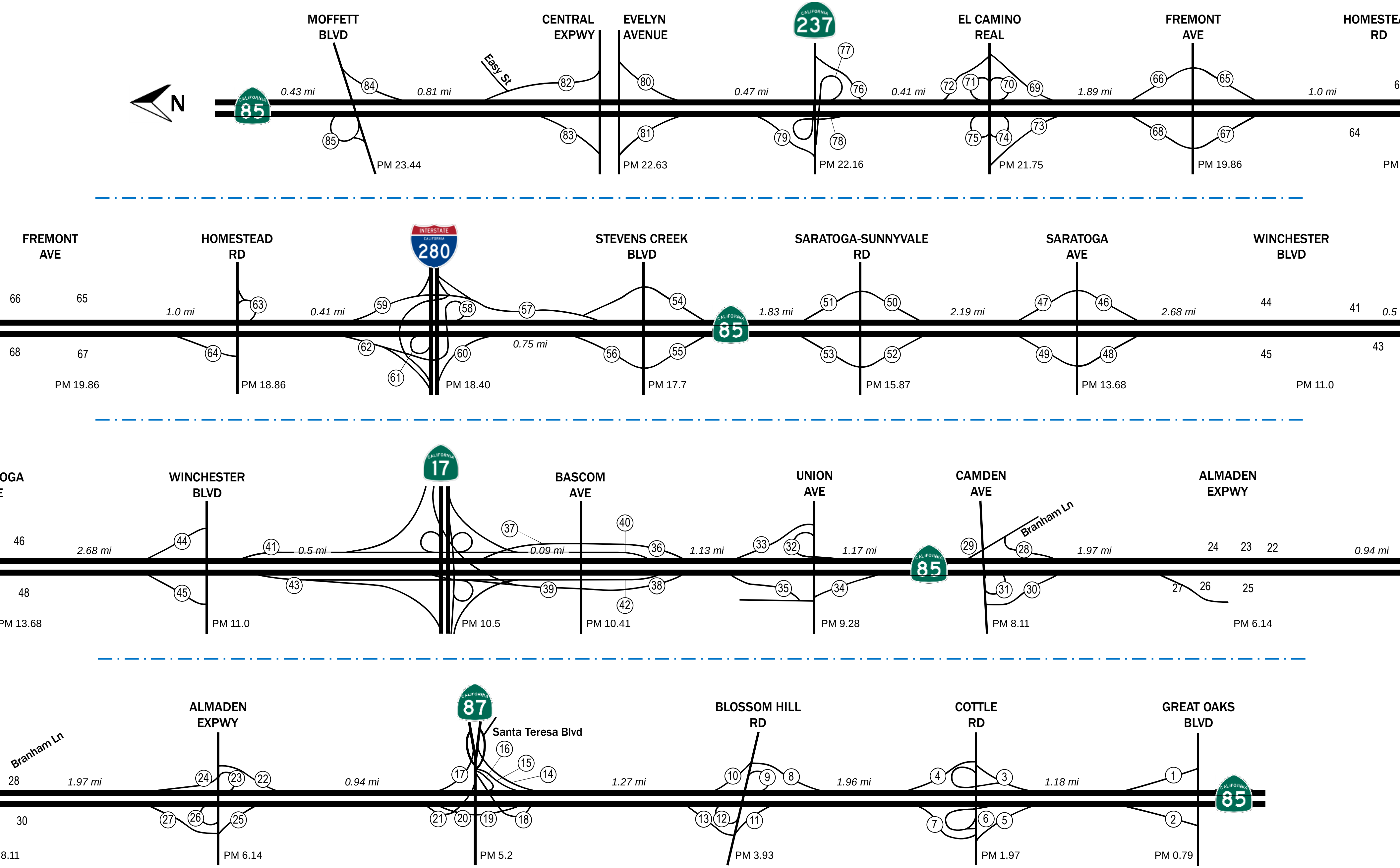
The budget reserve would not be required for Alternative 1-1, No Build. Less than this amount would be required for Alternatives 2-1 and 2-2. All or less than all of this amount would be required for the transit guideway alternatives given the inclusion of in-line transit stations along SR 85.

ATTACHMENT 1

SR 85 Interchange Ramps

CDM Smith

PARSONS



State Route 85 Proposed Engineering Features

Version 2.0, November 8, 2019

Basis of Design Report

STATE ROUTE 85 TRANSIT GUIDEWAY STUDY

Part 3: Capital Costs

December 23, 2019

PARSONS

100 West San Fernando Street, Suite 375

San Jose, CA 95113-2233

Valley Transportation Authority

Solutions that move you

MEASURE B

Revision History

Revision	Date	Description
1.0	December 23, 2019	Initial Draft Submission

ATTACHMENT 4

Capital Costs

Capital Cost Estimates for
HOV to Express Lane Conversion and Lane Additions

- Summary of Conceptual Capital Costs
- Alternative 1-2 HOV to Express Lane Conversion
- Alternative 2-1 Express Lanes Project
- Alternative 2-2 Long Express Lanes Project
- Alternative 3-1 Long Transit Lane (Median Adjacent Lane)
- Alternative 3-2 Long Transit Lane (Right-side Lane)
- Alternative 3-4 Short Transit Lane
- Alternative 3-5 Long Shoulder (Median Lane)
- Alternative 3-6 Long Shoulder (Right-side Lane)

Note: No cost estimate is provided for Alternative 3-3 Long Transit Lane (Hybrid) as this alternative is not defined.

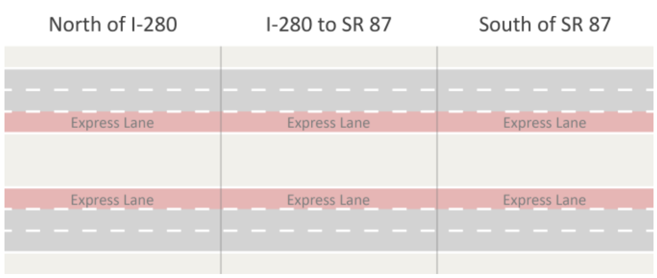
Summary of Conceptual Capital Costs ($, millions)

Alternative		HOV to Express Lane Conversion	Lane Additions	Transit Stations	Optional Items	Total Capital Cost	
						Current	Escalated
1-1	No Build	$ 0	$ 0	$ 0	$0	$ 0	$ 0
1-2	HOV to Express Lane Conversion	$250.14	$ 0	$ 0	$0	$250.14	$303.00
2-1	Express Lanes Project	$250.14	$ 96.09	$ 0	$0	$346.23	$464.00
2-2	Long Express Lanes Project	$250.14	$129.60	$ 0	$0	$379.74	$500.00
3-1	Long Transit Lane (Median Adjacent Lane)	$250.14	$135.77	$45.26	$8.47	$439.64	$589.12
3-2	Long Transit Lane (Right-side Lane)	$250.14	$135.77	$ 8.60	$0	$394.51	$530.00
3-3	Long Transit Lane (Hybrid)	TBD	TBD	TBD	TBD	TBD	TBD
3-4	Short Transit Lane	$250.14	$ 99.73	$33.95	$0	$383.82	$514.32
3-5	Long Shoulder (Median)	$250.14	$107.76	$45.26	$8.47	$411.63	$551.58
3-6	Long Shoulder (Right-side)	$250.14	$ 85.99	$ 8.60	$0	$344.73	$463.00

Note: Capital cost excludes “SR 85/El Camino Real Interchange Improvements” multi-agency project, Bay Area 2040 ID 17-07-0037, with total project cost of $27 million.

Alternative 1-2: HOV to Express Lane Conversion

- Convert existing HOV lane in each direction from Bernal Road, near U.S. 101 in south San Jose to Moffett Boulevard, near U.S. 101 in Mountain View, a distance of 23.2 miles, to operate as one express lane in each direction.
- Provide continuous access to express lane from the adjacent general-purpose lanes.
- Install toll infrastructure in median to support express lanes.
- Reconstruct concrete median barrier south of Santa Teresa Boulevard and north of Stelling Road to accommodate toll gantries and dynamic message signs.
- Widen paved median shoulder to 14 feet in both directions from Santa Teresa Boulevard to South Stelling Road (excepting structures) to provide continuous CHP enforcement area.
- Widen right-side shoulders to meet Highway Design Manual standards (10 feet). Relocate drainage inlets as needed to the outside edge of shoulder.
- Install double-luminaire mast arm lighting at 250- to 400-foot intervals from PM 6.00 (Almaden Expressway) to PM 17.70 (Stevens Creek Boulevard) and from PM 18.86 (Homestead Road) to PM 23.44 (Moffett Boulevard).
- Install high mast lighting at SR 17 and I-280 interchanges as needed to supplement existing (optional improvement).



Alternative 1-2: HOV to Express Lane Conversion

Engineer Cost Estimate --- Alternative 1-2
Preliminary Project Study Report

Project ID: XXXXXX

Type of Estimate :	Preliminary Project Study Report (Dec 2019)
Program Code :	04-XXXXX
Project Limits :	From Hwy 101 Interchange in Santa Jose to South of Hwy 101 Interchange in Mt. View
Description:	From PM 0.00 to PM 23.68
Scope :	Convert the Existing HOV on SR 85 to An Express Lanes But the Unused Space in the Median Between I-280 and SR 87 would not be changed, Leaving it for A future Transportation Investment
Alternative :	Alternative 1-2 HOV to Express Lane Conversion

		Current Cost		Escalated Cost
ROADWAY ITEMS	$	185,288,856	$	223,916,200
STRUCTURE ITEMS	$	-	$	-
SUBTOTAL CONSTRUCTION COST	$	185,288,856	$	223,916,200
RIGHT OF WAY	$	-	$	-
TOTAL CAPITAL OUTLAY COST	$	185,289,000	$	223,917,000
PR/ED SUPPORT (3%)	$	5,559,000	$	6,718,000
PS&E SUPPORT (12%)	$	22,235,000	$	26,870,000
RIGHT OF WAY SUPPORT				
CONSTRUCTION SUPPORT (12%)	$	22,235,000	$	26,870,000
AGENCY SUPPORT (8%)	$	14,824,000	$	17,914,000
TOTAL CAPITAL OUTLAY SUPPORT COST*	$	64,853,000	$	78,372,000
TOTAL PROJECT COST	$	250,142,000	$	303,000,000

If Project has been programmed enter Programmed Amount

	Month	/	Year
Date of Estimate (Month/Year)	12	/	2019
Estimated Date of Construction Start (Month/Year)	10	/	2023
Number of Working Days	750		Working Days
Estimated Mid-Point of Construction (Month/Year)	4	/	2024
Number of Plant Establishment Days			Days

Estimated Project Schedule

PID Approval
PA/ED Approval
PS&E
RTL
Begin Construction

Approved by Project Manager

Project Manager	**Date**	**Phone**

I. ROADWAY ITEMS SUMMARY

	Section	Cost
1	Earthwork	$ -
2	Pavement Structural Section	$ -
3	Drainage	$ -
4	Specialty Items	$ 30,000
5	Environmental	$ 545,000
6	Traffic Items	$ 116,510,800
7	Detours	$ 250,000
8	Minor Items	$ 5,866,800
9	Roadway Mobilization	$ 12,320,300
10	Supplemental Work	$ 6,160,200
11	State Furnished	$ 5,332,100
12	Contingencies	$ 30,881,500
13	Overhead	$ 7,392,156

TOTAL ROADWAY ITEMS	$ 185,288,856

Estimate Prepared By :

Name and Title	Date	Phone

Estimate Reviewed By :

Name and Title	Date	Phone

SECTION 1: EARTHWORK

Item code		Unit	Quantity		Unit Price ($)			Cost
160101	Clearing & Grubbing	AC	0	x	1,725	=		$0
170101	Develop Water Supply	LS	0	x	50,000	=		$0
190101	Roadway Excavation	CY	0	x	29	=		$0
190103	Roadway Excavation (Type Y) ADL	CY		x		=		$0
190105	Roadway Excavation (Type Z-2) ADL	CY		x		=		$0
192037	Structure Excavation (Retaining Wall)	CY		x		=		$0
193013	Structure Backfill (Retaining Wall)	CY		x		=		$0
193031	Pervious Backfill Material (Retaining Wall)	CY		x		=		$0
194001	Ditch Excavation	CY		x		=		$0
198001	Impored Borrow	CY	0	x	17	=		$0
198007	Imported Material (Shoulder Backing)	TON		x		=		$0
XXXXXX	Some Item			x		=		$0

TOTAL EARTHWORK SECTION ITEMS $ -

SECTION 2: PAVEMENT STRUCTURAL SECTION

Item code		Unit	Quantity		Unit Price ($)			Cost
150771	Remove Asphalt Concrete Dike	LF	0	x		=	$	-
150860	Remove Base and Surfacing	CY	0	x	12.5	=	$	-
153103	Cold Plane Asphalt Concrete Pavement	SQYD	0	x	8	=	$	-
150854	Remove Concrete Pavement	CY	0	x	156	=	$	-
260201	Class 4 Aggregate Base	CY	0	x	61	=	$	-
250401	Class 4 Aggregate Subbase	CY	0	x	38	=	$	-
290201	Asphalt Treated Permeable Base	CY	0	x	160	=	$	-
365001	Sand Cover	TON		x		=	$	-
374002	Asphaltic Emulsion (Fog Seal Coat)	TON		x		=	$	-
374492	Asphaltic Emulsion (Polymer Modified)	TON		x		=	$	-
3750XX	Screenings (Type XX)	TON		x		=	$	-
377501	Slurry Seal	TON		x		=	$	-
390095	Replace Asphalt Concrete Surfacing	CY		x		=	$	-
390132	Hot Mix Asphalt (Type A)	TON		x		=	$	-
390136	Minor Hot Mix Asphalt	TON		x		=	$	-
390137	Rubberized Hot Mix Asphalt (Gap Graded)	TON		x		=	$	-
393003	Geosynthetic Pavement Interlayer	SQYD		x		=	$	-
39405X	Shoulder Rumber Strip *(HMA, Type XX Indent*	STA		x		=	$	-
394071	Place Hot Mix Asphalt Dike	LF	0	x		=	$	-
394090	Place Hot Mix Asphalt (Misc. Area)	SQYD		x		=	$	-
397005	Tack Coat	TON		x		=	$	-
400050	Continuously Reinfored Concrete Pavement	CY	0	x	300	=	$	-
401108	Replace Concrete Pavement (Rapid Strength	CY		x		=	$	-
404092	Seal Pavement Joint	LF		x		=	$	-
404094	Seal Longitudinal Isolation Joint	LF		x		=	$	-
413112A	Repair Spalled Joints (Polyester Grout)	SQYD		x		=	$	-
413115	Seal Existing Concrete Pavement Joint	LF		x		=	$	-
420102	Groove Existing Concrete Pavement	SQYD		x		=	$	-
420201	Grind Existing Concrete Pavement	SQYD		x		=	$	-
731502	Minor Concrete (Misc. Const)	CY		x		=	$	-
731530	Minor Concrete (Textured Paving)	SQFT		x		=	$	-
XXXXXX	Some Item			x		=	$	-

TOTAL STRUCTURAL SECTION ITEMS $ -

SECTION 3: DRAINAGE

Item code		Unit	Quantity		Unit Price ($)			Cost
150206	Abandon Culvert	LF		x		=	$	-
150805	Remove Culvert	LF		x		=	$	-
150820	Modify Inlet	EA		x		=	$	-
152430	Adjust Inlet	LF		x		=	$	-
155003	Cap Inlet	EA		x		=	$	-
193114	Sand Backfill	CY		x		=	$	-
510502	Minor Concrete (Minor Structure)	CY		x		=	$	-
510512	Minor Concrete (Box Culvert)	CY		x		=	$	-
510XXX	Culvert (Roadway Crossing)	EA		x		=	$	-
62XXXX	XXX" APC Pipe	LF		x		=	$	-
64XXXX	XXX" Plastic Pipe	LF		x		=	$	-
65XXXX	XXX" RCP Pipe	LF		x		=	$	-
66XXXX	XXX" CSP Pipe	LF		x		=	$	-
680905	Underdrain (6" Alternative)	LF	0	x	36	=	$	-
681103	Edge Drain (3" Plastic Pipe)	LF	0	x	21	=	$	-
69XXXX	XXX" Pipe Downdrain	LF		x		=	$	-
70XXXX	XXX" Pipe Inlet	LF		x		=	$	-
70XXXX	XXX" Pipe Riser	LF		x		=	$	-
70XXXX	XXX" Flared End Section	EA		x		=	$	-
703233	Grated Line Drain	LF		x		=	$	-
72XXXX	Rock Slope Protection (Type and Method)	CY		x		=	$	-
721420	Concrete (Ditch Lining)	CY		x		=	$	-
721430	Concrete (Channel Lining)	CY		x		=	$	-
729010	Rock Slope Protection Fabric	SQYD		x		=	$	-
750001	Miscellaneous Iron and Steel	LB		x		=	$	-
XXXXXX	Additional Drainage (Detention Base, etc)	LS		x		=	$	-
XXXXXX	Some Item			x		=	$	-

TOTAL DRAINAGE ITEMS $ -

SECTION 4: SPECIALTY ITEMS

Item code		Unit	Quantity		Unit Price ($)			Cost
070012	Progress Schedule (Critical Path Method)	LS	1	x	30,000	=	$	30,000
150662	Remove Metal Beam Guard Railing	LF	0	x	15	=	$	-
150668	Remove Terminal Systems	EA		x		=	$	-
1532XX	Remove Concrete Barrier (25, 50 or 50C)	LF	0	x	16	=	$	-
153250	Remove Sound Wall	SQFT	0	x	25	=	$	-
150606	Remove Fence (BW)	LF		x		=	$	-
190110	Lead Compliance Plan	LS	0	x	18,000	=	$	-
49XXXX	CIDH Concrete Piling *(Insert Diameter)*	LF		x		=	$	-
510060	Structural Concrete (Retaining Wall)	CY		x		=	$	-
510133	Class 2 Concrete (Retaining Wall)	CY		x		=	$	-
510XXX	Retaining Wall (MSE)	SQFT	0	x	85	=	$	-
XXXXXX	Sound Wall (On Pile, On Barrier or On Ret. Wall)	SQFT	0	x	40	=	$	-
5110XX	Architectural Treatment *(Insert Type)*	SQFT		x		=	$	-
511048	Apply Anti-Graffiti Coating	SQFT		x		=	$	-
5136XX	Reinforced Concrete Crib Wall *(Insert Type)*	SQFT		x		=	$	-
518002	Sound Wall (Masonry Block)	SQFT		x		=	$	-
520103	Bar Reinf. Steel (Retaining Wall)	LB		x		=	$	-
800007	Fence (BW)	LF		x		=	$	-
832001	Metal Beam Guard Railing	LF	0	x	47	=	$	-
839310	Double Thrie Beam Barrier	LF		x		=	$	-
839521	Cable Railing	LF		x		=	$	-
83954X	Transition Railing *(Insert Type)*	EA		x		=	$	-
8395XX	Terminal System (Type CAT)	EA		x		=	$	-
8395XX	Alternative Flared Terminal System	EA	0	x	1,200	=	$	-
8395XX	End Anchor Assembly (*Insert Type*)	EA		x		=	$	-
839561	Rail Tensioning Assembly	EA		x		=	$	-
839596	Crash Cushion *(G.R.E.A.T)*	EA		x		=	$	-
839701	Concrete Barrier *(50 or 60)*	LF	0	x	78	=	$	-
833128	Concrete Barrier *(25 Modify)*	LF	0	x	128	=	$	-
XXXXXX	Some Item			x		=	$	-

TOTAL SPECIALTY ITEMS $ 30,000

SECTION 5: ENVIRONMENTAL

5A - ENVIRONMENTAL MITIGATION

Item code		Unit	Quantity		Unit Price ($)			Cost
XXXXXX	Biological Mitigation	LS		x		=	$	-
071325	Temporary Reinforced Silt Fence	LF		x		=	$	-
XXXXXX	Hazardous Material Remediation	LS	0	x	180,000	=	$	-
XXXXXX	Permits	LS	1	x	45,000	=	$	45,000
071325	Temporary Fence (Type ESA)	LF		x		=	$	-

Subtotal Environmental *$ 45,000*

5B - LANDSCAPE AND IRRIGATION

Item code		Unit	Quantity		Unit Price ($)			Cost
200001	Highway Planting	ACRE		x		=	$	-
20XXXX	XXX" (*Insert Type*) Conduit *(Use for Irrigation x-*	LF		x		=	$	-
20XXXX	Extend XXX" *(Insert Type)* Conduit	LF		x		=	$	-
201700	Imported Topsoil	CY		x		=	$	-
203015	Erosion Control	ACRE		x		=	$	-
203021	Fiber Rolls	LF		x		=	$	-
203026	Move In/ Move Out (Erosion Control)	EA		x		=	$	-
204099	Plant Establishment Work	LS		x		=	$	-
204101	Extend Plant Establishment (X Years)	LS		x		=	$	-
208000	Irrigation System	LS		x		=	$	-
208304	Water Meter	EA		x		=	$	-
209801	Maintenance Vehicle Pullout	EA		x		=	$	-
XXXXXX	Some Item							

Subtotal Landscape and Irrigation *$ -*

5C - NPDES

Item code		Unit	Quantity		Unit Price ($)			Cost
074016	Construction Site Management	LS	1	x	300,000	=	$	300,000
074017	Prepare WPCP	LS	0	x	20,000	=	$	-
074019	Prepare SWPPP	LS	0	x	20,000	=	$	-
074023	Temporary Erosion Control	ACRE	0	x	2,500	=	$	-
074027	Temporary Erosion Control Blanket	SQYD		x		=	$	-
074028	Temporary Fiber Roll	LF		x		=	$	-
074032	Temporary Concrete Washout Facility	EA		x		=	$	-
074033	Temporary Construction Entrance	EA		x		=	$	-
074035	Temporary Check Dam	LF		x		=	$	-
074037	Move In/ Move Out (Temp Erosion Control)	EA		x		=	$	-
074038	Temp. Drainage Inlet Protection	EA	0	x	60	=	$	-
XXXXXX	Site Job Management	LS	1	x	200,000	=	$	200,000
074042	Temporary Concrete Washout (Portable)	LS		x		=	$	-
XXXXXX	Some Item			x		=	$	-

Supplemental Work for NPDES

(These costs are not accounted in total here but under Supplemental Work on sheet 7 of 11).

074021	Water Pollution Control Maintenance Work*	LS	0	x	45,500	=	$	-
066596	Additional Water Pollution Control**	LS		x		=	$	-
066597	Storm Water Sampling and Analysis***	LS		x		=	$	-
XXXXXX	Some Item							

Subtotal NPDES (Without Supplemental Work) *$ 500,000*

*Applies to all SWPPPs and those WPCPs with sediment control or soil stabilization BMPs.

**Applies to both SWPPPs and WPCP projects.

*** Applies only to project with SWPPPs.

TOTAL ENVIRONMENTAL $ 545,000

SECTION 6: TRAFFIC ITEMS

6A - Traffic Electrical

Item code		Unit	Quantity		Unit Price ($)		Cost
150760	Remove Sign Structure	EA		x		=	$ -
151581	Reconstruct Sign Structure	EA		x		=	$ -
152641	Modify Sign Structure	EA		x		=	$ -
5602XX	Furnish Sign Structure	LB		x		=	$ -
5602XX	Install Sign Structure	LB		x		=	$ -
56XXXX	XXX" CIDHC Pile (Sign Foundation)	LF		x		=	$ -
56XXXX	Install Overhead Sign (Two Post)	EA	15	x	400,000	=	$ 6,000,000
56XXXX	Install Overhead Sign (One Post)	EA	10	x	160,000	=	$ 1,600,000
860090	Maintain Existing Traffic Management System	LS	1	x	900,000	=	$ 900,000
860810	Inductive Loop Detectors	EA		x		=	$ -
86055X	Lighting & Sign Illumination	EA	378	x	4,000	=	$ 1,512,000
8607XX	Interconnection Facilities	LS		x		=	$ -
8609XX	Traffic Traffic Monitoring Stations	LS	1	x	200,000	=	$ 200,000
860XXX	Signals & Lighting	LS		x		=	$ -
860XXX	ITS Elements	LS		x		=	$ -
861100	Ramp Metering System	LS		x		=	$ -
86XXXX	Fiber Optic Conduit System	LS		x		=	$ -
XXXXXX	Ramp Terminal Intersection Improvement	LS	0	x	1,000,000	=	$ -
XXXXXX	Toll Equipment and System Integration (Capital)	LS	1	x	100,000,000	=	$ 100,000,000
XXXXXX	Some Item						

Subtotal Traffic Electrical *$ 110,212,000*

6B - Traffic Signing and Striping

Item code		Unit	Quantity		Unit Price ($)		Cost
120090	Construction Area Signs	LS	1	x	600,000	=	$ 600,000
150701	Remove Yellow Painted Traffic Stripe	LF	0	x	4	=	$ -
150710	Remove Traffic Stripe	LF	0	x	0.25	=	$ -
150713	Remove Pavement Marking	SQFT	9,071	x	4.50	=	$ 40,820
150742	Remove Roadside Sign	EA	20	x	120	=	$ 2,400
15075X	Remove Sign Structure	EA	30	x	20,000	=	$ 600,000
15075X	Remove Sign Structure (On Bridge)	EA	8	x	5,000	=	$ 40,000
152320	Reset Roadside Sign	EA		x		=	$ -
152390	Relocate Roadside Sign	EA		x		=	$ -
566011	Roadside Sign (One Post)	EA	30	x	340	=	$ 10,200
566012	Roadside Sign (Two Post)	EA	10	x	1,250	=	$ 12,500
560XXX	Furnish Sign Panels	SQFT		x		=	$ -
560XXX	Install Sign Panels	SQFT		x		=	$ -
82010X	Delineator (Class X)	EA		x		=	$ -
84XXXX	Permanent Pavement Delineation	LS	1	x	350,000	=	$ 350,000
840504	Thermoplastic Traffic Strip (4")	LF	0	x	0.50	=	$ -

Subtotal Traffic Signing and Striping *$ 1,655,920*

6C - Stage Construction and Traffic Handling

Item code		Unit	Quantity		Unit Price ($)		Cost
120100	Traffic Control System	LS	1	x	4,000,000	=	$ 4,000,000
120120	Type III Barricade	EA		x		=	$ -
120143	Temporary Pavement Delineation	LF		x		=	$ -
120149	Temporary Pavement Marking (Paint)	LS	0	x	90,000	=	$ -
120159	Temporary Traffic Strip (Paint)	LS	0	x	90,000	=	$ -
12016X	Channelizer	EA		x		=	$ -
128650	Portable Changeable Message Signs	EA	18	x	10,000	=	$ 180,000
129000	Temporary Railing (Type K)	LF	6,000	x	17	=	$ 102,000
129100	Temp. Crash Cushion Module	EA	4	x	200	=	$ 800
129099A	Traffic Plastic Drum	EA		x		=	$ -
839603A	Temporary Crash Cushion (ADIEM)	EA		x		=	$ -
XXXXXX	Misc. Items (Traffic Management Plan)	LS	1	x	360,000	=	$ 360,000
XXXXXX	Some Item	LS		x		=	$ -

Subtotal Stage Construction and Traffic Handling *$ 4,642,800*

TOTAL TRAFFIC ITEMS **$ 116,510,800**

SECTION 7: DETOURS

Include constructing, maintaining, and removal

Item code		Unit	Quantity		Unit Price ($)		Cost
0713XX	Temporary Fence (Type X)	LF		x		=	$ -
07XXXX	Temporary Drainage	LS		x		=	$ -
120143	Temporary Pavement Delineation	LF		x		=	$ -
1286XX	Temporary Signals	EA		x		=	$ -
129000	Temporary Railing (Type K)	LF		x		=	$ -
190101	Roadway Excavation	CY		x		=	$ -
198001	Imported Borrow	CY		x		=	$ -
198050	Embankment	CY		x		=	$ -
250401	Class 4 Aggregate Subbase	CY		x		=	$ -
260201	Class 2 Aggregate Base	CY		x		=	$ -
390132	Hot Mix Asphalt (Type A)	TON		x		=	$ -
XXXXXX	Some Item	LS	1	x	$250,000	=	$ 250,000

TOTAL DETOURS $ 250,000

SUBTOTAL SECTIONS 1-7 $ 117,335,800

SECTION 8: MINOR ITEMS

8A - Americans with Disabilities Act Items

ADA Items $ -

8B - Bike Path Items

Bike Path Items $ -

8C - Other Minor Items

Other Minor Items 5.0% $ 5,866,790

Total of Section 1-7 $ 117,335,800 x 5.0% = $ 5,866,790

TOTAL MINOR ITEMS $ 5,866,800

SECTIONS 9: MOBILIZATION

Item code							
999990	Total Section 1-8	$	123,202,600	x	10%	=	$12,320,260

TOTAL MOBILIZATION $ 12,320,300

SECTION 10: SUPPLEMENTAL WORK

Item code		Unit	Quantity		Unit Price ($)		Cost
066015	Federal Trainee Program	LS		x		=	$ -
066063	Traffic Management Plan - Public Information	LS		x		=	$ -
066090	Maintain Traffic	LS		x		=	$ -
066094	Value Analysis	LS		x		=	$ -
066204	Remove Rock & Debris	LS		x		=	$ -
066222	Locate Existing Cross-Over	LS		x		=	$ -
066670	Payment Adjustments For Price Index Fluctuations	LS		x		=	$ -
066700	Partnering	LS		x		=	$ -
066866	Operation of Existing Traffic Management System Eler	LS		x		=	$ -
066920	Dispute Review Board	LS		x		=	$ -
066XXX	Some Item	LS		x		=	$ -

*Cost of **NPDES** Supplemental Work specified in Section 5C* = $ -

Total Section 1-8 $ 123,202,600 5% = $ 6,160,130

TOTAL SUPPLEMENTAL WORK $ 6,160,200

Note: Mobilization item will automatically calculate if working days are 50 or more. For Project less than 50 Working Days Mobilization is not required as a separate contract, however contract item prices should take into consideration mobilization as part of the price. If the building portion of the project is greater than 50% of the total project cost,
If the building portion of the project is greater than 50% of the total project cost, then mobilization is not included.

SECTION 11: STATE FURNISHED MATERIALS AND EXPENSES

Item code		*Unit*	*Quantity*		*Unit Price ($)*		*Cost*
066063	Public Information	LS	0	x	$100,000	=	$0
066105	RE Office	LS	1	x	$400,000	=	$400,000
066803	Padlocks	LS		x		=	$0
066838	Reflective Numbers and Edge Sealer	LS		x		=	$0
066901	Water Expenses	LS		x		=	$0
066062A	COZEEP Expenses	LS		x		=	$0
06684X	Ramp Meter Controller Assembly	LS		x		=	$0
XXXXXX	Toll Back Office System	LS	1	x	$1,700,000	=	$1,700,000
06684X	TMS Controller Assembly	LS	1	x	$2,000,000	=	$2,000,000
06684X	Traffic Signal Controller Assembly	LS		x		=	$0
XXXXXX	Some Item						
	Total Section 1-8	$	123,202,600		1%	=	$ 1,232,026

TOTAL STATE FURNISHED	**$5,332,100**

SECTION 12: TIME-RELATED OVERHEAD

Estimated Time-Releated Overhead (TRO) Percentage (0% to 10%) = 6%

Item code		*Unit*	*Quantity*		*Unit Price ($)*		*Cost*	
			Total of All Contract Items Only				$ 123,202,600	(used to calculate TR
070018	Time-Related Overhead	$	123,202,600	X	6%	=	$7,392,156	

TOTAL TIME-RELATED OVERHEAD	**$7,392,156**

SECTION 13: CONTINGENCY

Total Section 1-12	$	154,407,356	x	20%	=	$30,881,472

TOTAL CONTINGENCY	**$30,881,500**

Note: TRO is a contract item if total project cost is (non-escalated) over $5 million AND 100 or more working days.
If the building portion of the project is greater than 50% of the total project cost, then TRO is not included.
TRO calculated for you as percentage of the sum of all contract items only;
excluding mobilization, supplemental work, state furnished materials and expenses, and contingency.

II. STRUCTURE ITEMS

	Bridge 1	Bridge 2	Bridge 3
DATE OF ESTIMATE	Dec, 2019	Dec, 2019	Dec, 2019
Bridge Name	ALAMADEN UC	CAMDEN UC	OKA UC
Bridge Number			
Structure Type	CIP/PS Box Girder	CIP/PS Box Girder	CIP/PS Box Girder
Width (Feet) [out to out]	0 LF	0 LF	0 LF
Total Bridge Length (Feet)	238 LF	210 LF	102 LF
Total Area (Square Feet)	0 SQFT	0 SQFT	0 SQFT
Structure Depth (Feet)	LF	LF	LF
Footing Type (pile or spread)	None	Pile	Pile
Cost Per Square Foot	$300	$300	$300
COST OF EACH STRUCTURE	**$0**	**$0**	**$0**

	Bridge 4	Bridge 5	Bridge 6
DATE OF ESTIMATE	Dec, 2019	Dec, 2019	Dec, 2019
Bridge Name	LOS GATOS CREEK BRIDGE	POLLARD UC	SAN TOMAS AQUINAS CREEK
Bridge Number			
Structure Type	CIP/PS Box Girder	CIP/PS Box Girder	CIP/PS Box Girder
Width (Feet) [out to out]	0 LF	0 LF	0 LF
Total Bridge Length (Feet)	178 LF	196 LF	105 LF
Total Area (Square Feet)	0 SQFT	0 SQFT	0 SQFT
Structure Depth (Feet)	LF	LF	LF
Footing Type (pile or spread)	Pile	Pile	Pile
Cost Per Square Foot	$300	$300	$300
COST OF EACH STRUCTURE	**$0**	**$0**	**$0**

	Bridge 7	Bridge 8	Bridge 9
DATE OF ESTIMATE	Dec, 2019	Dec, 2019	Dec, 2019
Bridge Name	SARATOGA UC	SARATOGA CREEK BRIDGE	CALABAZAS CREEK BRG
Bridge Number			
Structure Type	CIP/PS Box Girder	CIP/PS Box Girder	CIP/PS Box Girder
Width (Feet) [out to out]	0 LF	0 LF	0 LF
#REF!	192 LF	100 LF	156 LF
Total Area (Square Feet)	0 SQFT	0 SQFT	0 SQFT
Structure Depth (Feet)	LF	LF	LF
Footing Type (pile or spread)	Pile	Pile	Pile
Cost Per Square Foot	$300	$300	$300
COST OF EACH	**$0**	**$0**	**$0**

	Bridge 10		
DATE OF ESTIMATE	Dec, 2019		
Bridge Name	Pedestrian Bridge (Dalles Ave)		
Bridge Number			
Structure Type	CIP/PS Box Girder		
Width (Feet) [out to out]	0 LF		
#REF!	370 LF		
Total Area (Square Feet)	0 SQFT		
Structure Depth (Feet)	LF		
Footing Type (pile or spread)	Pile		
Cost Per Square Foot	$300		
COST OF EACH	**$0**		
TOTAL COST OF STRUCTURES[1]			**0**

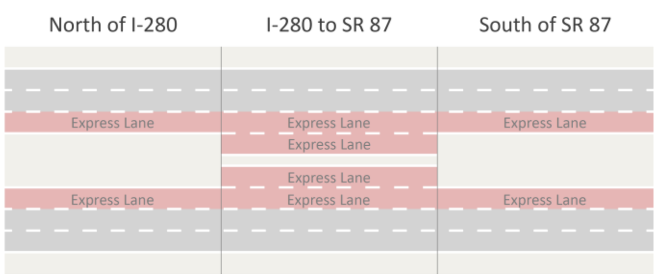
Estimate Prepared By: ______________________ ______________________

XXXXXXXXXXXXXXXXX ------ Division of Structures Date

[1]Structure's Estimate includes Overhead and Mobilization are based on 2019 CALTRAN's "COMPARATIVE BRIDGE COSTS".

Alternative 2-1: Express Lanes Project

- Add one express lane in each direction from Almaden Expressway to I-280 to operate jointly with existing HOV lanes as two express lanes in each direction.
- Convert existing HOV lane in each direction from U.S. 101 (southern end of SR 85) to Almaden Expressway to operate as one express lane in each direction.
- Provide continuous access to the express lane(s) from the adjacent general-purpose lanes.
- Extend existing auxiliary lane on northbound SR 85 from the South De Anza Boulevard northbound on-ramp to 0.2 mile south of the Stevens Creek Boulevard off-ramp.
- Provide CHP enforcement/observation areas in the median at selected locations along the corridor.
- Install double-luminaire mast arm lighting at 250- to 400-foot intervals from PM 6.00 (Almaden Expressway) to PM 17.70 (Stevens Creek Boulevard).
- Install high mast lighting at SR 17 and I-280 interchanges as needed to supplement existing.
- Widen nine bridge structures.



Alternative 2-1: Express Lanes Project

Engineer Cost Estimate --- Alternative 2-1
Preliminary Project Study Report

Project ID: XXXXXX

Type of Estimate :	Preliminary Project Study Report (Dec 2019)
Program Code :	04-XXXXX
Project Limits :	From Hwy 101 Interchange in Santa Jose to South of Hwy 101 Interchange in Mt. View
Description:	From PM 0.00 to PM 23.68
Scope :	Convert the Existing HOV Lanes Into Express Lane on SR 85 to An Express Lane and Construct A New Express Lane Between I-280 to SR 87 In Accordance with the Design in VTA's Silicon Valley Lane Program
Alternative :	Alternative 2-1 Express Lanes Project

	Current Cost		Escalated Cost	
ROADWAY ITEMS	$	242,381,278	$	324,755,400
STRUCTURE ITEMS	$	14,084,700	$	18,871,500
SUBTOTAL CONSTRUCTION COST	$	256,465,978	$	343,626,900
RIGHT OF WAY	$	-	$	-
TOTAL CAPITAL OUTLAY COST	$	256,466,000	$	343,627,000
PR/ED SUPPORT (3%)	$	7,694,000	$	10,309,000
PS&E SUPPORT (12%)	$	30,776,000	$	41,236,000
RIGHT OF WAY SUPPORT				
CONSTRUCTION SUPPORT (12%)	$	30,776,000	$	41,236,000
AGENCY SUPPORT (8%)	$	20,518,000	$	27,491,000
TOTAL CAPITAL OUTLAY SUPPORT COST*	$	89,764,000	$	120,272,000
TOTAL PROJECT COST	$	346,230,000	$	464,000,000

If Project has been programmed enter Programmed Amount

	Month	/	Year
Date of Estimate (Month/Year)	12	/	2019
Estimated Date of Construction Start (Month/Year)	10	/	2023
Number of Working Days	1500		Working Days
Estimated Mid-Point of Construction (Month/Year)	10	/	2026
Number of Plant Establishment Days			Days

Estimated Project Schedule

PID Approval
PA/ED Approval
PS&E
RTL
Begin Construction

Approved by Project Manager

Project Manager	**Date**	**Phone**

I. ROADWAY ITEMS SUMMARY

	Section	Cost
1	**Earthwork**	$ 4,928,700
2	**Pavement Structural Section**	$ 18,859,800
3	**Drainage**	$ 1,737,900
4	**Specialty Items**	$ 10,301,700
5	**Environmental**	$ 1,112,600
6	**Traffic Items**	$ 116,706,000
7	**Detours**	$ 150,000
8	**Minor Items**	$ 7,689,900
9	**Roadway Mobilization**	$ 16,148,700
10	**Supplemental Work**	$ 8,099,900
11	**State Furnished**	$ 5,714,900
12	**Contingencies**	$ 40,396,900
13	**Overhead**	$ 10,534,278

TOTAL ROADWAY ITEMS	**$ 242,381,278**

Estimate Prepared By : ______________________

Name and Title Date Phone

Estimate Reviewed By : ______________________

Name and Title Date Phone

SECTION 1: EARTHWORK

Item code		Unit	Quantity		Unit Price ($)		Cost
160101	Clearing & Grubbing	AC	36	x	1,725	=	$62,100
170101	Develop Water Supply	LS	1	x	50,000	=	$50,000
190101	Roadway Excavation	CY	151,427	x	29	=	$4,330,812
190103	Roadway Excavation (Type Y) ADL	CY		x		=	$0
190105	Roadway Excavation (Type Z-2) ADL	CY		x		=	$0
192037	Structure Excavation (Retaining Wall)	CY		x		=	$0
193013	Structure Backfill (Retaining Wall)	CY		x		=	$0
193031	Pervious Backfill Material (Retaining Wall)	CY		x		=	$0
194001	Ditch Excavation	CY		x		=	$0
198001	Impored Borrow	CY	29,441	x	17	=	$485,777
198007	Imported Material (Shoulder Backing)	TON		x		=	$0
XXXXXX	Some Item			x		=	$0

TOTAL EARTHWORK SECTION ITEMS $ 4,928,700

SECTION 2: PAVEMENT STRUCTURAL SECTION

Item code		Unit	Quantity		Unit Price ($)			Cost
150771	Remove Asphalt Concrete Dike	LF		x		=	$	-
150860	Remove Base and Surfacing	CY		x		=	$	-
153103	Cold Plane Asphalt Concrete Pavement	SQYD	12,305	x	8	=	$	98,440
150854	Remove Concrete Pavement	CY	2,912	x	156	=	$	454,272
260201	Class 4 Aggregate Base	CY	20,561	x	61	=	$	1,243,941
250401	Class 4 Aggregate Subbase	CY	39,359	x	38	=	$	1,495,642
290201	Asphalt Treated Permeable Base	CY	14,686	x	160	=	$	2,349,760
365001	Sand Cover	TON		x		=	$	-
374002	Asphaltic Emulsion (Fog Seal Coat)	TON		x		=	$	-
374492	Asphaltic Emulsion (Polymer Modified)	TON		x		=	$	-
3750XX	Screenings (Type XX)	TON		x		=	$	-
377501	Slurry Seal	TON		x		=	$	-
390095	Replace Asphalt Concrete Surfacing	CY		x		=	$	-
390132	Hot Mix Asphalt (Type A)	TON		x		=	$	-
390136	Minor Hot Mix Asphalt	TON		x		=	$	-
390137	Rubberized Hot Mix Asphalt (Gap Graded)	TON		x		=	$	-
393003	Geosynthetic Pavement Interlayer	SQYD		x		=	$	-
39405X	Shoulder Rumber Strip *(HMA, Type XX Inden*	STA		x		=	$	-
394071	Place Hot Mix Asphalt Dike	LF		x		=	$	-
394090	Place Hot Mix Asphalt (Misc. Area)	SQYD		x		=	$	-
397005	Tack Coat	TON		x		=	$	-
400050	Continuously Reinfored Concrete Pavement	CY	44,059	x	300	=	$	13,217,700
401108	Replace Concrete Pavement (Rapid Strength	CY		x		=	$	-
404092	Seal Pavement Joint	LF		x		=	$	-
404094	Seal Longitudinal Isolation Joint	LF		x		=	$	-
413112A	Repair Spalled Joints (Polyester Grout)	SQYD		x		=	$	-
413115	Seal Existing Concrete Pavement Joint	LF		x		=	$	-
420102	Groove Existing Concrete Pavement	SQYD		x		=	$	-
420201	Grind Existing Concrete Pavement	SQYD		x		=	$	-
731502	Minor Concrete (Misc. Const)	CY		x		=	$	-
731530	Minor Concrete (Textured Paving)	SQFT		x		=	$	-
XXXXXX	Some Item			x		=	$	-

TOTAL STRUCTURAL SECTION ITEMS $ 18,859,800

SECTION 3: DRAINAGE

Item code		*Unit*	*Quantity*		*Unit Price ($)*			*Cost*
150206	Abandon Culvert	LF		x		=	$	-
150805	Remove Culvert	LF		x		=	$	-
150820	Modify Inlet	EA		x		=	$	-
152430	Adjust Inlet	LF		x		=	$	-
155003	Cap Inlet	EA		x		=	$	-
193114	Sand Backfill	CY		x		=	$	-
510502	Minor Concrete (Minor Structure)	CY		x		=	$	-
510512	Minor Concrete (Box Culvert)	CY		x		=	$	-
510XXX	Culvert (Roadway Crossing)	EA		x		=	$	-
62XXXX	XXX" APC Pipe	LF		x		=	$	-
64XXXX	XXX" Plastic Pipe	LF		x		=	$	-
65XXXX	XXX" RCP Pipe	LF		x		=	$	-
66XXXX	XXX" CSP Pipe	LF		x		=	$	-
680905	Underdrain (6" Alternative)	LF	7,866	x	36	=	$	283,176
681103	Edge Drain (3" Plastic Pipe)	LF	69,269	x	21	=	$	1,454,649
69XXXX	XXX" Pipe Downdrain	LF		x		=	$	-
70XXXX	XXX" Pipe Inlet	LF		x		=	$	-
70XXXX	XXX" Pipe Riser	LF		x		=	$	-
70XXXX	XXX" Flared End Section	EA		x		=	$	-
703233	Grated Line Drain	LF		x		=	$	-
72XXXX	Rock Slope Protection (Type and Method)	CY		x		=	$	-
721420	Concrete (Ditch Lining)	CY		x		=	$	-
721430	Concrete (Channel Lining)	CY		x		=	$	-
729010	Rock Slope Protection Fabric	SQYD		x		=	$	-
750001	Miscellaneous Iron and Steel	LB		x		=	$	-
XXXXXX	Additional Drainage (Detention Base, etc)	LS		x		=	$	-
XXXXXX	Some Item			x		=	$	-

TOTAL DRAINAGE ITEMS $ 1,737,900

SECTION 4: SPECIALTY ITEMS

Item code		*Unit*	*Quantity*		*Unit Price ($)*			*Cost*
070012	Progress Schedule (Critical Path Method)	LS	1	x	30,000	=	$	30,000
150662	Remove Metal Beam Guard Railing	LF	61,156	x	15	=	$	886,762
150668	Remove Terminal Systems	EA		x		=	$	-
1532XX	Remove Concrete Barrier (25, 50 or 50C)	LF	3,110	x	16	=	$	49,760
153250	Remove Sound Wall	SQFT	0	x	25	=	$	-
150606	Remove Fence (BW)	LF		x		=	$	-
190110	Lead Compliance Plan	LS	1	x	18,000	=	$	18,000
49XXXX	CIDH Concrete Piling *(Insert Diameter)*	LF		x		=	$	-
510060	Structural Concrete (Retaining Wall)	CY		x		=	$	-
510133	Class 2 Concrete (Retaining Wall)	CY		x		=	$	-
510XXX	Retaining Wall (MSE)	SQFT	39,520	x	85	=	$	3,359,200
XXXXXX	Sound Wall (On Pile, On Barrier or On Ret. Wall)	SQFT	0	x	40	=	$	-
5110XX	Architectural Treatment *(Insert Type)*	SQFT		x		=	$	-
511048	Apply Anti-Graffiti Coating	SQFT		x		=	$	-
5136XX	Reinforced Concrete Crib Wall *(Insert Type)*	SQFT		x		=	$	-
518002	Sound Wall (Masonry Block)	SQFT		x		=	$	-
520103	Bar Reinf. Steel (Retaining Wall)	LB		x		=	$	-
800007	Fence (BW)	LF		x		=	$	-
832001	Metal Beam Guard Railing	LF	52,594	x	47	=	$	2,445,621
839310	Double Thrie Beam Barrier	LF		x		=	$	-
839521	Cable Railing	LF		x		=	$	-
83954X	Transition Railing *(Insert Type)*	EA		x		=	$	-
8395XX	Terminal System (Type CAT)	EA		x		=	$	-
8395XX	Alternative Flared Terminal System	EA	4	x	1,200	=	$	4,800
8395XX	End Anchor Assembly (*Insert Type*)	EA		x		=	$	-
839561	Rail Tensioning Assembly	EA		x		=	$	-
839596	Crash Cushion *(G.R.E.A.T)*	EA		x		=	$	-
839701	Concrete Barrier *(50 or 60)*	LF	44,180	x	78	=	$	3,446,040
833128	Concrete Barrier *(25 Modify)*	LF	480	x	128	=	$	61,440
XXXXXX	Some Item			x		=	$	-

TOTAL SPECIALTY ITEMS $ 10,301,700

SECTION 5: ENVIRONMENTAL

5A - ENVIRONMENTAL MITIGATION

Item code		Unit	Quantity		Unit Price ($)			Cost
XXXXXX	Biological Mitigation	LS		x		=	$	-
071325	Temporary Reinforced Silt Fence	LF		x		=	$	-
XXXXXX	Hazardous Material Remediation	LS	1	x	45,000	=	$	45,000
XXXXXX	Permits	LS	1	x	45,000	=	$	45,000
071325	Temporary Fence (Type ESA)	LF		x		=	$	-

Subtotal Environmental *$ 90,000*

5B - LANDSCAPE AND IRRIGATION

Item code		Unit	Quantity		Unit Price ($)			Cost
200001	Highway Planting	ACRE		x		=	$	-
20XXXX	XXX" (*Insert Type*) Conduit *(Use for Irrigation x-*	LF		x		=	$	-
20XXXX	Extend XXX" *(Insert Type)* Conduit	LF		x		=	$	-
201700	Imported Topsoil	CY		x		=	$	-
203015	Erosion Control	ACRE		x		=	$	-
203021	Fiber Rolls	LF		x		=	$	-
203026	Move In/ Move Out (Erosion Control)	EA		x		=	$	-
204099	Plant Establishment Work	LS		x		=	$	-
204101	Extend Plant Establishment (X Years)	LS		x		=	$	-
208000	Irrigation System	LS		x		=	$	-
208304	Water Meter	EA		x		=	$	-
209801	Maintenance Vehicle Pullout	EA		x		=	$	-
XXXXXX	Some Item							

Subtotal Landscape and Irrigation *$ -*

5C - NPDES

Item code		Unit	Quantity		Unit Price ($)			Cost
074016	Construction Site Management	LS	1	x	450,000	=	$	450,000
074017	Prepare WPCP	LS	1	x	10,000	=	$	10,000
074019	Prepare SWPPP	LS	1	x	10,000	=	$	10,000
074023	Temporary Erosion Control	ACRE	36	x	2,500	=	$	90,000
074027	Temporary Erosion Control Blanket	SQYD		x		=	$	-
074028	Temporary Fiber Roll	LF		x		=	$	-
074032	Temporary Concrete Washout Facility	EA		x		=	$	-
074033	Temporary Construction Entrance	EA		x		=	$	-
074035	Temporary Check Dam	LF		x		=	$	-
074037	Move In/ Move Out (Temp Erosion Control)	EA		x		=	$	-
074038	Temp. Drainage Inlet Protection	EA	210	x	60	=	$	12,600
XXXXXX	Site Job Management	LS	1	x	450,000	=	$	450,000
074042	Temporary Concrete Washout (Portable)	LS		x		=	$	-
XXXXXX	Some Item			x		=	$	-

Supplemental Work for NPDES
(These costs are not accounted in total here but under Supplemental Work on sheet 7 of 11).

074021	Water Pollution Control Maintenance Work*	LS	1	x	25,500	=	$	25,500
066596	Additional Water Pollution Control**	LS		x		=	$	-
066597	Storm Water Sampling and Analysis***	LS		x		=	$	-
XXXXXX	Some Item							

Subtotal NPDES (Without Supplemental Work) *$ 1,022,600*

*Applies to all SWPPPs and those WPCPs with sediment control or soil stabilization BMPs.

**Applies to both SWPPPs and WPCP projects.

*** Applies only to project with SWPPPs.

TOTAL ENVIRONMENTAL $ 1,112,600

SECTION 6: TRAFFIC ITEMS

6A - Traffic Electrical

Item code		Unit	Quantity		Unit Price ($)			Cost
150760	Remove Sign Structure	EA		x		=	$	-
151581	Reconstruct Sign Structure	EA		x		=	$	-
152641	Modify Sign Structure	EA		x		=	$	-
5602XX	Furnish Sign Structure	LB		x		=	$	-
5602XX	Install Sign Structure	LB		x		=	$	-
56XXXX	XXX" CIDHC Pile (Sign Foundation)	LF		x		=	$	-
56XXXX	Install Overhead Sign (Two Post)	EA	15	x	400,000	=	$	6,000,000
56XXXX	Install Overhead Sign (One Post)	EA	10	x	160,000	=	$	1,600,000
860090	Maintain Existing Traffic Management System	LS	1	x	900,000	=	$	900,000
860810	Inductive Loop Detectors	EA		x		=	$	-
86055X	Lighting & Sign Illumination	EA	253	x	4,000	=	$	1,012,000
8607XX	Interconnection Facilities	LS		x		=	$	-
8609XX	Traffic Traffic Monitoring Stations	LS	1	x	200,000	=	$	200,000
860XXX	Signals & Lighting	LS		x		=	$	-
860XXX	ITS Elements	LS		x		=	$	-
861100	Ramp Metering System (Location X)	LS		x		=	$	-
86XXXX	Fiber Optic Conduit System	LS		x		=	$	-
XXXXXX	Ramp Terminal Intersection Improvement	LS	0	x	1,000,000	=	$	-
XXXXXX	Toll Equipment and System Integration (Capital)	LS	1	x	100,000,000	=	$	100,000,000
XXXXX	Some Item							

Subtotal Traffic Electrical *$ 109,712,000*

6B - Traffic Signing and Striping

Item code		Unit	Quantity		Unit Price ($)			Cost
120090	Construction Area Signs	LS	1	x	900,000	=	$	900,000
150701	Remove Yellow Painted Traffic Stripe	LF	63,360	x	4	=	$	253,440
150710	Remove Traffic Stripe	LF	633,600	x	0.25	=	$	158,400
150713	Remove Pavement Marking	SQFT		x		=	$	-
150742	Remove Roadside Sign	EA	10	x	120	=	$	1,200
15075X	Remove Sign Structure	EA	15	x	20,000	=	$	300,000
15075X	Remove Sign Structure (On Bridge)	EA	8	x	5,000	=	$	40,000
152320	Reset Roadside Sign	EA		x		=	$	-
152390	Relocate Roadside Sign	EA		x		=	$	-
566011	Roadside Sign (One Post)	EA	15	x	340	=	$	5,100
566012	Roadside Sign (Two Post)	EA	5	x	1,250	=	$	6,250
560XXX	Furnish Sign Panels	SQFT		x		=	$	-
560XXX	Install Sign Panels	SQFT		x		=	$	-
82010X	Delineator (Class X)	EA		x		=	$	-
84XXXX	Permanent Pavement Delineation	LS	1	x	450,000	=	$	450,000
840504	Thermoplastic Traffic Strip (4")	LF	633,600	x	0.50	=	$	316,800

Subtotal Traffic Signing and Striping *$ 2,431,190*

6C - Stage Construction and Traffic Handling

Item code		Unit	Quantity		Unit Price ($)			Cost
120100	Traffic Control System	LS	1	x	4,000,000	=	$	4,000,000
120120	Type III Barricade	EA		x		=	$	-
120143	Temporary Pavement Delineation	LF		x		=	$	-
120149	Temporary Pavement Marking (Paint)	LS	1	x	90,000	=	$	90,000
120159	Temporary Traffic Strip (Paint)	LS	1	x	90,000	=	$	90,000
12016X	Channelizer	EA		x		=	$	-
128650	Portable Changeable Message Signs	EA	10	x	10,000	=	$	100,000
129000	Temporary Railing (Type K)	LF	6,000	x	17	=	$	102,000
129100	Temp. Crash Cushion Module	EA	4	x	200	=	$	800
129099A	Traffic Plastic Drum	EA		x		=	$	-
839603A	Temporary Crash Cushion (ADIEM)	EA		x		=	$	-
XXXXXX	Misc. Items (Traffic Management Plan)	LS	1	x	180,000	=	$	180,000
XXXXXX	Some Item	LS		x		=	$	-

Subtotal Stage Construction and Traffic Handling *$ 4,562,800*

TOTAL TRAFFIC ITEMS $ 116,706,000

SECTION 7: DETOURS

Include constructing, maintaining, and removal

Item code		Unit	Quantity		Unit Price ($)		Cost
0713XX	Temporary Fence (Type X)	LF		x		=	$ -
07XXXX	Temporary Drainage	LS		x		=	$ -
120143	Temporary Pavement Delineation	LF		x		=	$ -
1286XX	Temporary Signals	EA		x		=	$ -
129000	Temporary Railing (Type K)	LF		x		=	$ -
190101	Roadway Excavation	CY		x		=	$ -
198001	Imported Borrow	CY		x		=	$ -
198050	Embankment	CY		x		=	$ -
250401	Class 4 Aggregate Subbase	CY		x		=	$ -
260201	Class 2 Aggregate Base	CY		x		=	$ -
390132	Hot Mix Asphalt (Type A)	TON		x		=	$ -
XXXXXX	Some Item	LS	1	x	$150,000	=	$ 150,000

TOTAL DETOURS **$ 150,000**

SUBTOTAL SECTIONS 1-7 $ 153,796,700

SECTION 8: MINOR ITEMS

8A - Americans with Disabilities Act Items						
ADA Items						$ -
8B - Bike Path Items						
Bike Path Items						$ -
8C - Other Minor Items						
Other Minor Items				5.0%		$ 7,689,835
Total of Section 1-7	$	153,796,700	x	5.0%	=	$ 7,689,835

TOTAL MINOR ITEMS **$ 7,689,900**

SECTIONS 9: MOBILIZATION

Item code							
999990	Total Section 1-8	$	161,486,600	x	10%	=	$16,148,660

TOTAL MOBILIZATION **$ 16,148,700**

SECTION 10: SUPPLEMENTAL WORK

Item code		Unit	Quantity		Unit Price ($)		Cost
066015	Federal Trainee Program	LS		x		=	$ -
066063	Traffic Management Plan - Public Information	LS		x		=	$ -
066090	Maintain Traffic	LS		x		=	$ -
066094	Value Analysis	LS		x		=	$ -
066204	Remove Rock & Debris	LS		x		=	$ -
066222	Locate Existing Cross-Over	LS		x		=	$ -
066670	Payment Adjustments For Price Index Fluctuations	LS		x		=	$ -
066700	Partnering	LS		x		=	$ -
066866	Operation of Existing Traffic Management System Eler	LS		x		=	$ -
066920	Dispute Review Board	LS		x		=	$ -
066XXX	Some Item	LS		x		=	$ -

Cost of ***NPDES*** *Supplemental Work specified in Section 5C* = $ 25,500

Total Section 1-8	$	161,486,600	5%	=	$ 8,074,330

TOTAL SUPPLEMENTAL WORK **$ 8,099,900**

Note: Mobilization item will automatically calculate if working days are 50 or more. For Project less than 50 Working Days Mobilization is not required as a separate contract, however contract item prices should take into consideration mobilization as part of the price. If the building portion of the project is greater than 50% of the total project cost,
If the building portion of the project is greater than 50% of the total project cost, then mobilization is not included.

SECTION 11: STATE FURNISHED MATERIALS AND EXPENSES

Item code		Unit	Quantity		Unit Price ($)		Cost
066063	Public Information	LS	0	x	$100,000	=	$0
066105	RE Office	LS	1	x	$400,000	=	$400,000
066803	Padlocks	LS		x		=	$0
066838	Reflective Numbers and Edge Sealer	LS		x		=	$0
066901	Water Expenses	LS		x		=	$0
066062A	COZEEP Expenses	LS		x		=	$0
06684X	Ramp Meter Controller Assembly	LS		x		=	$0
XXXXXX	Toll Back Office System	LS	1	x	$1,700,000	=	$1,700,000
06684X	TMS Controller Assembly	LS	1	x	$2,000,000	=	$2,000,000
06684X	Traffic Signal Controller Assembly	LS		x		=	$0
XXXXXX	Some Item						
	Total Section 1-8	$	161,486,600		1%	=	$ 1,614,866

TOTAL STATE FURNISHED **$5,714,900**

SECTION 12: TIME-RELATED OVERHEAD

Estimated Time-Releated Overhead (TRO) Percentage (0% to 10%) = 6%

Item code		Unit	Quantity		Unit Price ($)		Cost	
			Total of All Contract Items Only				$ 175,571,300	(used to calculate TR
070018	Time-Related Overhead	$	175,571,300	X	6%	=	$10,534,278	

TOTAL TIME-RELATED OVERHEAD **$10,534,278**

SECTION 13: CONTINGENCY

Total Section 1-12	$	201,984,378	x	20%	=	$40,396,876

TOTAL CONTINGENCY **$40,396,900**

Note: TRO is a contract item if total project cost is (non-escalated) over $5 million AND 100 or more working days.
If the building portion of the project is greater than 50% of the total project cost, then TRO is not included.
TRO calculated for you as percentage of the sum of all contract items only;
excluding mobilization, supplemental work, state furnished materials and expenses, and contingency.

II. STRUCTURE ITEMS

	Bridge 1	**Bridge 2**	**Bridge 3**
DATE OF ESTIMATE	Dec, 2019	Dec, 2019	Dec, 2019
Bridge Name	ALAMADEN UC	CAMDEN UC	OKA UC
Bridge Number			
Structure Type	CIP/PS Box Girder	CIP/PS Box Girder	CIP/PS Box Girder
Width (Feet) [out to out]	50 LF	45 LF	33 LF
Total Bridge Length (Feet)	238 LF	210 LF	102 LF
Total Area (Square Feet)	11,900 SQFT	9,450 SQFT	3,366 SQFT
Structure Depth (Feet)	LF	LF	LF
Footing Type (pile or spread)	None	Pile	Pile
Cost Per Square Foot	$300	$300	$300
COST OF EACH STRUCTURE	**$3,570,000**	**$2,835,000**	**$1,009,800**

	Bridge 4	**Bridge 5**	**Bridge 6**
DATE OF ESTIMATE	Dec, 2019	Dec, 2019	Dec, 2019
Bridge Name	LOS GATOS CREEK BRIDGE	POLLARD UC	SAN TOMAS AQUINAS CREEK
Bridge Number			
Structure Type	CIP/PS Box Girder	CIP/PS Box Girder	CIP/PS Box Girder
Width (Feet) [out to out]	29 LF	23 LF	23 LF
Total Bridge Length (Feet)	178 LF	196 LF	105 LF
Total Area (Square Feet)	5,162 SQFT	4,508 SQFT	2,415 SQFT
Structure Depth (Feet)	LF	LF	LF
Footing Type (pile or spread)	Pile	Pile	Pile
Cost Per Square Foot	$300	$300	$300
COST OF EACH STRUCTURE	**$1,548,600**	**$1,352,400**	**$724,500**

	Bridge 7	**Bridge 8**	**Bridge 9**
DATE OF ESTIMATE	Dec, 2019	Dec, 2019	Dec, 2019
Bridge Name	SARATOGA UC	SARATOGA CREEK BRIDGE	CALABAZAS CREEK BRG
Bridge Number			
Structure Type	CIP/PS Box Girder	CIP/PS Box Girder	CIP/PS Box Girder
Width (Feet) [out to out]	23 LF	23 LF	22 LF
#REF!	192 LF	100 LF	156 LF
Total Area (Square Feet)	4,416 SQFT	2,300 SQFT	3,432 SQFT
Structure Depth (Feet)	LF	LF	LF
Footing Type (pile or spread)	Pile	Pile	Pile
Cost Per Square Foot	$300	$300	$300
COST OF EACH	**$1,324,800**	**$690,000**	**$1,029,600**

	Bridge 10		
DATE OF ESTIMATE	Dec, 2019		
Bridge Name	Pedestrian Bridge (Dalles Ave)		
Bridge Number			
Structure Type	CIP/PS Box Girder		
Width (Feet) [out to out]	0 LF		
#REF!	370 LF		
Total Area (Square Feet)	0 SQFT		
Structure Depth (Feet)	LF		
Footing Type (pile or spread)	Pile		
Cost Per Square Foot	$300		
COST OF EACH	**$0**		
TOTAL COST OF STRUCTURES[1]			**14,084,700**

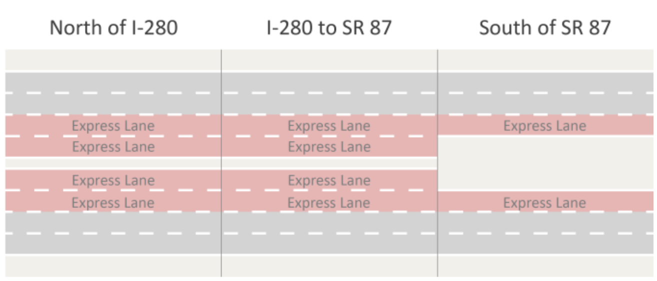
Estimate Prepared By: ______________________ ______________________

XXXXXXXXXXXXXXXXX ------ Division of Structures Date

[1]Structure's Estimate includes Overhead and Mobilization are based on 2019 CALTRAN's "COMPARATIVE BRIDGE COSTS".

Alternative 2-2: Long Express Lanes

- Add one express lane in each direction from Almaden Expressway to I-280 to operate jointly with existing HOV lanes as two express lanes in each direction.
- Convert existing HOV lane in each direction from U.S. 101 (southern end of SR 85) to Almaden Expressway to operate as one express lane in each direction.
- Provide continuous access to the express lane(s) from the adjacent general-purpose lanes.
- Extend existing auxiliary lane on northbound SR 85 from the South De Anza Boulevard northbound on-ramp to 0.2 mile south of the Stevens Creek Boulevard off-ramp.
- Provide CHP enforcement/observation areas in the median at selected locations along the corridor.
- Install double-luminaire mast arm lighting at 250- to 400-foot intervals from PM 6.00 (Almaden Expressway) to PM 17.70 (Stevens Creek Boulevard) and from PM 18.86 (Homestead Road to PM 23.44 (Moffett Boulevard).
- Install high mast lighting at SR 17 and I-280 interchanges as needed to supplement existing.
- Widen nine bridge structures.
- Replace Dalles Avenue pedestrian bridge.



Alternative 2-2: Long Express Lanes

Engineer Cost Estimate --- Alternative 2-2
Preliminary Project Study Report

Project ID: XXXXXX

Type of Estimate :	Preliminary Project Study Report (Dec 2019)
Program Code :	04-XXXXX
Project Limits :	From Hwy 101 Interchange in Santa Jose to South of Hwy 101 Interchange in Mt. View
Description:	From PM 0.00 to PM 23.68
Scope :	Convert the Existing HOV Lanes Into Express Lanes (PM 0.00 to PM 22.13) and Construct A New Express Lane from North of Sanchez Drive (PM 5.75) to South of Highway 101 (PM 23.68)
Alternative :	Alternative 2-2 Long Express Lanes

		Current Cost		**Escalated Cost**
ROADWAY ITEMS	**$**	**266,093,526**	**$**	**356,526,300**
STRUCTURE ITEMS	**$**	**15,194,700**	**$**	**20,358,700**
SUBTOTAL CONSTRUCTION COST	**$**	**281,288,226**	**$**	**376,885,000**
RIGHT OF WAY	**$**	**-**	**$**	**-**
TOTAL CAPITAL OUTLAY COST	**$**	**281,289,000**	**$**	**376,885,000**
PR/ED SUPPORT (3%)	**$**	**8,439,000**	**$**	**11,307,000**
PS&E SUPPORT (12%)	**$**	**33,755,000**	**$**	**45,227,000**
RIGHT OF WAY SUPPORT				
CONSTRUCTION SUPPORT (12%)	**$**	**33,755,000**	**$**	**45,227,000**
AGENCY SUPPORT (8%)	**$**	**22,504,000**	**$**	**30,151,000**
TOTAL CAPITAL OUTLAY SUPPORT COST*	**$**	**98,453,000**	**$**	**131,912,000**
TOTAL PROJECT COST	**$**	**379,742,000**	**$**	**509,000,000**

If Project has been programmed enter Programmed Amount

	Month	/	Year
Date of Estimate (Month/Year)	12	/	2019
Estimated Date of Construction Start (Month/Year)	10	/	2023
Number of Working Days	1500		Working Days
Estimated Mid-Point of Construction (Month/Year)	10	/	2026
Number of Plant Establishment Days			Days

Estimated Project Schedule

PID Approval
PA/ED Approval
PS&E
RTL
Begin Construction

Approved by Project Manager

Project Manager	**Date**	**Phone**

I. ROADWAY ITEMS SUMMARY

	Section	Cost
1	**Earthwork**	$ 5,887,700
2	**Pavement Structural Section**	$ 20,438,400
3	**Drainage**	$ 2,619,700
4	**Specialty Items**	$ 18,243,300
5	**Environmental**	$ 2,128,900
6	**Traffic Items**	$ 119,586,600
7	**Detours**	$ 250,000
8	**Minor Items**	$ 8,457,800
9	**Roadway Mobilization**	$ 17,761,300
10	**Supplemental Work**	$ 8,926,200
11	**State Furnished**	$ 5,876,200
12	**Contingencies**	$ 44,349,000
13	**Overhead**	$ 11,568,426

TOTAL ROADWAY ITEMS	$ 266,093,526

Estimate Prepared By : ______________________

Name and Title Date Phone

Estimate Reviewed By : ______________________

Name and Title Date Phone

SECTION 1: EARTHWORK

Item code		Unit	Quantity		Unit Price ($)		Cost
160101	Clearing & Grubbing	AC	39	x	1,725	=	$67,275
170101	Develop Water Supply	LS	1	x	50,000	=	$50,000
190101	Roadway Excavation	CY	182,763	x	29	=	$5,227,022
190103	Roadway Excavation (Type Y) ADL	CY		x		=	$0
190105	Roadway Excavation (Type Z-2) ADL	CY		x		=	$0
192037	Structure Excavation (Retaining Wall)	CY		x		=	$0
193013	Structure Backfill (Retaining Wall)	CY		x		=	$0
193031	Pervious Backfill Material (Retaining Wall)	CY		x		=	$0
194001	Ditch Excavation	CY		x		=	$0
198001	Impored Borrow	CY	32,931	x	17	=	$543,362
198007	Imported Material (Shoulder Backing)	TON		x		=	$0
XXXXXX	Some Item			x		=	$0

TOTAL EARTHWORK SECTION ITEMS $ 5,887,700

SECTION 2: PAVEMENT STRUCTURAL SECTION

Item code		Unit	Quantity		Unit Price ($)			Cost
150771	Remove Asphalt Concrete Dike	LF		x		=	$	-
150860	Remove Base and Surfacing	CY		x		=	$	-
153103	Cold Plane Asphalt Concrete Pavement	SQYD	12,305	x	8	=	$	98,440
150854	Remove Concrete Pavement	CY	3,855	x	156	=	$	601,380
260201	Class 4 Aggregate Base	CY	22,168	x	61	=	$	1,341,164
250401	Class 4 Aggregate Subbase	CY	42,437	x	38	=	$	1,612,606
290201	Asphalt Treated Permeable Base	CY	15,835	x	160	=	$	2,533,600
365001	Sand Cover	TON		x		=	$	-
374002	Asphaltic Emulsion (Fog Seal Coat)	TON		x		=	$	-
374492	Asphaltic Emulsion (Polymer Modified)	TON		x		=	$	-
3750XX	Screenings (Type XX)	TON		x		=	$	-
377501	Slurry Seal	TON		x		=	$	-
390095	Replace Asphalt Concrete Surfacing	CY		x		=	$	-
390132	Hot Mix Asphalt (Type A)	TON		x		=	$	-
390136	Minor Hot Mix Asphalt	TON		x		=	$	-
390137	Rubberized Hot Mix Asphalt (Gap Graded)	TON		x		=	$	-
393003	Geosynthetic Pavement Interlayer	SQYD		x		=	$	-
39405X	Shoulder Rumber Strip *(HMA, Type XX Inden*	STA		x		=	$	-
394071	Place Hot Mix Asphalt Dike	LF		x		=	$	-
394090	Place Hot Mix Asphalt (Misc. Area)	SQYD		x		=	$	-
397005	Tack Coat	TON		x		=	$	-
400050	Continuously Reinfored Concrete Pavement	CY	47,504	x	300	=	$	14,251,200
401108	Replace Concrete Pavement (Rapid Strength	CY		x		=	$	-
404092	Seal Pavement Joint	LF		x		=	$	-
404094	Seal Longitudinal Isolation Joint	LF		x		=	$	-
413112A	Repair Spalled Joints (Polyester Grout)	SQYD		x		=	$	-
413115	Seal Existing Concrete Pavement Joint	LF		x		=	$	-
420102	Groove Existing Concrete Pavement	SQYD		x		=	$	-
420201	Grind Existing Concrete Pavement	SQYD		x		=	$	-
731502	Minor Concrete (Misc. Const)	CY		x		=	$	-
731530	Minor Concrete (Textured Paving)	SQFT		x		=	$	-
XXXXXX	Some Item			x		=	$	-

TOTAL STRUCTURAL SECTION ITEMS $ 20,438,400

SECTION 3: DRAINAGE

Item code		Unit	Quantity		Unit Price ($)			Cost
150206	Abandon Culvert	LF		x		=	$	-
150805	Remove Culvert	LF		x		=	$	-
150820	Modify Inlet	EA		x		=	$	-
152430	Adjust Inlet	LF		x		=	$	-
155003	Cap Inlet	EA		x		=	$	-
193114	Sand Backfill	CY		x		=	$	-
510502	Minor Concrete (Minor Structure)	CY		x		=	$	-
510512	Minor Concrete (Box Culvert)	CY		x		=	$	-
510XXX	Culvert (Roadway Crossing)	EA		x		=	$	-
62XXXX	XXX" APC Pipe	LF		x		=	$	-
64XXXX	XXX" Plastic Pipe	LF		x		=	$	-
65XXXX	XXX" RCP Pipe	LF		x		=	$	-
66XXXX	XXX" CSP Pipe	LF		x		=	$	-
680905	Underdrain (6" Alternative)	LF	32,360	x	36	=	$	1,164,960
681103	Edge Drain (3" Plastic Pipe)	LF	69,269	x	21	=	$	1,454,649
69XXXX	XXX" Pipe Downdrain	LF		x		=	$	-
70XXXX	XXX" Pipe Inlet	LF		x		=	$	-
70XXXX	XXX" Pipe Riser	LF		x		=	$	-
70XXXX	XXX" Flared End Section	EA		x		=	$	-
703233	Grated Line Drain	LF		x		=	$	-
72XXXX	Rock Slope Protection (Type and Method)	CY		x		=	$	-
721420	Concrete (Ditch Lining)	CY		x		=	$	-
721430	Concrete (Channel Lining)	CY		x		=	$	-
729010	Rock Slope Protection Fabric	SQYD		x		=	$	-
750001	Miscellaneous Iron and Steel	LB		x		=	$	-
XXXXXX	Additional Drainage (Detention Base, etc)	LS		x		=	$	-
XXXXXX	Some Item			x		=	$	-

TOTAL DRAINAGE ITEMS $ 2,619,700

SECTION 4: SPECIALTY ITEMS

Item code		Unit	Quantity		Unit Price ($)			Cost
070012	Progress Schedule (Critical Path Method)	LS	1	x	30,000	=	$	30,000
150662	Remove Metal Beam Guard Railing	LF	61,156	x	15	=	$	886,762
150668	Remove Terminal Systems	EA		x		=	$	-
1532XX	Remove Concrete Barrier (25, 50 or 50C)	LF	4,606	x	16	=	$	73,696
153250	Remove Sound Wall	SQFT	114,680	x	25	=	$	2,867,000
150606	Remove Fence (BW)	LF		x		=	$	-
190110	Lead Compliance Plan	LS	1	x	18,000	=	$	18,000
49XXXX	CIDH Concrete Piling *(Insert Diameter)*	LF		x		=	$	-
510060	Structural Concrete (Retaining Wall)	CY		x		=	$	-
510133	Class 2 Concrete (Retaining Wall)	CY		x		=	$	-
510XXX	Retaining Wall (MSE)	SQFT	42,720	x	85	=	$	3,631,200
XXXXXX	Sound Wall (On Pile, On Barrier or On Ret. Wall)	SQFT	114,680	x	40	=	$	4,587,200
5110XX	Architectural Treatment *(Insert Type)*	SQFT		x		=	$	-
511048	Apply Anti-Graffiti Coating	SQFT		x		=	$	-
5136XX	Reinforced Concrete Crib Wall *(Insert Type)*	SQFT		x		=	$	-
518002	Sound Wall (Masonry Block)	SQFT		x		=	$	-
520103	Bar Reinf. Steel (Retaining Wall)	LB		x		=	$	-
800007	Fence (BW)	LF		x		=	$	-
832001	Metal Beam Guard Railing	LF	52,594	x	47	=	$	2,445,621
839310	Double Thrie Beam Barrier	LF		x		=	$	-
839521	Cable Railing	LF		x		=	$	-
83954X	Transition Railing *(Insert Type)*	EA		x		=	$	-
8395XX	Terminal System (Type CAT)	EA		x		=	$	-
8395XX	Alternative Flared Terminal System	EA	4	x	1,200	=	$	4,800
8395XX	End Anchor Assembly (*Insert Type*)	EA		x		=	$	-
839561	Rail Tensioning Assembly	EA		x		=	$	-
839596	Crash Cushion *(G.R.E.A.T)*	EA		x		=	$	-
839701	Concrete Barrier *(50 or 60)*	LF	44,180	x	78	=	$	3,446,040
833128	Concrete Barrier *(25 Modify)*	LF	1,976	x	128	=	$	252,928
XXXXXX	Some Item			x		=	$	-

TOTAL SPECIALTY ITEMS $ 18,243,300

SECTION 5: ENVIRONMENTAL

5A - ENVIRONMENTAL MITIGATION

Item code		Unit	Quantity		Unit Price ($)			Cost
XXXXXX	Biological Mitigation	LS		x		=	$	-
071325	Temporary Reinforced Silt Fence	LF		x		=	$	-
XXXXXX	Hazardous Material Remediation	LS	1	x	180,000	=	$	180,000
XXXXXX	Permits	LS	1	x	90,000	=	$	90,000
071325	Temporary Fence (Type ESA)	LF		x		=	$	-

Subtotal Environmental *$ 270,000*

5B - LANDSCAPE AND IRRIGATION

Item code		Unit	Quantity		Unit Price ($)			Cost
200001	Highway Planting	ACRE		x		=	$	-
20XXXX	XXX" (*Insert Type*) Conduit *(Use for Irrigation x-*	LF		x		=	$	-
20XXXX	Extend XXX" *(Insert Type)* Conduit	LF		x		=	$	-
201700	Imported Topsoil	CY		x		=	$	-
203015	Erosion Control	ACRE		x		=	$	-
203021	Fiber Rolls	LF		x		=	$	-
203026	Move In/ Move Out (Erosion Control)	EA		x		=	$	-
204099	Plant Establishment Work	LS		x		=	$	-
204101	Extend Plant Establishment (X Years)	LS		x		=	$	-
208000	Irrigation System	LS		x		=	$	-
208304	Water Meter	EA		x		=	$	-
209801	Maintenance Vehicle Pullout	EA		x		=	$	-
XXXXXX	Some Item							

Subtotal Landscape and Irrigation *$ -*

5C - NPDES

Item code		Unit	Quantity		Unit Price ($)			Cost
074016	Construction Site Management	LS	1	x	900,000	=	$	900,000
074017	Prepare WPCP	LS	1	x	20,000	=	$	20,000
074019	Prepare SWPPP	LS	1	x	20,000	=	$	20,000
074023	Temporary Erosion Control	ACRE	0	x	2,500	=	$	-
074027	Temporary Erosion Control Blanket	SQYD		x		=	$	-
074028	Temporary Fiber Roll	LF		x		=	$	-
074032	Temporary Concrete Washout Facility	EA		x		=	$	-
074033	Temporary Construction Entrance	EA		x		=	$	-
074035	Temporary Check Dam	LF		x		=	$	-
074037	Move In/ Move Out (Temp Erosion Control)	EA		x		=	$	-
074038	Temp. Drainage Inlet Protection	EA	315	x	60	=	$	18,900
XXXXXX	Site Job Management	LS	1	x	900,000	=	$	900,000
074042	Temporary Concrete Washout (Portable)	LS		x		=	$	-
XXXXXX	Some Item			x		=	$	-

Supplemental Work for NPDES

(These costs are not accounted in total here but under Supplemental Work on sheet 7 of 11).

074021	Water Pollution Control Maintenance Work*	LS	1	x	45,500	=	$	45,500
066596	Additional Water Pollution Control**	LS		x		=	$	-
066597	Storm Water Sampling and Analysis***	LS		x		=	$	-
XXXXXX	Some Item							

Subtotal NPDES (Without Supplemental Work) *$ 1,858,900*

*Applies to all SWPPPs and those WPCPs with sediment control or soil stabilization BMPs.

**Applies to both SWPPPs and WPCP projects.

*** Applies only to project with SWPPPs.

TOTAL ENVIRONMENTAL $ 2,128,900

SECTION 6: TRAFFIC ITEMS

6A - Traffic Electrical

Item code		Unit	Quantity		Unit Price ($)		Cost
150760	Remove Sign Structure	EA		x		=	$ -
151581	Reconstruct Sign Structure	EA		x		=	$ -
152641	Modify Sign Structure	EA		x		=	$ -
5602XX	Furnish Sign Structure	LB		x		=	$ -
5602XX	Install Sign Structure	LB		x		=	$ -
56XXXX	XXX" CIDHC Pile (Sign Foundation)	LF		x		=	$ -
56XXXX	Install Overhead Sign (Two Post)	EA	15	x	400,000	=	$ 6,000,000
56XXXX	Install Overhead Sign (One Post)	EA	10	x	160,000	=	$ 1,600,000
860090	Maintain Existing Traffic Management System	LS	1	x	900,000	=	$ 900,000
860810	Inductive Loop Detectors	EA		x		=	$ -
86055X	Lighting & Sign Illumination	EA	378	x	4,000	=	$ 1,512,000
8607XX	Interconnection Facilities	LS		x		=	$ -
8609XX	Traffic Traffic Monitoring Stations	LS	1	x	200,000	=	$ 200,000
860XXX	Signals & Lighting	LS		x		=	$ -
860XXX	ITS Elements	LS		x		=	$ -
861100	Ramp Metering System (Location X)	LS		x		=	$ -
86XXXX	Fiber Optic Conduit System	LS		x		=	$ -
XXXXXX	Ramp Terminal Intersection Improvement	LS	1	x	1,000,000	=	$ 1,000,000
XXXXXX	Toll Equipment and System Integration (Capital)	LS	1	x	100,000,000	=	$ 100,000,000
XXXXX	Some Item						

Subtotal Traffic Electrical *$ 111,212,000*

6B - Traffic Signing and Striping

Item code		Unit	Quantity		Unit Price ($)		Cost
120090	Construction Area Signs	LS	1	x	900,000	=	$ 900,000
150701	Remove Yellow Painted Traffic Stripe	LF	94,494	x	4	=	$ 377,976
150710	Remove Traffic Stripe	LF	944,940	x	0.25	=	$ 236,235
150713	Remove Pavement Marking	SQFT		x		=	$ -
150742	Remove Roadside Sign	EA	20	x	120	=	$ 2,400
15075X	Remove Sign Structure	EA	30	x	20,000	=	$ 600,000
15075X	Remove Sign Structure (On Bridge)	EA	8	x	5,000	=	$ 40,000
152320	Reset Roadside Sign	EA		x		=	$ -
152390	Relocate Roadside Sign	EA		x		=	$ -
566011	Roadside Sign (One Post)	EA	30	x	340	=	$ 10,200
566012	Roadside Sign (Two Post)	EA	10	x	1,250	=	$ 12,500
560XXX	Furnish Sign Panels	SQFT		x		=	$ -
560XXX	Install Sign Panels	SQFT		x		=	$ -
82010X	Delineator (Class X)	EA		x		=	$ -
84XXXX	Permanent Pavement Delineation	LS	1	x	900,000	=	$ 900,000
840504	Thermoplastic Traffic Strip (4")	LF	944,940	x	0.50	=	$ 472,470

Subtotal Traffic Signing and Striping *$ 3,551,781*

6C - Stage Construction and Traffic Handling

Item code		Unit	Quantity		Unit Price ($)		Cost
120100	Traffic Control System	LS	1	x	4,000,000	=	$ 4,000,000
120120	Type III Barricade	EA		x		=	$ -
120143	Temporary Pavement Delineation	LF		x		=	$ -
120149	Temporary Pavement Marking (Paint)	LS	1	x	90,000	=	$ 90,000
120159	Temporary Traffic Strip (Paint)	LS	1	x	90,000	=	$ 90,000
12016X	Channelizer	EA		x		=	$ -
128650	Portable Changeable Message Signs	EA	18	x	10,000	=	$ 180,000
129000	Temporary Railing (Type K)	LF	6,000	x	17	=	$ 102,000
129100	Temp. Crash Cushion Module	EA	4	x	200	=	$ 800
129099A	Traffic Plastic Drum	EA		x		=	$ -
839603A	Temporary Crash Cushion (ADIEM)	EA		x		=	$ -
XXXXXX	Misc. Items (Traffic Management Plan)	LS	1	x	360,000	=	$ 360,000
XXXXXX	Some Item	LS		x		=	$ -

Subtotal Stage Construction and Traffic Handling *$ 4,822,800*

TOTAL TRAFFIC ITEMS $ 119,586,600

SECTION 7: DETOURS

Include constructing, maintaining, and removal

Item code		Unit	Quantity		Unit Price ($)		Cost
0713XX	Temporary Fence (Type X)	LF		x		=	$ -
07XXXX	Temporary Drainage	LS		x		=	$ -
120143	Temporary Pavement Delineation	LF		x		=	$ -
1286XX	Temporary Signals	EA		x		=	$ -
129000	Temporary Railing (Type K)	LF		x		=	$ -
190101	Roadway Excavation	CY		x		=	$ -
198001	Imported Borrow	CY		x		=	$ -
198050	Embankment	CY		x		=	$ -
250401	Class 4 Aggregate Subbase	CY		x		=	$ -
260201	Class 2 Aggregate Base	CY		x		=	$ -
390132	Hot Mix Asphalt (Type A)	TON		x		=	$ -
XXXXXX	Some Item	LS	1	x	$250,000	=	$ 250,000

TOTAL DETOURS **$ 250,000**

SUBTOTAL SECTIONS 1-7 $ 169,154,600

SECTION 8: MINOR ITEMS

8A - Americans with Disabilities Act Items					
ADA Items					$ -
8B - Bike Path Items					
Bike Path Items					$ -
8C - Other Minor Items					
Other Minor Items			5.0%		$ 8,457,730
Total of Section 1-7	$ 169,154,600	x	5.0%	=	$ 8,457,730

TOTAL MINOR ITEMS **$ 8,457,800**

SECTIONS 9: MOBILIZATION

Item code						
999990	Total Section 1-8	$ 177,612,400	x	10%	=	$17,761,240

TOTAL MOBILIZATION **$ 17,761,300**

SECTION 10: SUPPLEMENTAL WORK

Item code		Unit	Quantity		Unit Price ($)		Cost
066015	Federal Trainee Program	LS		x		=	$ -
066063	Traffic Management Plan - Public Information	LS		x		=	$ -
066090	Maintain Traffic	LS		x		=	$ -
066094	Value Analysis	LS		x		=	$ -
066204	Remove Rock & Debris	LS		x		=	$ -
066222	Locate Existing Cross-Over	LS		x		=	$ -
066670	Payment Adjustments For Price Index Fluctuations	LS		x		=	$ -
066700	Partnering	LS		x		=	$ -
066866	Operation of Existing Traffic Management System Eler	LS		x		=	$ -
066920	Dispute Review Board	LS		x		=	$ -
066XXX	Some Item	LS		x		=	$ -

Cost of ***NPDES*** *Supplemental Work specified in Section 5C* = $ 45,500

Total Section 1-8	$ 177,612,400	5%	=	$ 8,880,620

TOTAL SUPPLEMENTAL WORK **$ 8,926,200**

Note: Mobilization item will automatically calculate if working days are 50 or more. For Project less than 50 Working Days Mobilization is not required as a separate contract, however contract item prices should take into consideration mobilization as part of the price. If the building portion of the project is greater than 50% of the total project cost,
If the building portion of the project is greater than 50% of the total project cost, then mobilization is not included.

SECTION 11: STATE FURNISHED MATERIALS AND EXPENSES

Item code		Unit	Quantity		Unit Price ($)		Cost
066063	Public Information	LS	0	x	$100,000	=	$0
066105	RE Office	LS	1	x	$400,000	=	$400,000
066803	Padlocks	LS		x		=	$0
066838	Reflective Numbers and Edge Sealer	LS		x		=	$0
066901	Water Expenses	LS		x		=	$0
066062A	COZEEP Expenses	LS		x		=	$0
06684X	Ramp Meter Controller Assembly	LS		x		=	$0
XXXXXX	Toll Back Office System	LS	1	x	$1,700,000	=	$1,700,000
06684X	TMS Controller Assembly	LS	1	x	$2,000,000	=	$2,000,000
06684X	Traffic Signal Controller Assembly	LS		x		=	$0
XXXXXX	Some Item						
	Total Section 1-8	$	177,612,400		1%	=	$ 1,776,124

TOTAL STATE FURNISHED **$5,876,200**

SECTION 12: TIME-RELATED OVERHEAD

Estimated Time-Releated Overhead (TRO) Percentage (0% to 10%) = 6%

Item code		Unit	Quantity		Unit Price ($)		Cost	
			Total of All Contract Items Only				$ 192,807,100	(used to calculate TR
070018	Time-Related Overhead	$	192,807,100	X	6%	=	$11,568,426	

TOTAL TIME-RELATED OVERHEAD **$11,568,426**

SECTION 13: CONTINGENCY

Total Section 1-12	$	221,744,526	x	20%	=	$44,348,906

TOTAL CONTINGENCY **$44,349,000**

Note: TRO is a contract item if total project cost is (non-escalated) over $5 million AND 100 or more working days.
If the building portion of the project is greater than 50% of the total project cost, then TRO is not included.
TRO calculated for you as percentage of the sum of all contract items only;
excluding mobilization, supplemental work, state furnished materials and expenses, and contingency.

II. STRUCTURE ITEMS

	Bridge 1	Bridge 2	Bridge 3
DATE OF ESTIMATE	Dec, 2019	Dec, 2019	Dec, 2019
Bridge Name	ALAMADEN UC	CAMDEN UC	OKA UC
Bridge Number			
Structure Type	CIP/PS Box Girder	CIP/PS Box Girder	CIP/PS Box Girder
Width (Feet) [out to out]	50 LF	45 LF	33 LF
Total Bridge Length (Feet)	238 LF	210 LF	102 LF
Total Area (Square Feet)	11,900 SQFT	9,450 SQFT	3,366 SQFT
Structure Depth (Feet)	LF	LF	LF
Footing Type (pile or spread)	None	Pile	Pile
Cost Per Square Foot	$300	$300	$300
COST OF EACH STRUCTURE	**$3,570,000**	**$2,835,000**	**$1,009,800**

	Bridge 4	Bridge 5	Bridge 6
DATE OF ESTIMATE	Dec, 2019	Dec, 2019	Dec, 2019
Bridge Name	LOS GATOS CREEK BRIDGE	POLLARD UC	SAN TOMAS AQUINAS CREEK
Bridge Number			
Structure Type	CIP/PS Box Girder	CIP/PS Box Girder	CIP/PS Box Girder
Width (Feet) [out to out]	29 LF	23 LF	23 LF
Total Bridge Length (Feet)	178 LF	196 LF	105 LF
Total Area (Square Feet)	5,162 SQFT	4,508 SQFT	2,415 SQFT
Structure Depth (Feet)	LF	LF	LF
Footing Type (pile or spread)	Pile	Pile	Pile
Cost Per Square Foot	$300	$300	$300
COST OF EACH STRUCTURE	**$1,548,600**	**$1,352,400**	**$724,500**

	Bridge 7	Bridge 8	Bridge 9
DATE OF ESTIMATE	Dec, 2019	Dec, 2019	Dec, 2019
Bridge Name	SARATOGA UC	SARATOGA CREEK BRIDGE	CALABAZAS CREEK BRG
Bridge Number			
Structure Type	CIP/PS Box Girder	CIP/PS Box Girder	CIP/PS Box Girder
Width (Feet) [out to out]	23 LF	23 LF	22 LF
#REF!	192 LF	100 LF	156 LF
Total Area (Square Feet)	4,416 SQFT	2,300 SQFT	3,432 SQFT
Structure Depth (Feet)	LF	LF	LF
Footing Type (pile or spread)	Pile	Pile	Pile
Cost Per Square Foot	$300	$300	$300
COST OF EACH	**$1,324,800**	**$690,000**	**$1,029,600**

	Bridge 10		
DATE OF ESTIMATE	Dec, 2019		
Bridge Name	Pedestrian Bridge (Dalles Ave)		
Bridge Number			
Structure Type	CIP/PS Box Girder		
Width (Feet) [out to out]	10 LF		
#REF!	370 LF		
Total Area (Square Feet)	3,700 SQFT		
Structure Depth (Feet)	LF		
Footing Type (pile or spread)	Pile		
Cost Per Square Foot	$300		
COST OF EACH	**$1,110,000**		

TOTAL COST OF STRUCTURES[1]	**15,194,700**

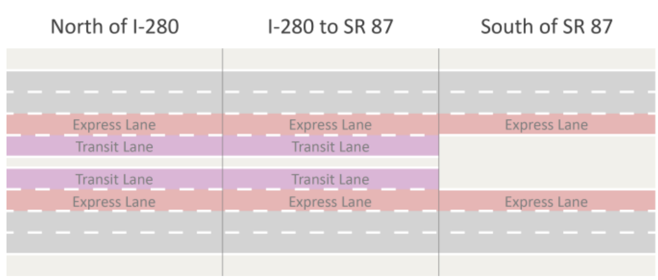
Estimate Prepared By: ______________________ ______________________

XXXXXXXXXXXXXXXXX ------ Division of Structures Date

[1]Structure's Estimate includes Overhead and Mobilization are based on 2019 CALTRAN's "COMPARATIVE BRIDGE COSTS".

Alternative 3-1: Long Median Adjacent Transit Lane

- Convert existing HOV lane in each direction from U.S. 101 (southern end of SR 85) to U.S. 101 in Mountain View to operate as a single express lane in each direction.
- Add one lane in each direction from Almaden Expressway to Evelynn Avenue or Moffett Boulevard. The added lane would be positioned in the existing median as the number 1 (inside) lane.
- With Alternative 3-1, the transit lane would occupy the number 1 lane position.
- Provide a buffer to separate the transit lane from the adjacent express lane.
- Provide continuous access to the express lane(s) from the adjacent general-purpose lanes.
- Extend existing auxiliary lane on northbound SR 85 from the South De Anza Boulevard northbound on-ramp to 0.2 mile south of the Stevens Creek Boulevard off-ramp.
- Provide CHP enforcement/observation areas in the median at selected locations along the corridor.
- Install double-luminaire mast arm lighting at 250- to 400-foot intervals from postmile (PM) 6.00 (Almaden expressway) to PM 17.70 (Stevens Creek Boulevard) and from PM 18.86 (Homestead Road) to PM 23.44 (Moffett Boulevard).
- Install high mast lighting at SR 17 and I-280 interchanges as needed to supplement existing lighting.
- Widen nine bridges.
- Replace Dalles Avenue pedestrian structure.
- Convert SR 85 interchange at El Camino Real from a cloverleaf Type L-10 ramp configuration to a spread diamond Type L-2 ramp configuration.



Alternative 3-1: Long Median Adjacent Transit Lane

Engineer Cost Estimate --- Alternative 3-1
Preliminary Project Study Report

Project ID: XXXXXX

Type of Estimate : Preliminary Project Study Report (Dec 2019)
Program Code : 04-XXXXX
Project Limits : From Hwy 101 Interchange in Santa Jose to South of Hwy 101 Interchange in Mt. View
Description: From PM 0.00 to PM 23.68

Scope : Construct A New and Median-Adjacent Transit Lane Bewteen US 101 in Mt. View and SR 87 in San Jose.

Alternative : Alternative 3-1 Long Transit Lane

	Current Cost		Escalated Cost	
ROADWAY ITEMS	$	270,663,728	$	362,649,700
STRUCTURE ITEMS	$	15,194,700	$	20,358,700
SUBTOTAL CONSTRUCTION COST	$	285,858,428	$	383,008,400
RIGHT OF WAY	$	-	$	-
TOTAL CAPITAL OUTLAY COST	$	285,859,000	$	383,009,000
PR/ED SUPPORT (3%)	$	8,576,000	$	11,491,000
PS&E SUPPORT (12%)	$	34,304,000	$	45,962,000
RIGHT OF WAY SUPPORT				
CONSTRUCTION SUPPORT (12%)	$	34,304,000	$	45,962,000
AGENCY SUPPORT (8%)	$	22,869,000	$	30,641,000
TOTAL CAPITAL OUTLAY SUPPORT COST*	$	100,053,000	$	134,056,000
TOTAL PROJECT COST	$	385,912,000	$	518,000,000

If Project has been programmed enter Programmed Amount

	Month	/	Year
Date of Estimate (Month/Year)	12	/	2019
Estimated Date of Construction Start (Month/Year)	10	/	2023
Number of Working Days	1500		Working Days
Estimated Mid-Point of Construction (Month/Year)	10	/	2026
Number of Plant Establishment Days			Days

Estimated Project Schedule

PID Approval
PA/ED Approval
PS&E
RTL
Begin Construction

Approved by Project Manager

Project Manager	**Date**	**Phone**

I. ROADWAY ITEMS SUMMARY

	Section	Cost
1	**Earthwork**	$ 6,364,900
2	**Pavement Structural Section**	$ 22,598,800
3	**Drainage**	$ 2,847,700
4	**Specialty Items**	$ 18,243,300
5	**Environmental**	$ 2,236,400
6	**Traffic Items**	$ 119,586,600
7	**Detours**	$ 250,000
8	**Minor Items**	$ 8,606,400
9	**Roadway Mobilization**	$ 18,073,500
10	**Supplemental Work**	$ 9,082,300
11	**State Furnished**	$ 5,907,400
12	**Contingencies**	$ 45,110,700
13	**Overhead**	$ 11,755,728

TOTAL ROADWAY ITEMS	$ 270,663,728

Estimate Prepared By :

Name and Title　　Date　　Phone

Estimate Reviewed By :

Name and Title　　Date　　Phone

SECTION 1: EARTHWORK

Item code		Unit	Quantity		Unit Price ($)		Cost
160101	Clearing & Grubbing	AC	43	x	1,725	=	$74,175
170101	Develop Water Supply	LS	1	x	50,000	=	$50,000
190101	Roadway Excavation	CY	201,337	x	29	=	$5,758,238
190103	Roadway Excavation (Type Y) ADL	CY		x		=	$0
190105	Roadway Excavation (Type Z-2) ADL	CY		x		=	$0
192037	Structure Excavation (Retaining Wall)	CY		x		=	$0
193013	Structure Backfill (Retaining Wall)	CY		x		=	$0
193031	Pervious Backfill Material (Retaining Wall)	CY		x		=	$0
194001	Ditch Excavation	CY		x		=	$0
198001	Impored Borrow	CY	29,236	x	17	=	$482,394
198007	Imported Material (Shoulder Backing)	TON		x		=	$0
XXXXXX	Some Item			x		=	$0

TOTAL EARTHWORK SECTION ITEMS $ 6,364,900

SECTION 2: PAVEMENT STRUCTURAL SECTION

Item code		Unit	Quantity		Unit Price ($)			Cost
150771	Remove Asphalt Concrete Dike	LF		x		=	$	-
150860	Remove Base and Surfacing	CY		x		=	$	-
153103	Cold Plane Asphalt Concrete Pavement	SQYD	12,305	x	8	=	$	98,440
150854	Remove Concrete Pavement	CY	3,855	x	156	=	$	601,380
260201	Class 4 Aggregate Base	CY	24,595	x	61	=	$	1,487,998
250401	Class 4 Aggregate Subbase	CY	47,082	x	38	=	$	1,789,116
290201	Asphalt Treated Permeable Base	CY	17,568	x	160	=	$	2,810,880
365001	Sand Cover	TON		x		=	$	-
374002	Asphaltic Emulsion (Fog Seal Coat)	TON		x		=	$	-
374492	Asphaltic Emulsion (Polymer Modified)	TON		x		=	$	-
3750XX	Screenings (Type XX)	TON		x		=	$	-
377501	Slurry Seal	TON		x		=	$	-
390095	Replace Asphalt Concrete Surfacing	CY		x		=	$	-
390132	Hot Mix Asphalt (Type A)	TON		x		=	$	-
390136	Minor Hot Mix Asphalt	TON		x		=	$	-
390137	Rubberized Hot Mix Asphalt (Gap Graded)	TON		x		=	$	-
393003	Geosynthetic Pavement Interlayer	SQYD		x		=	$	-
39405X	Shoulder Rumber Strip *(HMA, Type XX Inden*	STA		x		=	$	-
394071	Place Hot Mix Asphalt Dike	LF		x		=	$	-
394090	Place Hot Mix Asphalt (Misc. Area)	SQYD		x		=	$	-
397005	Tack Coat	TON		x		=	$	-
400050	Continuously Reinfored Concrete Pavement	CY	52,703	x	300	=	$	15,810,900
401108	Replace Concrete Pavement (Rapid Strength	CY		x		=	$	-
404092	Seal Pavement Joint	LF		x		=	$	-
404094	Seal Longitudinal Isolation Joint	LF		x		=	$	-
413112A	Repair Spalled Joints (Polyester Grout)	SQYD		x		=	$	-
413115	Seal Existing Concrete Pavement Joint	LF		x		=	$	-
420102	Groove Existing Concrete Pavement	SQYD		x		=	$	-
420201	Grind Existing Concrete Pavement	SQYD		x		=	$	-
731502	Minor Concrete (Misc. Const)	CY		x		=	$	-
731530	Minor Concrete (Textured Paving)	SQFT		x		=	$	-
XXXXXX	Some Item			x		=	$	-

TOTAL STRUCTURAL SECTION ITEMS $ 22,598,800

SECTION 3: DRAINAGE

Item code		Unit	Quantity		Unit Price ($)			Cost
150206	Abandon Culvert	LF		x		=	$	-
150805	Remove Culvert	LF		x		=	$	-
150820	Modify Inlet	EA		x		=	$	-
152430	Adjust Inlet	LF		x		=	$	-
155003	Cap Inlet	EA		x		=	$	-
193114	Sand Backfill	CY		x		=	$	-
510502	Minor Concrete (Minor Structure)	CY		x		=	$	-
510512	Minor Concrete (Box Culvert)	CY		x		=	$	-
510XXX	Culvert (Roadway Crossing)	EA		x		=	$	-
62XXXX	XXX" APC Pipe	LF		x		=	$	-
64XXXX	XXX" Plastic Pipe	LF		x		=	$	-
65XXXX	XXX" RCP Pipe	LF		x		=	$	-
66XXXX	XXX" CSP Pipe	LF		x		=	$	-
680905	Underdrain (6" Alternative)	LF	38,695	x	36	=	$	1,393,020
681103	Edge Drain (3" Plastic Pipe)	LF	69,269	x	21	=	$	1,454,649
69XXXX	XXX" Pipe Downdrain	LF		x		=	$	-
70XXXX	XXX" Pipe Inlet	LF		x		=	$	-
70XXXX	XXX" Pipe Riser	LF		x		=	$	-
70XXXX	XXX" Flared End Section	EA		x		=	$	-
703233	Grated Line Drain	LF		x		=	$	-
72XXXX	Rock Slope Protection (Type and Method)	CY		x		=	$	-
721420	Concrete (Ditch Lining)	CY		x		=	$	-
721430	Concrete (Channel Lining)	CY		x		=	$	-
729010	Rock Slope Protection Fabric	SQYD		x		=	$	-
750001	Miscellaneous Iron and Steel	LB		x		=	$	-
XXXXXX	Additional Drainage (Detention Base, etc)	LS		x		=	$	-
XXXXXX	Some Item			x		=	$	-

TOTAL DRAINAGE ITEMS $ 2,847,700

SECTION 4: SPECIALTY ITEMS

Item code		Unit	Quantity		Unit Price ($)			Cost
070012	Progress Schedule (Critical Path Method)	LS	1	x	30,000	=	$	30,000
150662	Remove Metal Beam Guard Railing	LF	61,156	x	15	=	$	886,762
150668	Remove Terminal Systems	EA		x		=	$	-
1532XX	Remove Concrete Barrier (25, 50 or 50C)	LF	4,606	x	16	=	$	73,696
153250	Remove Sound Wall	SQFT	114,680	x	25	=	$	2,867,000
150606	Remove Fence (BW)	LF		x		=	$	-
190110	Lead Compliance Plan	LS	1	x	18,000	=	$	18,000
49XXXX	CIDH Concrete Piling *(Insert Diameter)*	LF		x		=	$	-
510060	Structural Concrete (Retaining Wall)	CY		x		=	$	-
510133	Class 2 Concrete (Retaining Wall)	CY		x		=	$	-
510XXX	Retaining Wall (MSE)	SQFT	42,720	x	85	=	$	3,631,200
XXXXXX	Sound Wall (On Pile, On Barrier or On Ret. Wall)	SQFT	114,680	x	40	=	$	4,587,200
5110XX	Architectural Treatment *(Insert Type)*	SQFT		x		=	$	-
511048	Apply Anti-Graffiti Coating	SQFT		x		=	$	-
5136XX	Reinforced Concrete Crib Wall *(Insert Type)*	SQFT		x		=	$	-
518002	Sound Wall (Masonry Block)	SQFT		x		=	$	-
520103	Bar Reinf. Steel (Retaining Wall)	LB		x		=	$	-
800007	Fence (BW)	LF		x		=	$	-
832001	Metal Beam Guard Railing	LF	52,594	x	47	=	$	2,445,621
839310	Double Thrie Beam Barrier	LF		x		=	$	-
839521	Cable Railing	LF		x		=	$	-
83954X	Transition Railing *(Insert Type)*	EA		x		=	$	-
8395XX	Terminal System (Type CAT)	EA		x		=	$	-
8395XX	Alternative Flared Terminal System	EA	4	x	1,200	=	$	4,800
8395XX	End Anchor Assembly (*Insert Type*)	EA		x		=	$	-
839561	Rail Tensioning Assembly	EA		x		=	$	-
839596	Crash Cushion *(G.R.E.A.T)*	EA		x		=	$	-
839701	Concrete Barrier *(50 or 60)*	LF	44,180	x	78	=	$	3,446,040
833128	Concrete Barrier *(25 Modify)*	LF	1,976	x	128	=	$	252,928
XXXXXX	Some Item			x		=	$	-

TOTAL SPECIALTY ITEMS $ 18,243,300

SECTION 5: ENVIRONMENTAL

5A - ENVIRONMENTAL MITIGATION

Item code		Unit	Quantity		Unit Price ($)			Cost
XXXXXX	Biological Mitigation	LS		x		=	$	-
071325	Temporary Reinforced Silt Fence	LF		x		=	$	-
XXXXXX	Hazardous Material Remediation	LS	1	x	180,000	=	$	180,000
XXXXXX	Permits	LS	1	x	90,000	=	$	90,000
071325	Temporary Fence (Type ESA)	LF		x		=	$	-

Subtotal Environmental *$ 270,000*

5B - LANDSCAPE AND IRRIGATION

Item code		Unit	Quantity		Unit Price ($)			Cost
200001	Highway Planting	ACRE		x		=	$	-
20XXXX	XXX" (*Insert Type*) Conduit *(Use for Irrigation x-*	LF		x		=	$	-
20XXXX	Extend XXX" *(Insert Type)* Conduit	LF		x		=	$	-
201700	Imported Topsoil	CY		x		=	$	-
203015	Erosion Control	ACRE		x		=	$	-
203021	Fiber Rolls	LF		x		=	$	-
203026	Move In/ Move Out (Erosion Control)	EA		x		=	$	-
204099	Plant Establishment Work	LS		x		=	$	-
204101	Extend Plant Establishment (X Years)	LS		x		=	$	-
208000	Irrigation System	LS		x		=	$	-
208304	Water Meter	EA		x		=	$	-
209801	Maintenance Vehicle Pullout	EA		x		=	$	-
XXXXXX	Some Item							

Subtotal Landscape and Irrigation *$ -*

5C - NPDES

Item code		Unit	Quantity		Unit Price ($)			Cost
074016	Construction Site Management	LS	1	x	900,000	=	$	900,000
074017	Prepare WPCP	LS	1	x	20,000	=	$	20,000
074019	Prepare SWPPP	LS	1	x	20,000	=	$	20,000
074023	Temporary Erosion Control	ACRE	43	x	2,500	=	$	107,500
074027	Temporary Erosion Control Blanket	SQYD		x		=	$	-
074028	Temporary Fiber Roll	LF		x		=	$	-
074032	Temporary Concrete Washout Facility	EA		x		=	$	-
074033	Temporary Construction Entrance	EA		x		=	$	-
074035	Temporary Check Dam	LF		x		=	$	-
074037	Move In/ Move Out (Temp Erosion Control)	EA		x		=	$	-
074038	Temp. Drainage Inlet Protection	EA	315	x	60	=	$	18,900
XXXXXX	Site Job Management	LS	1	x	900,000	=	$	900,000
074042	Temporary Concrete Washout (Portable)	LS		x		=	$	-
XXXXXX	Some Item			x		=	$	-

Supplemental Work for NPDES

(These costs are not accounted in total here but under Supplemental Work on sheet 7 of 11).

074021	Water Pollution Control Maintenance Work*	LS	1	x	45,500	=	$	45,500
066596	Additional Water Pollution Control**	LS		x		=	$	-
066597	Storm Water Sampling and Analysis***	LS		x		=	$	-
XXXXXX	Some Item							

Subtotal NPDES (Without Supplemental Work) *$ 1,966,400*

*Applies to all SWPPPs and those WPCPs with sediment control or soil stabilization BMPs.

**Applies to both SWPPPs and WPCP projects.

*** Applies only to project with SWPPPs.

TOTAL ENVIRONMENTAL $ 2,236,400

SECTION 6: TRAFFIC ITEMS

6A - Traffic Electrical

Item code		Unit	Quantity		Unit Price ($)			Cost
150760	Remove Sign Structure	EA		x		=	$	-
151581	Reconstruct Sign Structure	EA		x		=	$	-
152641	Modify Sign Structure	EA		x		=	$	-
5602XX	Furnish Sign Structure	LB		x		=	$	-
5602XX	Install Sign Structure	LB		x		=	$	-
56XXXX	XXX" CIDHC Pile (Sign Foundation)	LF		x		=	$	-
56XXXX	Install Overhead Sign (Two Post)	EA	15	x	400,000	=	$	6,000,000
56XXXX	Install Overhead Sign (One Post)	EA	10	x	160,000	=	$	1,600,000
860090	Maintain Existing Traffic Management System	LS	1	x	900,000	=	$	900,000
860810	Inductive Loop Detectors	EA		x		=	$	-
86055X	Lighting & Sign Illumination	EA	378	x	4,000	=	$	1,512,000
8607XX	Interconnection Facilities	LS		x		=	$	-
8609XX	Traffic Traffic Monitoring Stations	LS	1	x	200,000	=	$	200,000
860XXX	Signals & Lighting	LS		x		=	$	-
860XXX	ITS Elements	LS		x		=	$	-
861100	Ramp Metering System (Location X)	LS		x		=	$	-
86XXXX	Fiber Optic Conduit System	LS		x		=	$	-
XXXXXX	Ramp Terminal Intersection Improvement	LS	1	x	1,000,000	=	$	1,000,000
XXXXXX	Toll Equipment and System Integration (Capital)	LS	1	x	100,000,000	=	$	100,000,000
XXXXX	Some Item							

Subtotal Traffic Electrical *$ 111,212,000*

6B - Traffic Signing and Striping

Item code		Unit	Quantity		Unit Price ($)			Cost
120090	Construction Area Signs	LS	1	x	900,000	=	$	900,000
150701	Remove Yellow Painted Traffic Stripe	LF	94,494	x	4	=	$	377,976
150710	Remove Traffic Stripe	LF	944,940	x	0.25	=	$	236,235
150713	Remove Pavement Marking	SQFT		x		=	$	-
150742	Remove Roadside Sign	EA	20	x	120	=	$	2,400
15075X	Remove Sign Structure	EA	30	x	20,000	=	$	600,000
15075X	Remove Sign Structure (On Bridge)	EA	8	x	5,000	=	$	40,000
152320	Reset Roadside Sign	EA		x		=	$	-
152390	Relocate Roadside Sign	EA		x		=	$	-
566011	Roadside Sign (One Post)	EA	30	x	340	=	$	10,200
566012	Roadside Sign (Two Post)	EA	10	x	1,250	=	$	12,500
560XXX	Furnish Sign Panels	SQFT		x		=	$	-
560XXX	Install Sign Panels	SQFT		x		=	$	-
82010X	Delineator (Class X)	EA		x		=	$	-
84XXXX	Permanent Pavement Delineation	LS	1	x	900,000	=	$	900,000
840504	Thermoplastic Traffic Strip (4")	LF	944,940	x	0.50	=	$	472,470

Subtotal Traffic Signing and Striping *$ 3,551,781*

6C - Stage Construction and Traffic Handling

Item code		Unit	Quantity		Unit Price ($)			Cost
120100	Traffic Control System	LS	1	x	4,000,000	=	$	4,000,000
120120	Type III Barricade	EA		x		=	$	-
120143	Temporary Pavement Delineation	LF		x		=	$	-
120149	Temporary Pavement Marking (Paint)	LS	1	x	90,000	=	$	90,000
120159	Temporary Traffic Strip (Paint)	LS	1	x	90,000	=	$	90,000
12016X	Channelizer	EA		x		=	$	-
128650	Portable Changeable Message Signs	EA	18	x	10,000	=	$	180,000
129000	Temporary Railing (Type K)	LF	6,000	x	17	=	$	102,000
129100	Temp. Crash Cushion Module	EA	4	x	200	=	$	800
129099A	Traffic Plastic Drum	EA		x		=	$	-
839603A	Temporary Crash Cushion (ADIEM)	EA		x		=	$	-
XXXXXX	Misc. Items (Traffic Management Plan)	LS	1	x	360,000	=	$	360,000
XXXXXX	Some Item	LS		x		=	$	-

Subtotal Stage Construction and Traffic Handling *$ 4,822,800*

TOTAL TRAFFIC ITEMS $ 119,586,600

SECTION 7: DETOURS

Include constructing, maintaining, and removal

Item code		Unit	Quantity		Unit Price ($)		Cost
0713XX	Temporary Fence (Type X)	LF		x		=	$ -
07XXXX	Temporary Drainage	LS		x		=	$ -
120143	Temporary Pavement Delineation	LF		x		=	$ -
1286XX	Temporary Signals	EA		x		=	$ -
129000	Temporary Railing (Type K)	LF		x		=	$ -
190101	Roadway Excavation	CY		x		=	$ -
198001	Imported Borrow	CY		x		=	$ -
198050	Embankment	CY		x		=	$ -
250401	Class 4 Aggregate Subbase	CY		x		=	$ -
260201	Class 2 Aggregate Base	CY		x		=	$ -
390132	Hot Mix Asphalt (Type A)	TON		x		=	$ -
XXXXXX	Some Item	LS	1	x	$250,000	=	$ 250,000

TOTAL DETOURS $ 250,000

SUBTOTAL SECTIONS 1-7 $ 172,127,700

SECTION 8: MINOR ITEMS

8A - Americans with Disabilities Act Items						
ADA Items						$ -
8B - Bike Path Items						
Bike Path Items						$ -
8C - Other Minor Items						
Other Minor Items				5.0%		$ 8,606,385
Total of Section 1-7	$	172,127,700	x	5.0%	=	$ 8,606,385

TOTAL MINOR ITEMS $ 8,606,400

SECTIONS 9: MOBILIZATION

Item code							
999990	Total Section 1-8	$	180,734,100	x	10%	=	$18,073,410

TOTAL MOBILIZATION $ 18,073,500

SECTION 10: SUPPLEMENTAL WORK

Item code		Unit	Quantity		Unit Price ($)		Cost
066015	Federal Trainee Program	LS		x		=	$ -
066063	Traffic Management Plan - Public Information	LS		x		=	$ -
066090	Maintain Traffic	LS		x		=	$ -
066094	Value Analysis	LS		x		=	$ -
066204	Remove Rock & Debris	LS		x		=	$ -
066222	Locate Existing Cross-Over	LS		x		=	$ -
066670	Payment Adjustments For Price Index Fluctuations	LS		x		=	$ -
066700	Partnering	LS		x		=	$ -
066866	Operation of Existing Traffic Management System Eler	LS		x		=	$ -
066920	Dispute Review Board	LS		x		=	$ -
066XXX	Some Item	LS		x		=	$ -

*Cost of **NPDES** Supplemental Work specified in Section 5C* = $ 45,500

Total Section 1-8	$	180,734,100	5%	=	$ 9,036,705

TOTAL SUPPLEMENTAL WORK $ 9,082,300

Note: Mobilization item will automatically calculate if working days are 50 or more. For Project less than 50 Working Days Mobilization is not required as a separate contract, however contract item prices should take into consideration mobilization as part of the price. If the building portion of the project is greater than 50% of the total project cost,
If the building portion of the project is greater than 50% of the total project cost, then mobilization is not included.

SECTION 11: STATE FURNISHED MATERIALS AND EXPENSES

Item code		Unit	Quantity		Unit Price ($)		Cost
066063	Public Information	LS	0	x	$100,000	=	$0
066105	RE Office	LS	1	x	$400,000	=	$400,000
066803	Padlocks	LS		x		=	$0
066838	Reflective Numbers and Edge Sealer	LS		x		=	$0
066901	Water Expenses	LS		x		=	$0
066062A	COZEEP Expenses	LS		x		=	$0
06684X	Ramp Meter Controller Assembly	LS		x		=	$0
XXXXXX	Toll Back Office System	LS	1	x	$1,700,000	=	$1,700,000
06684X	TMS Controller Assembly	LS	1	x	$2,000,000	=	$2,000,000
06684X	Traffic Signal Controller Assembly	LS		x		=	$0
XXXXXX	Some Item						
	Total Section 1-8	$	180,734,100		1%	=	$ 1,807,341

TOTAL STATE FURNISHED **$5,907,400**

SECTION 12: TIME-RELATED OVERHEAD

Estimated Time-Releated Overhead (TRO) Percentage (0% to 10%) = 6%

Item code		Unit	Quantity		Unit Price ($)		Cost	
			Total of All Contract Items Only				$ 195,928,800	(used to calculate TR
070018	Time-Related Overhead	$	195,928,800	X	6%	=	$11,755,728	

TOTAL TIME-RELATED OVERHEAD **$11,755,728**

SECTION 13: CONTINGENCY

Total Section 1-12	$	225,553,028	x	20%	=	$45,110,606

TOTAL CONTINGENCY **$45,110,700**

Note: TRO is a contract item if total project cost is (non-escalated) over $5 million AND 100 or more working days.
If the building portion of the project is greater than 50% of the total project cost, then TRO is not included.
TRO calculated for you as percentage of the sum of all contract items only;
excluding mobilization, supplemental work, state furnished materials and expenses, and contingency.

II. STRUCTURE ITEMS

	Bridge 1	Bridge 2	Bridge 3
DATE OF ESTIMATE	Dec, 2019	Dec, 2019	Dec, 2019
Bridge Name	ALAMADEN UC	CAMDEN UC	OKA UC
Bridge Number			
Structure Type	CIP/PS Box Girder	CIP/PS Box Girder	CIP/PS Box Girder
Width (Feet) [out to out]	50 LF	45 LF	33 LF
Total Bridge Length (Feet)	238 LF	210 LF	102 LF
Total Area (Square Feet)	11,900 SQFT	9,450 SQFT	3,366 SQFT
Structure Depth (Feet)	LF	LF	LF
Footing Type (pile or spread)	None	Pile	Pile
Cost Per Square Foot	$300	$300	$300
COST OF EACH STRUCTURE	**$3,570,000**	**$2,835,000**	**$1,009,800**

	Bridge 4	Bridge 5	Bridge 6
DATE OF ESTIMATE	Dec, 2019	Dec, 2019	Dec, 2019
Bridge Name	LOS GATOS CREEK BRIDGE	POLLARD UC	SAN TOMAS AQUINAS CREEK
Bridge Number			
Structure Type	CIP/PS Box Girder	CIP/PS Box Girder	CIP/PS Box Girder
Width (Feet) [out to out]	29 LF	23 LF	23 LF
Total Bridge Length (Feet)	178 LF	196 LF	105 LF
Total Area (Square Feet)	5,162 SQFT	4,508 SQFT	2,415 SQFT
Structure Depth (Feet)	LF	LF	LF
Footing Type (pile or spread)	Pile	Pile	Pile
Cost Per Square Foot	$300	$300	$300
COST OF EACH STRUCTURE	**$1,548,600**	**$1,352,400**	**$724,500**

	Bridge 7	Bridge 8	Bridge 9
DATE OF ESTIMATE	Dec, 2019	Dec, 2019	Dec, 2019
Bridge Name	SARATOGA UC	SARATOGA CREEK BRIDGE	CALABAZAS CREEK BRG
Bridge Number			
Structure Type	CIP/PS Box Girder	CIP/PS Box Girder	CIP/PS Box Girder
Width (Feet) [out to out]	23 LF	23 LF	22 LF
#REF!	192 LF	100 LF	156 LF
Total Area (Square Feet)	4,416 SQFT	2,300 SQFT	3,432 SQFT
Structure Depth (Feet)	LF	LF	LF
Footing Type (pile or spread)	Pile	Pile	Pile
Cost Per Square Foot	$300	$300	$300
COST OF EACH	**$1,324,800**	**$690,000**	**$1,029,600**

	Bridge 10		
DATE OF ESTIMATE	Dec, 2019		
Bridge Name	Pedestrian Bridge (Dalles Ave)		
Bridge Number			
Structure Type	CIP/PS Box Girder		
Width (Feet) [out to out]	10 LF		
#REF!	370 LF		
Total Area (Square Feet)	3,700 SQFT		
Structure Depth (Feet)	LF		
Footing Type (pile or spread)	Pile		
Cost Per Square Foot	$300		
COST OF EACH	**$1,110,000**		
TOTAL COST OF STRUCTURES[1]			**15,194,700**

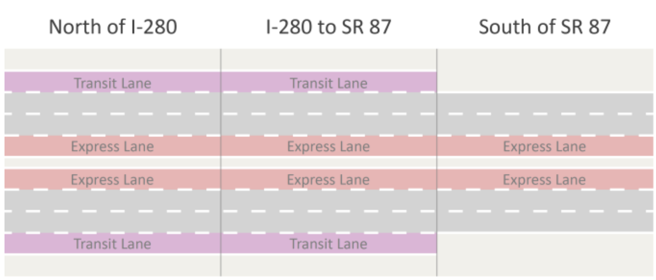
Estimate Prepared By: ______________________ ______________________

XXXXXXXXXXXXXXXXX ------ Division of Structures Date

[1]Structure's Estimate includes Overhead and Mobilization are based on 2019 CALTRAN's "COMPARATIVE BRIDGE COSTS".

Alternative 3-2: Long Right-side Transit Lane

- Convert existing HOV lane in each direction from U.S. 101 (southern end of SR 85) to U.S. 101 in Mountain View to operate as a single express lane in each direction.
- Add one lane in each direction from Almaden Expressway to Evelynn Avenue or Moffett Boulevard. The added lane would be positioned in the existing median as the number 1 (inside) lane.
- With Alternative 3-2, the transit lane would occupy the number 4 (outside) lane position.
- Provide a buffer to separate the transit lane from the adjacent general-purpose lane.
- Provide continuous access to the express lane(s) from the adjacent general-purpose lanes.
- Extend existing auxiliary lane on northbound SR 85 from the South De Anza Boulevard northbound on-ramp to 0.2 mile south of the Stevens Creek Boulevard off-ramp.
- Provide CHP enforcement/observation areas in the median at selected locations along the corridor.
- Install double-luminaire mast arm lighting at 250- to 400-foot intervals from postmile (PM) 6.00 (Almaden expressway) to PM 17.70 (Stevens Creek Boulevard) and from PM 18.86 (Homestead Road) to PM 23.44 (Moffett Boulevard) as an optional improvement.
- Install high mast lighting at SR 17 and I-280 interchanges as needed to supplement existing lighting as an optional improvement.
- Widen nine bridges.
- Replace Dalles Avenue pedestrian structure.
- Convert SR 85 interchange at El Camino Real from a cloverleaf Type L-10 ramp configuration to a spread diamond Type L-2 ramp configuration.



Alternative 3-2: Long Right-side Transit Lane

Engineer Cost Estimate --- Alternative 3-2
Preliminary Project Study Report

Project ID: XXXXXX

Type of Estimate :	Preliminary Project Study Report (Dec 2019)
Program Code :	04-XXXXX
Project Limits :	From Hwy 101 Interchange in Santa Jose to South of Hwy 101 Interchange in Mt. View
Description:	From PM 0.00 to PM 23.68
Scope :	Install A Transit Lane Between US 101 in Mt. View and SR 87 in San Jose that Would Be Located Along the Right Side of the Roadway
Alternative :	Alternative 3-2 Long Transit Lane (Right-Side Lane)

		Current Cost		**Escalated Cost**
ROADWAY ITEMS	$	270,663,728	$	362,649,700
STRUCTURE ITEMS	$	15,194,700	$	20,358,700
SUBTOTAL CONSTRUCTION COST	$	285,858,428	$	383,008,400
RIGHT OF WAY	$	-	$	-
TOTAL CAPITAL OUTLAY COST	$	285,859,000	$	383,009,000
PR/ED SUPPORT (3%)	$	8,576,000	$	11,491,000
PS&E SUPPORT (12%)	$	34,304,000	$	45,962,000
RIGHT OF WAY SUPPORT				
CONSTRUCTION SUPPORT (12%)	$	34,304,000	$	45,962,000
AGENCY SUPPORT (8%)	$	22,869,000	$	30,641,000
TOTAL CAPITAL OUTLAY SUPPORT COST*	$	100,053,000	$	134,056,000
TOTAL PROJECT COST	$	385,912,000	$	518,000,000

If Project has been programmed enter Programmed Amount

	Month	/	Year
Date of Estimate (Month/Year)	12	/	2019
Estimated Date of Construction Start (Month/Year)	10	/	2023
Number of Working Days	1500		Working Days
Estimated Mid-Point of Construction (Month/Year)	10	/	2026
Number of Plant Establishment Days			Days

Estimated Project Schedule

PID Approval
PA/ED Approval
PS&E
RTL
Begin Construction

Approved by Project Manager

Project Manager	**Date**	**Phone**

I. ROADWAY ITEMS SUMMARY

	Section	Cost
1	**Earthwork**	$ 6,364,900
2	**Pavement Structural Section**	$ 22,598,800
3	**Drainage**	$ 2,847,700
4	**Specialty Items**	$ 18,243,300
5	**Environmental**	$ 2,236,400
6	**Traffic Items**	$ 119,586,600
7	**Detours**	$ 250,000
8	**Minor Items**	$ 8,606,400
9	**Roadway Mobilization**	$ 18,073,500
10	**Supplemental Work**	$ 9,082,300
11	**State Furnished**	$ 5,907,400
12	**Contingencies**	$ 45,110,700
13	**Overhead**	$ 11,755,728

TOTAL ROADWAY ITEMS	$ 270,663,728

Estimate Prepared By :

Name and Title　　Date　　Phone

Estimate Reviewed By :

Name and Title　　Date　　Phone

SECTION 1: EARTHWORK

Item code		Unit	Quantity		Unit Price ($)		Cost
160101	Clearing & Grubbing	AC	43	x	1,725	=	$74,175
170101	Develop Water Supply	LS	1	x	50,000	=	$50,000
190101	Roadway Excavation	CY	201,337	x	29	=	$5,758,238
190103	Roadway Excavation (Type Y) ADL	CY		x		=	$0
190105	Roadway Excavation (Type Z-2) ADL	CY		x		=	$0
192037	Structure Excavation (Retaining Wall)	CY		x		=	$0
193013	Structure Backfill (Retaining Wall)	CY		x		=	$0
193031	Pervious Backfill Material (Retaining Wall)	CY		x		=	$0
194001	Ditch Excavation	CY		x		=	$0
198001	Impored Borrow	CY	29,236	x	17	=	$482,394
198007	Imported Material (Shoulder Backing)	TON		x		=	$0
XXXXXX	Some Item			x		=	$0

TOTAL EARTHWORK SECTION ITEMS	**$**	**6,364,900**

SECTION 2: PAVEMENT STRUCTURAL SECTION

Item code		Unit	Quantity		Unit Price ($)			Cost
150771	Remove Asphalt Concrete Dike	LF		x		=	$	-
150860	Remove Base and Surfacing	CY		x		=	$	-
153103	Cold Plane Asphalt Concrete Pavement	SQYD	12,305	x	8	=	$	98,440
150854	Remove Concrete Pavement	CY	3,855	x	156	=	$	601,380
260201	Class 4 Aggregate Base	CY	24,595	x	61	=	$	1,487,998
250401	Class 4 Aggregate Subbase	CY	47,082	x	38	=	$	1,789,116
290201	Asphalt Treated Permeable Base	CY	17,568	x	160	=	$	2,810,880
365001	Sand Cover	TON		x		=	$	-
374002	Asphaltic Emulsion (Fog Seal Coat)	TON		x		=	$	-
374492	Asphaltic Emulsion (Polymer Modified)	TON		x		=	$	-
3750XX	Screenings (Type XX)	TON		x		=	$	-
377501	Slurry Seal	TON		x		=	$	-
390095	Replace Asphalt Concrete Surfacing	CY		x		=	$	-
390132	Hot Mix Asphalt (Type A)	TON		x		=	$	-
390136	Minor Hot Mix Asphalt	TON		x		=	$	-
390137	Rubberized Hot Mix Asphalt (Gap Graded)	TON		x		=	$	-
393003	Geosynthetic Pavement Interlayer	SQYD		x		=	$	-
39405X	Shoulder Rumber Strip *(HMA, Type XX Inden*	STA		x		=	$	-
394071	Place Hot Mix Asphalt Dike	LF		x		=	$	-
394090	Place Hot Mix Asphalt (Misc. Area)	SQYD		x		=	$	-
397005	Tack Coat	TON		x		=	$	-
400050	Continuously Reinfored Concrete Pavement	CY	52,703	x	300	=	$	15,810,900
401108	Replace Concrete Pavement (Rapid Strength	CY		x		=	$	-
404092	Seal Pavement Joint	LF		x		=	$	-
404094	Seal Longitudinal Isolation Joint	LF		x		=	$	-
413112A	Repair Spalled Joints (Polyester Grout)	SQYD		x		=	$	-
413115	Seal Existing Concrete Pavement Joint	LF		x		=	$	-
420102	Groove Existing Concrete Pavement	SQYD		x		=	$	-
420201	Grind Existing Concrete Pavement	SQYD		x		=	$	-
731502	Minor Concrete (Misc. Const)	CY		x		=	$	-
731530	Minor Concrete (Textured Paving)	SQFT		x		=	$	-
XXXXXX	Some Item			x		=	$	-

TOTAL STRUCTURAL SECTION ITEMS	**$**	**22,598,800**

SECTION 3: DRAINAGE

Item code		Unit	Quantity		Unit Price ($)			Cost
150206	Abandon Culvert	LF		x		=	$	-
150805	Remove Culvert	LF		x		=	$	-
150820	Modify Inlet	EA		x		=	$	-
152430	Adjust Inlet	LF		x		=	$	-
155003	Cap Inlet	EA		x		=	$	-
193114	Sand Backfill	CY		x		=	$	-
510502	Minor Concrete (Minor Structure)	CY		x		=	$	-
510512	Minor Concrete (Box Culvert)	CY		x		=	$	-
510XXX	Culvert (Roadway Crossing)	EA		x		=	$	-
62XXXX	XXX" APC Pipe	LF		x		=	$	-
64XXXX	XXX" Plastic Pipe	LF		x		=	$	-
65XXXX	XXX" RCP Pipe	LF		x		=	$	-
66XXXX	XXX" CSP Pipe	LF		x		=	$	-
680905	Underdrain (6" Alternative)	LF	38,695	x	36	=	$	1,393,020
681103	Edge Drain (3" Plastic Pipe)	LF	69,269	x	21	=	$	1,454,649
69XXXX	XXX" Pipe Downdrain	LF		x		=	$	-
70XXXX	XXX" Pipe Inlet	LF		x		=	$	-
70XXXX	XXX" Pipe Riser	LF		x		=	$	-
70XXXX	XXX" Flared End Section	EA		x		=	$	-
703233	Grated Line Drain	LF		x		=	$	-
72XXXX	Rock Slope Protection (Type and Method)	CY		x		=	$	-
721420	Concrete (Ditch Lining)	CY		x		=	$	-
721430	Concrete (Channel Lining)	CY		x		=	$	-
729010	Rock Slope Protection Fabric	SQYD		x		=	$	-
750001	Miscellaneous Iron and Steel	LB		x		=	$	-
XXXXXX	Additional Drainage (Detention Base, etc)	LS		x		=	$	-
XXXXXX	Some Item			x		=	$	-

TOTAL DRAINAGE ITEMS $ 2,847,700

SECTION 4: SPECIALTY ITEMS

Item code		Unit	Quantity		Unit Price ($)			Cost
070012	Progress Schedule (Critical Path Method)	LS	1	x	30,000	=	$	30,000
150662	Remove Metal Beam Guard Railing	LF	61,156	x	15	=	$	886,762
150668	Remove Terminal Systems	EA		x		=	$	-
1532XX	Remove Concrete Barrier (25, 50 or 50C)	LF	4,606	x	16	=	$	73,696
153250	Remove Sound Wall	SQFT	114,680	x	25	=	$	2,867,000
150606	Remove Fence (BW)	LF		x		=	$	-
190110	Lead Compliance Plan	LS	1	x	18,000	=	$	18,000
49XXXX	CIDH Concrete Piling *(Insert Diameter)*	LF		x		=	$	-
510060	Structural Concrete (Retaining Wall)	CY		x		=	$	-
510133	Class 2 Concrete (Retaining Wall)	CY		x		=	$	-
510XXX	Retaining Wall (MSE)	SQFT	42,720	x	85	=	$	3,631,200
XXXXXX	Sound Wall (On Pile, On Barrier or On Ret. Wall)	SQFT	114,680	x	40	=	$	4,587,200
5110XX	Architectural Treatment *(Insert Type)*	SQFT		x		=	$	-
511048	Apply Anti-Graffiti Coating	SQFT		x		=	$	-
5136XX	Reinforced Concrete Crib Wall *(Insert Type)*	SQFT		x		=	$	-
518002	Sound Wall (Masonry Block)	SQFT		x		=	$	-
520103	Bar Reinf. Steel (Retaining Wall)	LB		x		=	$	-
800007	Fence (BW)	LF		x		=	$	-
832001	Metal Beam Guard Railing	LF	52,594	x	47	=	$	2,445,621
839310	Double Thrie Beam Barrier	LF		x		=	$	-
839521	Cable Railing	LF		x		=	$	-
83954X	Transition Railing *(Insert Type)*	EA		x		=	$	-
8395XX	Terminal System (Type CAT)	EA		x		=	$	-
8395XX	Alternative Flared Terminal System	EA	4	x	1,200	=	$	4,800
8395XX	End Anchor Assembly (*Insert Type*)	EA		x		=	$	-
839561	Rail Tensioning Assembly	EA		x		=	$	-
839596	Crash Cushion *(G.R.E.A.T)*	EA		x		=	$	-
839701	Concrete Barrier *(50 or 60)*	LF	44,180	x	78	=	$	3,446,040
833128	Concrete Barrier *(25 Modify)*	LF	1,976	x	128	=	$	252,928
XXXXXX	Some Item			x		=	$	-

TOTAL SPECIALTY ITEMS $ 18,243,300

SECTION 5: ENVIRONMENTAL

5A - ENVIRONMENTAL MITIGATION

Item code		Unit	Quantity		Unit Price ($)			Cost
XXXXXX	Biological Mitigation	LS		x		=	$	-
071325	Temporary Reinforced Silt Fence	LF		x		=	$	-
XXXXXX	Hazardous Material Remediation	LS	1	x	180,000	=	$	180,000
XXXXXX	Permits	LS	1	x	90,000	=	$	90,000
071325	Temporary Fence (Type ESA)	LF		x		=	$	-

Subtotal Environmental *$ 270,000*

5B - LANDSCAPE AND IRRIGATION

Item code		Unit	Quantity		Unit Price ($)			Cost
200001	Highway Planting	ACRE		x		=	$	-
20XXXX	XXX" (*Insert Type*) Conduit *(Use for Irrigation x-*	LF		x		=	$	-
20XXXX	Extend XXX" *(Insert Type)* Conduit	LF		x		=	$	-
201700	Imported Topsoil	CY		x		=	$	-
203015	Erosion Control	ACRE		x		=	$	-
203021	Fiber Rolls	LF		x		=	$	-
203026	Move In/ Move Out (Erosion Control)	EA		x		=	$	-
204099	Plant Establishment Work	LS		x		=	$	-
204101	Extend Plant Establishment (X Years)	LS		x		=	$	-
208000	Irrigation System	LS		x		=	$	-
208304	Water Meter	EA		x		=	$	-
209801	Maintenance Vehicle Pullout	EA		x		=	$	-
XXXXXX	Some Item							

Subtotal Landscape and Irrigation *$ -*

5C - NPDES

Item code		Unit	Quantity		Unit Price ($)			Cost
074016	Construction Site Management	LS	1	x	900,000	=	$	900,000
074017	Prepare WPCP	LS	1	x	20,000	=	$	20,000
074019	Prepare SWPPP	LS	1	x	20,000	=	$	20,000
074023	Temporary Erosion Control	ACRE	43	x	2,500	=	$	107,500
074027	Temporary Erosion Control Blanket	SQYD		x		=	$	-
074028	Temporary Fiber Roll	LF		x		=	$	-
074032	Temporary Concrete Washout Facility	EA		x		=	$	-
074033	Temporary Construction Entrance	EA		x		=	$	-
074035	Temporary Check Dam	LF		x		=	$	-
074037	Move In/ Move Out (Temp Erosion Control)	EA		x		=	$	-
074038	Temp. Drainage Inlet Protection	EA	315	x	60	=	$	18,900
XXXXXX	Site Job Management	LS	1	x	900,000	=	$	900,000
074042	Temporary Concrete Washout (Portable)	LS		x		=	$	-
XXXXXX	Some Item			x		=	$	-

Supplemental Work for NPDES

(These costs are not accounted in total here but under Supplemental Work on sheet 7 of 11).

074021	Water Pollution Control Maintenance Work*	LS	1	x	45,500	=	$	45,500
066596	Additional Water Pollution Control**	LS		x		=	$	-
066597	Storm Water Sampling and Analysis***	LS		x		=	$	-
XXXXXX	Some Item							

Subtotal NPDES (Without Supplemental Work) *$ 1,966,400*

*Applies to all SWPPPs and those WPCPs with sediment control or soil stabilization BMPs.

**Applies to both SWPPPs and WPCP projects.

*** Applies only to project with SWPPPs.

TOTAL ENVIRONMENTAL $ 2,236,400

SECTION 6: TRAFFIC ITEMS

6A - Traffic Electrical

Item code		Unit	Quantity		Unit Price ($)			Cost
150760	Remove Sign Structure	EA		x		=	$	-
151581	Reconstruct Sign Structure	EA		x		=	$	-
152641	Modify Sign Structure	EA		x		=	$	-
5602XX	Furnish Sign Structure	LB		x		=	$	-
5602XX	Install Sign Structure	LB		x		=	$	-
56XXXX	XXX" CIDHC Pile (Sign Foundation)	LF		x		=	$	-
56XXXX	Install Overhead Sign (Two Post)	EA	15	x	400,000	=	$	6,000,000
56XXXX	Install Overhead Sign (One Post)	EA	10	x	160,000	=	$	1,600,000
860090	Maintain Existing Traffic Management System	LS	1	x	900,000	=	$	900,000
860810	Inductive Loop Detectors	EA		x		=	$	-
86055X	Lighting & Sign Illumination	EA	378	x	4,000	=	$	1,512,000
8607XX	Interconnection Facilities	LS		x		=	$	-
8609XX	Traffic Traffic Monitoring Stations	LS	1	x	200,000	=	$	200,000
860XXX	Signals & Lighting	LS		x		=	$	-
860XXX	ITS Elements	LS		x		=	$	-
861100	Ramp Metering System (Location X)	LS		x		=	$	-
86XXXX	Fiber Optic Conduit System	LS		x		=	$	-
XXXXXX	Ramp Terminal Intersection Improvement	LS	1	x	1,000,000	=	$	1,000,000
XXXXXX	Toll Equipment and System Integration (Capital)	LS	1	x	100,000,000	=	$	100,000,000
XXXXX	Some Item							

Subtotal Traffic Electrical *$ 111,212,000*

6B - Traffic Signing and Striping

Item code		Unit	Quantity		Unit Price ($)			Cost
120090	Construction Area Signs	LS	1	x	900,000	=	$	900,000
150701	Remove Yellow Painted Traffic Stripe	LF	94,494	x	4	=	$	377,976
150710	Remove Traffic Stripe	LF	944,940	x	0.25	=	$	236,235
150713	Remove Pavement Marking	SQFT		x		=	$	-
150742	Remove Roadside Sign	EA	20	x	120	=	$	2,400
15075X	Remove Sign Structure	EA	30	x	20,000	=	$	600,000
15075X	Remove Sign Structure (On Bridge)	EA	8	x	5,000	=	$	40,000
152320	Reset Roadside Sign	EA		x		=	$	-
152390	Relocate Roadside Sign	EA		x		=	$	-
566011	Roadside Sign (One Post)	EA	30	x	340	=	$	10,200
566012	Roadside Sign (Two Post)	EA	10	x	1,250	=	$	12,500
560XXX	Furnish Sign Panels	SQFT		x		=	$	-
560XXX	Install Sign Panels	SQFT		x		=	$	-
82010X	Delineator (Class X)	EA		x		=	$	-
84XXXX	Permanent Pavement Delineation	LS	1	x	900,000	=	$	900,000
840504	Thermoplastic Traffic Strip (4")	LF	944,940	x	0.50	=	$	472,470

Subtotal Traffic Signing and Striping *$ 3,551,781*

6C - Stage Construction and Traffic Handling

Item code		Unit	Quantity		Unit Price ($)			Cost
120100	Traffic Control System	LS	1	x	4,000,000	=	$	4,000,000
120120	Type III Barricade	EA		x		=	$	-
120143	Temporary Pavement Delineation	LF		x		=	$	-
120149	Temporary Pavement Marking (Paint)	LS	1	x	90,000	=	$	90,000
120159	Temporary Traffic Strip (Paint)	LS	1	x	90,000	=	$	90,000
12016X	Channelizer	EA		x		=	$	-
128650	Portable Changeable Message Signs	EA	18	x	10,000	=	$	180,000
129000	Temporary Railing (Type K)	LF	6,000	x	17	=	$	102,000
129100	Temp. Crash Cushion Module	EA	4	x	200	=	$	800
129099A	Traffic Plastic Drum	EA		x		=	$	-
839603A	Temporary Crash Cushion (ADIEM)	EA		x		=	$	-
XXXXXX	Misc. Items (Traffic Management Plan)	LS	1	x	360,000	=	$	360,000
XXXXXX	Some Item	LS		x		=	$	-

Subtotal Stage Construction and Traffic Handling *$ 4,822,800*

TOTAL TRAFFIC ITEMS **$ 119,586,600**

SECTION 7: DETOURS

Include constructing, maintaining, and removal

Item code		Unit	Quantity		Unit Price ($)		Cost
0713XX	Temporary Fence (Type X)	LF		x		=	$ -
07XXXX	Temporary Drainage	LS		x		=	$ -
120143	Temporary Pavement Delineation	LF		x		=	$ -
1286XX	Temporary Signals	EA		x		=	$ -
129000	Temporary Railing (Type K)	LF		x		=	$ -
190101	Roadway Excavation	CY		x		=	$ -
198001	Imported Borrow	CY		x		=	$ -
198050	Embankment	CY		x		=	$ -
250401	Class 4 Aggregate Subbase	CY		x		=	$ -
260201	Class 2 Aggregate Base	CY		x		=	$ -
390132	Hot Mix Asphalt (Type A)	TON		x		=	$ -
XXXXXX	Some Item	LS	1	x	$250,000	=	$ 250,000

TOTAL DETOURS $ 250,000

SUBTOTAL SECTIONS 1-7 $ 172,127,700

SECTION 8: MINOR ITEMS

8A - Americans with Disabilities Act Items					
ADA Items					$ -
8B - Bike Path Items					
Bike Path Items					$ -
8C - Other Minor Items					
Other Minor Items				5.0%	$ 8,606,385
Total of Section 1-7	$ 172,127,700	x		5.0% =	$ 8,606,385

TOTAL MINOR ITEMS $ 8,606,400

SECTIONS 9: MOBILIZATION

Item code							
999990	Total Section 1-8	$	180,734,100	x	10%	=	$18,073,410

TOTAL MOBILIZATION $ 18,073,500

SECTION 10: SUPPLEMENTAL WORK

Item code		Unit	Quantity		Unit Price ($)		Cost
066015	Federal Trainee Program	LS		x		=	$ -
066063	Traffic Management Plan - Public Information	LS		x		=	$ -
066090	Maintain Traffic	LS		x		=	$ -
066094	Value Analysis	LS		x		=	$ -
066204	Remove Rock & Debris	LS		x		=	$ -
066222	Locate Existing Cross-Over	LS		x		=	$ -
066670	Payment Adjustments For Price Index Fluctuations	LS		x		=	$ -
066700	Partnering	LS		x		=	$ -
066866	Operation of Existing Traffic Management System Eler	LS		x		=	$ -
066920	Dispute Review Board	LS		x		=	$ -
066XXX	Some Item	LS		x		=	$ -

*Cost of **NPDES** Supplemental Work specified in Section 5C* = $ 45,500

Total Section 1-8	$	180,734,100	5%	=	$ 9,036,705

TOTAL SUPPLEMENTAL WORK $ 9,082,300

Note: Mobilization item will automatically calculate if working days are 50 or more. For Project less than 50 Working Days Mobilization is not required as a separate contract, however contract item prices should take into consideration mobilization as part of the price. If the building portion of the project is greater than 50% of the total project cost,
If the building portion of the project is greater than 50% of the total project cost, then mobilization is not included.

SECTION 11: STATE FURNISHED MATERIALS AND EXPENSES

Item code		Unit	Quantity		Unit Price ($)		Cost
066063	Public Information	LS	0	x	$100,000	=	$0
066105	RE Office	LS	1	x	$400,000	=	$400,000
066803	Padlocks	LS		x		=	$0
066838	Reflective Numbers and Edge Sealer	LS		x		=	$0
066901	Water Expenses	LS		x		=	$0
066062A	COZEEP Expenses	LS		x		=	$0
06684X	Ramp Meter Controller Assembly	LS		x		=	$0
XXXXXX	Toll Back Office System	LS	1	x	$1,700,000	=	$1,700,000
06684X	TMS Controller Assembly	LS	1	x	$2,000,000	=	$2,000,000
06684X	Traffic Signal Controller Assembly	LS		x		=	$0
XXXXXX	Some Item						
	Total Section 1-8	$	180,734,100		1%	=	$ 1,807,341

TOTAL STATE FURNISHED **$5,907,400**

SECTION 12: TIME-RELATED OVERHEAD

Estimated Time-Releated Overhead (TRO) Percentage (0% to 10%) = 6%

Item code		Unit	Quantity		Unit Price ($)		Cost	
			Total of All Contract Items Only				$ 195,928,800	(used to calculate TR
070018	Time-Related Overhead	$	195,928,800	X	6%	=	$11,755,728	

TOTAL TIME-RELATED OVERHEAD **$11,755,728**

SECTION 13: CONTINGENCY

Total Section 1-12	$	225,553,028	x	20%	=	$45,110,606

TOTAL CONTINGENCY **$45,110,700**

Note: TRO is a contract item if total project cost is (non-escalated) over $5 million AND 100 or more working days.
If the building portion of the project is greater than 50% of the total project cost, then TRO is not included.
TRO calculated for you as percentage of the sum of all contract items only;
excluding mobilization, supplemental work, state furnished materials and expenses, and contingency.

II. STRUCTURE ITEMS

	Bridge 1	Bridge 2	Bridge 3
DATE OF ESTIMATE	Dec, 2019	Dec, 2019	Dec, 2019
Bridge Name	ALAMADEN UC	CAMDEN UC	OKA UC
Bridge Number			
Structure Type	CIP/PS Box Girder	CIP/PS Box Girder	CIP/PS Box Girder
Width (Feet) [out to out]	50 LF	45 LF	33 LF
Total Bridge Length (Feet)	238 LF	210 LF	102 LF
Total Area (Square Feet)	11,900 SQFT	9,450 SQFT	3,366 SQFT
Structure Depth (Feet)	LF	LF	LF
Footing Type (pile or spread)	None	Pile	Pile
Cost Per Square Foot	$300	$300	$300
COST OF EACH STRUCTURE	**$3,570,000**	**$2,835,000**	**$1,009,800**

	Bridge 4	Bridge 5	Bridge 6
DATE OF ESTIMATE	Dec, 2019	Dec, 2019	Dec, 2019
Bridge Name	LOS GATOS CREEK BRIDGE	POLLARD UC	SAN TOMAS AQUINAS CREEK
Bridge Number			
Structure Type	CIP/PS Box Girder	CIP/PS Box Girder	CIP/PS Box Girder
Width (Feet) [out to out]	29 LF	23 LF	23 LF
Total Bridge Length (Feet)	178 LF	196 LF	105 LF
Total Area (Square Feet)	5,162 SQFT	4,508 SQFT	2,415 SQFT
Structure Depth (Feet)	LF	LF	LF
Footing Type (pile or spread)	Pile	Pile	Pile
Cost Per Square Foot	$300	$300	$300
COST OF EACH STRUCTURE	**$1,548,600**	**$1,352,400**	**$724,500**

	Bridge 7	Bridge 8	Bridge 9
DATE OF ESTIMATE	Dec, 2019	Dec, 2019	Dec, 2019
Bridge Name	SARATOGA UC	SARATOGA CREEK BRIDGE	CALABAZAS CREEK BRG
Bridge Number			
Structure Type	CIP/PS Box Girder	CIP/PS Box Girder	CIP/PS Box Girder
Width (Feet) [out to out]	23 LF	23 LF	22 LF
#REF!	192 LF	100 LF	156 LF
Total Area (Square Feet)	4,416 SQFT	2,300 SQFT	3,432 SQFT
Structure Depth (Feet)	LF	LF	LF
Footing Type (pile or spread)	Pile	Pile	Pile
Cost Per Square Foot	$300	$300	$300
COST OF EACH	**$1,324,800**	**$690,000**	**$1,029,600**

	Bridge 10		
DATE OF ESTIMATE	Dec, 2019		
Bridge Name	Pedestrian Bridge (Dalles Ave)		
Bridge Number			
Structure Type	CIP/PS Box Girder		
Width (Feet) [out to out]	10 LF		
#REF!	370 LF		
Total Area (Square Feet)	3,700 SQFT		
Structure Depth (Feet)	LF		
Footing Type (pile or spread)	Pile		
Cost Per Square Foot	$300		
COST OF EACH	**$1,110,000**		
TOTAL COST OF STRUCTURES[1]			**15,194,700**

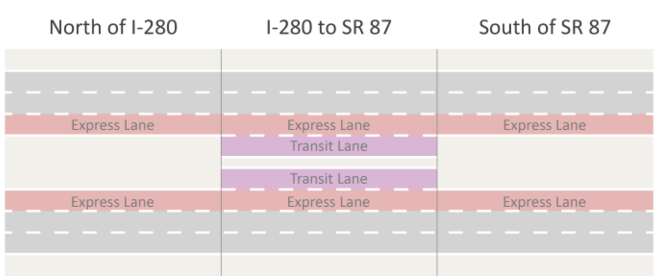
Estimate Prepared By: ______________________ ______________________

XXXXXXXXXXXXXXXXX ------ Division of Structures — Date

[1]Structure's Estimate includes Overhead and Mobilization are based on 2019 CALTRAN's "COMPARATIVE BRIDGE COSTS".

Alternative 3-4: Short Median Adjacent Transit Lane

- Convert existing HOV lane in each direction from U.S. 101 (southern end of SR 85) to U.S. 101 in Mountain View to operate as a single express lane in each direction.
- Add one lane in each direction from Almaden Expressway to Stevens Creek Boulevard or I-280. The added lane would be positioned in the existing median as the number 1 (inside) lane.
- With Alternative 3-4, the transit lane would occupy the number 1 lane position.
- Provide a buffer to separate the transit lane from the adjacent express lane.
- Provide continuous access to the express lane(s) from the adjacent general-purpose lanes.
- Extend existing auxiliary lane on northbound SR 85 from the South De Anza Boulevard northbound on-ramp to 0.2 mile south of the Stevens Creek Boulevard off-ramp.
- Provide CHP enforcement/observation areas in the median at selected locations along the corridor.
- Install double-luminaire mast arm lighting at 250- to 400-foot intervals from postmile (PM) 6.00 (Almaden expressway) to PM 17.70 (Stevens Creek Boulevard) and from PM 18.86 (Homestead Road) to PM 23.44 (Moffett Boulevard).
- Install high mast lighting at SR 17 and I-280 interchanges as needed to supplement existing lighting.
- Widen nine bridges.



Alternative 3-4: Short Median Adjacent Transit Lane

Engineer Cost Estimate --- Alternative 3-4
Preliminary Project Study Report

Project ID: XXXXXX

Type of Estimate :	Preliminary Project Study Report (Dec 2019)
Program Code :	04-XXXXX
Project Limits :	From Hwy 101 Interchange in Santa Jose to South of Hwy 101 Interchange in Mt. View
Description:	From PM 0.00 to PM 23.68
Scope :	Construct A New Transit Lane in the Unused Space Adjacent to the SR 85 Median Between I-280 and SR 87 in San Jose.
Alternative :	Alternative 3-4 Short Transit Lane

	Current Cost		Escalated Cost	
ROADWAY ITEMS	$	245,077,368	$	328,367,700
STRUCTURE ITEMS	$	14,084,700	$	18,871,500
SUBTOTAL CONSTRUCTION COST	$	259,162,068	$	347,239,200
RIGHT OF WAY	$	-	$	-
TOTAL CAPITAL OUTLAY COST	$	259,163,000	$	347,240,000
PR/ED SUPPORT (3%)	$	7,775,000	$	10,418,000
PS&E SUPPORT (12%)	$	31,100,000	$	41,669,000
RIGHT OF WAY SUPPORT				
CONSTRUCTION SUPPORT (12%)	$	31,100,000	$	41,669,000
AGENCY SUPPORT (8%)	$	20,734,000	$	27,780,000
TOTAL CAPITAL OUTLAY SUPPORT COST*	$	90,709,000	$	121,536,000
TOTAL PROJECT COST	**$**	**349,872,000**	**$**	**469,000,000**

If Project has been programmed enter Programmed Amount

	Month	/	Year
Date of Estimate (Month/Year)	12	/	2019
Estimated Date of Construction Start (Month/Year)	10	/	2023
Number of Working Days	1500		Working Days
Estimated Mid-Point of Construction (Month/Year)	10	/	2026
Number of Plant Establishment Days			Days

Estimated Project Schedule

PID Approval
PA/ED Approval
PS&E
RTL
Begin Construction

Approved by Project Manager

Project Manager	Date	Phone

I. ROADWAY ITEMS SUMMARY

	Section	Cost
1	Earthwork	$ 5,164,900
2	Pavement Structural Section	$ 20,367,400
3	Drainage	$ 1,737,900
4	Specialty Items	$ 10,304,200
5	Environmental	$ 1,120,100
6	Traffic Items	$ 116,706,000
7	Detours	$ 150,000
8	Minor Items	$ 7,777,600
9	Roadway Mobilization	$ 16,332,900
10	Supplemental Work	$ 8,192,000
11	State Furnished	$ 5,733,300
12	Contingencies	$ 40,846,300
13	Overhead	$ 10,644,768

TOTAL ROADWAY ITEMS	$ 245,077,368

Estimate Prepared By :

Name and Title | Date | Phone

Estimate Reviewed By :

Name and Title | Date | Phone

SECTION 1: EARTHWORK

Item code		Unit	Quantity		Unit Price ($)		Cost
160101	Clearing & Grubbing	AC	39	x	1,725	=	$67,275
170101	Develop Water Supply	LS	1	x	50,000	=	$50,000
190101	Roadway Excavation	CY	161,827	x	29	=	$4,628,252
190103	Roadway Excavation (Type Y) ADL	CY		x		=	$0
190105	Roadway Excavation (Type Z-2) ADL	CY		x		=	$0
192037	Structure Excavation (Retaining Wall)	CY		x		=	$0
193013	Structure Backfill (Retaining Wall)	CY		x		=	$0
193031	Pervious Backfill Material (Retaining Wall)	CY		x		=	$0
194001	Ditch Excavation	CY		x		=	$0
198001	Impored Borrow	CY	25,413	x	17	=	$419,315
198007	Imported Material (Shoulder Backing)	TON		x		=	$0
XXXXXX	Some Item			x		=	$0

TOTAL EARTHWORK SECTION ITEMS $ 5,164,900

SECTION 2: PAVEMENT STRUCTURAL SECTION

Item code		Unit	Quantity		Unit Price ($)			Cost
150771	Remove Asphalt Concrete Dike	LF		x		=	$	-
150860	Remove Base and Surfacing	CY		x		=	$	-
153103	Cold Plane Asphalt Concrete Pavement	SQYD	12,305	x	8	=	$	98,440
150854	Remove Concrete Pavement	CY	2,912	x	156	=	$	454,272
260201	Class 4 Aggregate Base	CY	22,254	x	61	=	$	1,346,367
250401	Class 4 Aggregate Subbase	CY	42,600	x	38	=	$	1,618,800
290201	Asphalt Treated Permeable Base	CY	15,896	x	160	=	$	2,543,360
365001	Sand Cover	TON		x		=	$	-
374002	Asphaltic Emulsion (Fog Seal Coat)	TON		x		=	$	-
374492	Asphaltic Emulsion (Polymer Modified)	TON		x		=	$	-
3750XX	Screenings (Type XX)	TON		x		=	$	-
377501	Slurry Seal	TON		x		=	$	-
390095	Replace Asphalt Concrete Surfacing	CY		x		=	$	-
390132	Hot Mix Asphalt (Type A)	TON		x		=	$	-
390136	Minor Hot Mix Asphalt	TON		x		=	$	-
390137	Rubberized Hot Mix Asphalt (Gap Graded)	TON		x		=	$	-
393003	Geosynthetic Pavement Interlayer	SQYD		x		=	$	-
39405X	Shoulder Rumber Strip *(HMA, Type XX Inden*	STA		x		=	$	-
394071	Place Hot Mix Asphalt Dike	LF		x		=	$	-
394090	Place Hot Mix Asphalt (Misc. Area)	SQYD		x		=	$	-
397005	Tack Coat	TON		x		=	$	-
400050	Continuously Reinfored Concrete Pavement	CY	47,687	x	300	=	$	14,306,100
401108	Replace Concrete Pavement (Rapid Strength	CY		x		=	$	-
404092	Seal Pavement Joint	LF		x		=	$	-
404094	Seal Longitudinal Isolation Joint	LF		x		=	$	-
413112A	Repair Spalled Joints (Polyester Grout)	SQYD		x		=	$	-
413115	Seal Existing Concrete Pavement Joint	LF		x		=	$	-
420102	Groove Existing Concrete Pavement	SQYD		x		=	$	-
420201	Grind Existing Concrete Pavement	SQYD		x		=	$	-
731502	Minor Concrete (Misc. Const)	CY		x		=	$	-
731530	Minor Concrete (Textured Paving)	SQFT		x		=	$	-
XXXXXX	Some Item			x		=	$	-

TOTAL STRUCTURAL SECTION ITEMS $ 20,367,400

SECTION 3: DRAINAGE

Item code		Unit	Quantity		Unit Price ($)			Cost
150206	Abandon Culvert	LF		x		=	$	-
150805	Remove Culvert	LF		x		=	$	-
150820	Modify Inlet	EA		x		=	$	-
152430	Adjust Inlet	LF		x		=	$	-
155003	Cap Inlet	EA		x		=	$	-
193114	Sand Backfill	CY		x		=	$	-
510502	Minor Concrete (Minor Structure)	CY		x		=	$	-
510512	Minor Concrete (Box Culvert)	CY		x		=	$	-
510XXX	Culvert (Roadway Crossing)	EA		x		=	$	-
62XXXX	XXX" APC Pipe	LF		x		=	$	-
64XXXX	XXX" Plastic Pipe	LF		x		=	$	-
65XXXX	XXX" RCP Pipe	LF		x		=	$	-
66XXXX	XXX" CSP Pipe	LF		x		=	$	-
680905	Underdrain (6" Alternative)	LF	7,866	x	36	=	$	283,176
681103	Edge Drain (3" Plastic Pipe)	LF	69,269	x	21	=	$	1,454,649
69XXXX	XXX" Pipe Downdrain	LF		x		=	$	-
70XXXX	XXX" Pipe Inlet	LF		x		=	$	-
70XXXX	XXX" Pipe Riser	LF		x		=	$	-
70XXXX	XXX" Flared End Section	EA		x		=	$	-
703233	Grated Line Drain	LF		x		=	$	-
72XXXX	Rock Slope Protection (Type and Method)	CY		x		=	$	-
721420	Concrete (Ditch Lining)	CY		x		=	$	-
721430	Concrete (Channel Lining)	CY		x		=	$	-
729010	Rock Slope Protection Fabric	SQYD		x		=	$	-
750001	Miscellaneous Iron and Steel	LB		x		=	$	-
XXXXXX	Additional Drainage (Detention Base, etc)	LS		x		=	$	-
XXXXXX	Some Item			x		=	$	-

TOTAL DRAINAGE ITEMS $ 1,737,900

SECTION 4: SPECIALTY ITEMS

Item code		Unit	Quantity		Unit Price ($)			Cost
070012	Progress Schedule (Critical Path Method)	LS	1	x	30,000	=	$	30,000
150662	Remove Metal Beam Guard Railing	LF	61,156	x	15	=	$	886,762
150668	Remove Terminal Systems	EA		x		=	$	-
1532XX	Remove Concrete Barrier (25, 50 or 50C)	LF	3,110	x	16	=	$	49,760
153250	Remove Sound Wall	SQFT	0	x	25	=	$	-
150606	Remove Fence (BW)	LF		x		=	$	-
190110	Lead Compliance Plan	LS	1	x	18,000	=	$	18,000
49XXXX	CIDH Concrete Piling *(Insert Diameter)*	LF		x		=	$	-
510060	Structural Concrete (Retaining Wall)	CY		x		=	$	-
510133	Class 2 Concrete (Retaining Wall)	CY		x		=	$	-
510XXX	Retaining Wall (MSE)	SQFT	39,520	x	85	=	$	3,359,200
XXXXXX	Sound Wall (On Pile, On Barrier or On Ret. Wall)	SQFT	0	x	40	=	$	-
5110XX	Architectural Treatment *(Insert Type)*	SQFT		x		=	$	-
511048	Apply Anti-Graffiti Coating	SQFT		x		=	$	-
5136XX	Reinforced Concrete Crib Wall *(Insert Type)*	SQFT		x		=	$	-
518002	Sound Wall (Masonry Block)	SQFT		x		=	$	-
520103	Bar Reinf. Steel (Retaining Wall)	LB		x		=	$	-
800007	Fence (BW)	LF		x		=	$	-
832001	Metal Beam Guard Railing	LF	52,594	x	47	=	$	2,445,621
839310	Double Thrie Beam Barrier	LF		x		=	$	-
839521	Cable Railing	LF		x		=	$	-
83954X	Transition Railing *(Insert Type)*	EA		x		=	$	-
8395XX	Terminal System (Type CAT)	EA		x		=	$	-
8395XX	Alternative Flared Terminal System	EA	4	x	1,200	=	$	4,800
8395XX	End Anchor Assembly (*Insert Type*)	EA		x		=	$	-
839561	Rail Tensioning Assembly	EA		x		=	$	-
839596	Crash Cushion *(G.R.E.A.T)*	EA		x		=	$	-
839701	Concrete Barrier *(50 or 60)*	LF	44,180	x	78	=	$	3,446,040
833128	Concrete Barrier *(25 Modify)*	LF	500	x	128	=	$	64,000
XXXXXX	Some Item			x		=	$	-

TOTAL SPECIALTY ITEMS $ 10,304,200

SECTION 5: ENVIRONMENTAL

5A - ENVIRONMENTAL MITIGATION

Item code		Unit	Quantity		Unit Price ($)			Cost
XXXXXX	Biological Mitigation	LS		x		=	$	-
071325	Temporary Reinforced Silt Fence	LF		x		=	$	-
XXXXXX	Hazardous Material Remediation	LS	1	x	45,000	=	$	45,000
XXXXXX	Permits	LS	1	x	45,000	=	$	45,000
071325	Temporary Fence (Type ESA)	LF		x		=	$	-

Subtotal Environmental *$ 90,000*

5B - LANDSCAPE AND IRRIGATION

Item code		Unit	Quantity		Unit Price ($)			Cost
200001	Highway Planting	ACRE		x		=	$	-
20XXXX	XXX" (*Insert Type*) Conduit *(Use for Irrigation x-*	LF		x		=	$	-
20XXXX	Extend XXX" *(Insert Type)* Conduit	LF		x		=	$	-
201700	Imported Topsoil	CY		x		=	$	-
203015	Erosion Control	ACRE		x		=	$	-
203021	Fiber Rolls	LF		x		=	$	-
203026	Move In/ Move Out (Erosion Control)	EA		x		=	$	-
204099	Plant Establishment Work	LS		x		=	$	-
204101	Extend Plant Establishment (X Years)	LS		x		=	$	-
208000	Irrigation System	LS		x		=	$	-
208304	Water Meter	EA		x		=	$	-
209801	Maintenance Vehicle Pullout	EA		x		=	$	-
XXXXXX	Some Item							

Subtotal Landscape and Irrigation *$ -*

5C - NPDES

Item code		Unit	Quantity		Unit Price ($)			Cost
074016	Construction Site Management	LS	1	x	450,000	=	$	450,000
074017	Prepare WPCP	LS	1	x	10,000	=	$	10,000
074019	Prepare SWPPP	LS	1	x	10,000	=	$	10,000
074023	Temporary Erosion Control	ACRE	39	x	2,500	=	$	97,500
074027	Temporary Erosion Control Blanket	SQYD		x		=	$	-
074028	Temporary Fiber Roll	LF		x		=	$	-
074032	Temporary Concrete Washout Facility	EA		x		=	$	-
074033	Temporary Construction Entrance	EA		x		=	$	-
074035	Temporary Check Dam	LF		x		=	$	-
074037	Move In/ Move Out (Temp Erosion Control)	EA		x		=	$	-
074038	Temp. Drainage Inlet Protection	EA	210	x	60	=	$	12,600
XXXXXX	Site Job Management	LS	1	x	450,000	=	$	450,000
074042	Temporary Concrete Washout (Portable)	LS		x		=	$	-
XXXXXX	Some Item			x		=	$	-

Supplemental Work for NPDES

(These costs are not accounted in total here but under Supplemental Work on sheet 7 of 11).

Item code		Unit	Quantity		Unit Price ($)			Cost
074021	Water Pollution Control Maintenance Work*	LS	1	x	25,500	=	$	25,500
066596	Additional Water Pollution Control**	LS		x		=	$	-
066597	Storm Water Sampling and Analysis***	LS		x		=	$	-
XXXXXX	Some Item							

Subtotal NPDES (Without Supplemental Work) *$ 1,030,100*

*Applies to all SWPPPs and those WPCPs with sediment control or soil stabilization BMPs.

**Applies to both SWPPPs and WPCP projects.

*** Applies only to project with SWPPPs.

TOTAL ENVIRONMENTAL $ 1,120,100

SECTION 6: TRAFFIC ITEMS

6A - Traffic Electrical

Item code		Unit	Quantity		Unit Price ($)			Cost
150760	Remove Sign Structure	EA		x		=	$	-
151581	Reconstruct Sign Structure	EA		x		=	$	-
152641	Modify Sign Structure	EA		x		=	$	-
5602XX	Furnish Sign Structure	LB		x		=	$	-
5602XX	Install Sign Structure	LB		x		=	$	-
56XXXX	XXX" CIDHC Pile (Sign Foundation)	LF		x		=	$	-
56XXXX	Install Overhead Sign (Two Post)	EA	15	x	400,000	=	$	6,000,000
56XXXX	Install Overhead Sign (One Post)	EA	10	x	160,000	=	$	1,600,000
860090	Maintain Existing Traffic Management System	LS	1	x	900,000	=	$	900,000
860810	Inductive Loop Detectors	EA		x		=	$	-
86055X	Lighting & Sign Illumination	EA	253	x	4,000	=	$	1,012,000
8607XX	Interconnection Facilities	LS		x		=	$	-
8609XX	Traffic Traffic Monitoring Stations	LS	1	x	200,000	=	$	200,000
860XXX	Signals & Lighting	LS		x		=	$	-
860XXX	ITS Elements	LS		x		=	$	-
861100	Ramp Metering System (Location X)	LS		x		=	$	-
86XXXX	Fiber Optic Conduit System	LS		x		=	$	-
XXXXXX	Ramp Terminal Intersection Improvement	LS	0	x	1,000,000	=	$	-
XXXXXX	Toll Equipment and System Integration (Capital)	LS	1	x	100,000,000	=	$	100,000,000
XXXXX	Some Item							

Subtotal Traffic Electrical *$ 109,712,000*

6B - Traffic Signing and Striping

Item code		Unit	Quantity		Unit Price ($)			Cost
120090	Construction Area Signs	LS	1	x	900,000	=	$	900,000
150701	Remove Yellow Painted Traffic Stripe	LF	63,360	x	4	=	$	253,440
150710	Remove Traffic Stripe	LF	633,600	x	0.25	=	$	158,400
150713	Remove Pavement Marking	SQFT		x		=	$	-
150742	Remove Roadside Sign	EA	10	x	120	=	$	1,200
15075X	Remove Sign Structure	EA	15	x	20,000	=	$	300,000
15075X	Remove Sign Structure (On Bridge)	EA	8	x	5,000	=	$	40,000
152320	Reset Roadside Sign	EA		x		=	$	-
152390	Relocate Roadside Sign	EA		x		=	$	-
566011	Roadside Sign (One Post)	EA	15	x	340	=	$	5,100
566012	Roadside Sign (Two Post)	EA	5	x	1,250	=	$	6,250
560XXX	Furnish Sign Panels	SQFT		x		=	$	-
560XXX	Install Sign Panels	SQFT		x		=	$	-
82010X	Delineator (Class X)	EA		x		=	$	-
84XXXX	Permanent Pavement Delineation	LS	1	x	450,000	=	$	450,000
840504	Thermoplastic Traffic Strip (4")	LF	633,600	x	0.50	=	$	316,800

Subtotal Traffic Signing and Striping *$ 2,431,190*

6C - Stage Construction and Traffic Handling

Item code		Unit	Quantity		Unit Price ($)			Cost
120100	Traffic Control System	LS	1	x	4,000,000	=	$	4,000,000
120120	Type III Barricade	EA		x		=	$	-
120143	Temporary Pavement Delineation	LF		x		=	$	-
120149	Temporary Pavement Marking (Paint)	LS	1	x	90,000	=	$	90,000
120159	Temporary Traffic Strip (Paint)	LS	1	x	90,000	=	$	90,000
12016X	Channelizer	EA		x		=	$	-
128650	Portable Changeable Message Signs	EA	10	x	10,000	=	$	100,000
129000	Temporary Railing (Type K)	LF	6,000	x	17	=	$	102,000
129100	Temp. Crash Cushion Module	EA	4	x	200	=	$	800
129099A	Traffic Plastic Drum	EA		x		=	$	-
839603A	Temporary Crash Cushion (ADIEM)	EA		x		=	$	-
XXXXXX	Misc. Items (Traffic Management Plan)	LS	1	x	180,000	=	$	180,000
XXXXXX	Some Item	LS		x		=	$	-

Subtotal Stage Construction and Traffic Handling *$ 4,562,800*

TOTAL TRAFFIC ITEMS $ 116,706,000

SECTION 7: DETOURS

Include constructing, maintaining, and removal

Item code		Unit	Quantity		Unit Price ($)		Cost
0713XX	Temporary Fence (Type X)	LF		x		=	$ -
07XXXX	Temporary Drainage	LS		x		=	$ -
120143	Temporary Pavement Delineation	LF		x		=	$ -
1286XX	Temporary Signals	EA		x		=	$ -
129000	Temporary Railing (Type K)	LF		x		=	$ -
190101	Roadway Excavation	CY		x		=	$ -
198001	Imported Borrow	CY		x		=	$ -
198050	Embankment	CY		x		=	$ -
250401	Class 4 Aggregate Subbase	CY		x		=	$ -
260201	Class 2 Aggregate Base	CY		x		=	$ -
390132	Hot Mix Asphalt (Type A)	TON		x		=	$ -
XXXXXX	Some Item	LS	1	x	$150,000	=	$ 150,000

TOTAL DETOURS $ 150,000

SUBTOTAL SECTIONS 1-7 $ 155,550,500

SECTION 8: MINOR ITEMS

8A - Americans with Disabilities Act Items							
	ADA Items						$ -
8B - Bike Path Items							
	Bike Path Items						$ -
8C - Other Minor Items							
	Other Minor Items				5.0%		$ 7,777,525
	Total of Section 1-7	$	155,550,500	x	5.0%	=	$ 7,777,525

TOTAL MINOR ITEMS $ 7,777,600

SECTIONS 9: MOBILIZATION

Item code							
999990	Total Section 1-8	$	163,328,100	x	10%	=	$16,332,810

TOTAL MOBILIZATION $ 16,332,900

SECTION 10: SUPPLEMENTAL WORK

Item code		Unit	Quantity		Unit Price ($)		Cost
066015	Federal Trainee Program	LS		x		=	$ -
066063	Traffic Management Plan - Public Information	LS		x		=	$ -
066090	Maintain Traffic	LS		x		=	$ -
066094	Value Analysis	LS		x		=	$ -
066204	Remove Rock & Debris	LS		x		=	$ -
066222	Locate Existing Cross-Over	LS		x		=	$ -
066670	Payment Adjustments For Price Index Fluctuations	LS		x		=	$ -
066700	Partnering	LS		x		=	$ -
066866	Operation of Existing Traffic Management System Eler	LS		x		=	$ -
066920	Dispute Review Board	LS		x		=	$ -
066XXX	Some Item	LS		x		=	$ -
	*Cost of **NPDES** Supplemental Work specified in Section 5C*					=	$ 25,500
	Total Section 1-8	$	163,328,100		5%	=	$ 8,166,405

TOTAL SUPPLEMENTAL WORK $ 8,192,000

Note: Mobilization item will automatically calculate if working days are 50 or more. For Project less than 50 Working Days Mobilization is not required as a separate contract, however contract item prices should take into consideration mobilization as part of the price. If the building portion of the project is greater than 50% of the total project cost,

If the building portion of the project is greater than 50% of the total project cost, then mobilization is not included.

SECTION 11: STATE FURNISHED MATERIALS AND EXPENSES

Item code		Unit	Quantity		Unit Price ($)		Cost
066063	Public Information	LS	0	x	$100,000	=	$0
066105	RE Office	LS	1	x	$400,000	=	$400,000
066803	Padlocks	LS		x		=	$0
066838	Reflective Numbers and Edge Sealer	LS		x		=	$0
066901	Water Expenses	LS		x		=	$0
066062A	COZEEP Expenses	LS		x		=	$0
06684X	Ramp Meter Controller Assembly	LS		x		=	$0
XXXXXX	Toll Back Office System	LS	1	x	$1,700,000	=	$1,700,000
06684X	TMS Controller Assembly	LS	1	x	$2,000,000	=	$2,000,000
06684X	Traffic Signal Controller Assembly	LS		x		=	$0
XXXXXX	Some Item						
	Total Section 1-8	$	163,328,100		1%	=	$ 1,633,281

TOTAL STATE FURNISHED $5,733,300

SECTION 12: TIME-RELATED OVERHEAD

Estimated Time-Releated Overhead (TRO) Percentage (0% to 10%) = 6%

Item code		Unit	Quantity		Unit Price ($)		Cost	
			Total of All Contract Items Only				$ 177,412,800	(used to calculate TR
070018	Time-Related Overhead	$	177,412,800	X	6%	=	$10,644,768	

TOTAL TIME-RELATED OVERHEAD $10,644,768

SECTION 13: CONTINGENCY

Total Section 1-12	$	204,231,068	x	20%	=	$40,846,214

TOTAL CONTINGENCY $40,846,300

Note: TRO is a contract item if total project cost is (non-escalated) over $5 million AND 100 or more working days.
If the building portion of the project is greater than 50% of the total project cost, then TRO is not included.
TRO calculated for you as percentage of the sum of all contract items only;
excluding mobilization, supplemental work, state furnished materials and expenses, and contingency.

II. STRUCTURE ITEMS

	Bridge 1	Bridge 2	Bridge 3
DATE OF ESTIMATE	Dec, 2019	Dec, 2019	Dec, 2019
Bridge Name	ALAMADEN UC	CAMDEN UC	OKA UC
Bridge Number			
Structure Type	CIP/PS Box Girder	CIP/PS Box Girder	CIP/PS Box Girder
Width (Feet) [out to out]	50 LF	45 LF	33 LF
Total Bridge Length (Feet)	238 LF	210 LF	102 LF
Total Area (Square Feet)	11,900 SQFT	9,450 SQFT	3,366 SQFT
Structure Depth (Feet)	LF	LF	LF
Footing Type (pile or spread)	None	Pile	Pile
Cost Per Square Foot	$300	$300	$300
COST OF EACH STRUCTURE	**$3,570,000**	**$2,835,000**	**$1,009,800**

	Bridge 4	Bridge 5	Bridge 6
DATE OF ESTIMATE	Dec, 2019	Dec, 2019	Dec, 2019
Bridge Name	LOS GATOS CREEK BRIDGE	POLLARD UC	SAN TOMAS AQUINAS CREEK
Bridge Number			
Structure Type	CIP/PS Box Girder	CIP/PS Box Girder	CIP/PS Box Girder
Width (Feet) [out to out]	29 LF	23 LF	23 LF
Total Bridge Length (Feet)	178 LF	196 LF	105 LF
Total Area (Square Feet)	5,162 SQFT	4,508 SQFT	2,415 SQFT
Structure Depth (Feet)	LF	LF	LF
Footing Type (pile or spread)	Pile	Pile	Pile
Cost Per Square Foot	$300	$300	$300
COST OF EACH STRUCTURE	**$1,548,600**	**$1,352,400**	**$724,500**

	Bridge 7	Bridge 8	Bridge 9
DATE OF ESTIMATE	Dec, 2019	Dec, 2019	Dec, 2019
Bridge Name	SARATOGA UC	SARATOGA CREEK BRIDGE	CALABAZAS CREEK BRG
Bridge Number			
Structure Type	CIP/PS Box Girder	CIP/PS Box Girder	CIP/PS Box Girder
Width (Feet) [out to out]	23 LF	23 LF	22 LF
#REF!	192 LF	100 LF	156 LF
Total Area (Square Feet)	4,416 SQFT	2,300 SQFT	3,432 SQFT
Structure Depth (Feet)	LF	LF	LF
Footing Type (pile or spread)	Pile	Pile	Pile
Cost Per Square Foot	$300	$300	$300
COST OF EACH	**$1,324,800**	**$690,000**	**$1,029,600**

	Bridge 10		
DATE OF ESTIMATE	Dec, 2019		
Bridge Name	Pedestrian Bridge (Dalles Ave)		
Bridge Number			
Structure Type	CIP/PS Box Girder		
Width (Feet) [out to out]	0 LF		
#REF!	370 LF		
Total Area (Square Feet)	0 SQFT		
Structure Depth (Feet)	LF		
Footing Type (pile or spread)	Pile		
Cost Per Square Foot	$300		
COST OF EACH	**$0**		
TOTAL COST OF STRUCTURES[1]			**14,084,700**

Estimate Prepared By: ______________________

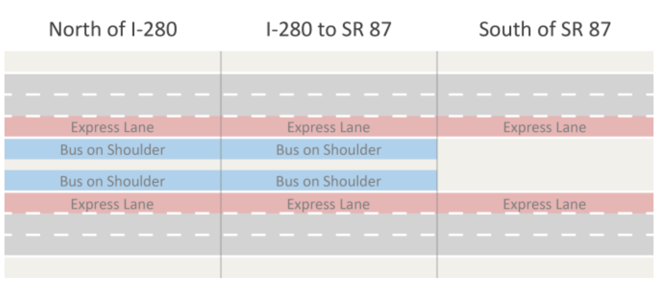
XXXXXXXXXXXXXXXX ------ Division of Structures

______________________ Date

[1]Structure's Estimate includes Overhead and Mobilization are based on 2019 CALTRAN's "COMPARATIVE BRIDGE COSTS".

Alternative 3-5: Long Bus on Median Shoulder

- Convert existing HOV lane in each direction from Bernal Road, near U.S. 101 in south San Jose to Moffett Boulevard, near U.S. 101 in Mountain View, a distance of 23.2 miles, to operate as a single express lane.
- Provide continuous access to express lane from the adjacent general-purpose lanes.
- Install toll infrastructure in median to support express lanes.
- Reconstruct concrete median barrier south of Santa Teresa Boulevard and north of Stelling Road to accommodate toll gantries and dynamic message signs.
- Widen paved median shoulder to 14 feet in both directions from Santa Teresa Boulevard to South Stelling Road (excepting structures) to provide continuous CHP enforcement area.
- Widen right-side shoulders to meet Highway Design Manual standards (10 feet). Relocate drainage inlets as needed to the outside edge of shoulder.
- Install double-luminaire mast arm lighting at 250- to 400-foot intervals from postmile (PM) 6.00 (Almaden Expressway) to PM 17.70 (Stevens Creek Boulevard) and from PM 18.86 (Homestead Road) to PM 23.44 (Moffett Boulevard.
- Install high mast lighting at SR 17 and I-280 interchanges as needed to supplement existing.
- For Alternative 3-5, the median shoulder is assumed to be paved with full depth AC or PCC to provide a 12-foot-wide part-time travel lane and a total shoulder width of 14 feet where space permits (from Santa Teresa Boulevard to South Stelling Road, excepting structures).
- Widen nine bridge structures.
- Replace Dalles Avenue pedestrian bridge.
- Convert SR 85 interchange at El Camino Real from a cloverleaf Type L-10 ramp configuration to a spread diamond Type L-2 ramp configuration.



Alternative 3-5: Long Bus on Median Shoulder

Engineer Cost Estimate --- Alternative 3-5
Preliminary Project Study Report

Project ID: XXXXXX

Type of Estimate :	Preliminary Project Study Report (Dec 2019)
Program Code :	04-XXXXX
Project Limits :	From Hwy 101 Interchange in Santa Jose to South of Hwy 101 Interchange in Mt. View
Description:	From PM 0.00 to PM 23.68
Scope :	Widen the Existing Median Shoulder to Provide Enough Space to Accommodate the Bus Operations
Alternative :	Alternative 3-5 Long Shoulder (Median)

		Current Cost		Escalated Cost
ROADWAY ITEMS	$	249,916,432	$	334,851,400
STRUCTURE ITEMS	$	15,194,700	$	20,358,700
SUBTOTAL CONSTRUCTION COST	$	265,111,132	$	355,210,100
RIGHT OF WAY	$	-	$	-
TOTAL CAPITAL OUTLAY COST	$	265,112,000	$	355,211,000
PR/ED SUPPORT (3%)	$	7,954,000	$	10,657,000
PS&E SUPPORT (12%)	$	31,814,000	$	42,626,000
RIGHT OF WAY SUPPORT				
CONSTRUCTION SUPPORT (12%)	$	31,814,000	$	42,626,000
AGENCY SUPPORT (8%)	$	21,209,000	$	28,417,000
TOTAL CAPITAL OUTLAY SUPPORT COST*	$	92,791,000	$	124,326,000
TOTAL PROJECT COST	$	357,903,000	$	480,000,000

If Project has been programmed enter Programmed Amount

	Month	/	Year
Date of Estimate (Month/Year)	12	/	2019
Estimated Date of Construction Start (Month/Year)	10	/	2023
Number of Working Days	1500		Working Days
Estimated Mid-Point of Construction (Month/Year)	10	/	2026
Number of Plant Establishment Days			Days

Estimated Project Schedule

PID Approval
PA/ED Approval
PS&E
RTL
Begin Construction

Approved by Project Manager

Project Manager	**Date**	**Phone**

I. ROADWAY ITEMS SUMMARY

	Section	Cost
1	Earthwork	$ 2,649,200
2	Pavement Structural Section	$ 26,118,200
3	Drainage	$ 903,300
4	Specialty Items	$ 6,877,200
5	Environmental	$ 2,246,400
6	Traffic Items	$ 119,586,600
7	Detours	$ 250,000
8	Minor Items	$ 7,931,600
9	Roadway Mobilization	$ 16,656,300
10	Supplemental Work	$ 8,373,700
11	State Furnished	$ 5,765,700
12	Contingencies	$ 41,652,800
13	Overhead	$ 10,905,432

TOTAL ROADWAY ITEMS	$ 249,916,432

Estimate Prepared By :

Name and Title	Date	Phone

Estimate Reviewed By :

Name and Title	Date	Phone

SECTION 1: EARTHWORK

Item code		Unit	Quantity		Unit Price ($)		Cost
160101	Clearing & Grubbing	AC	47	x	1,725	=	$81,075
170101	Develop Water Supply	LS	1	x	50,000	=	$50,000
190101	Roadway Excavation	CY	73,547	x	29	=	$2,103,444
190103	Roadway Excavation (Type Y) ADL	CY		x		=	$0
190105	Roadway Excavation (Type Z-2) ADL	CY		x		=	$0
192037	Structure Excavation (Retaining Wall)	CY		x		=	$0
193013	Structure Backfill (Retaining Wall)	CY		x		=	$0
193031	Pervious Backfill Material (Retaining Wall)	CY		x		=	$0
194001	Ditch Excavation	CY		x		=	$0
198001	Impored Borrow	CY	25,128	x	17	=	$414,612
198007	Imported Material (Shoulder Backing)	TON		x		=	$0
XXXXXX	Some Item			x		=	$0

TOTAL EARTHWORK SECTION ITEMS $ 2,649,200

SECTION 2: PAVEMENT STRUCTURAL SECTION

Item code		Unit	Quantity		Unit Price ($)		Cost
150771	Remove Asphalt Concrete Dike	LF		x		=	$ -
150860	Remove Base and Surfacing	CY	31,388	x	12.5	=	$ 392,350
153103	Cold Plane Asphalt Concrete Pavement	SQYD	0	x	8	=	$ -
150854	Remove Concrete Pavement	CY	21,723	x	156	=	$ 3,388,788
260201	Class 4 Aggregate Base	CY	8,283	x	61	=	$ 501,122
250401	Class 4 Aggregate Subbase	CY	15,565	x	38	=	$ 591,470
290201	Asphalt Treated Permeable Base	CY	5,647	x	160	=	$ 903,520
365001	Sand Cover	TON		x		=	$ -
374002	Asphaltic Emulsion (Fog Seal Coat)	TON		x		=	$ -
374492	Asphaltic Emulsion (Polymer Modified)	TON		x		=	$ -
3750XX	Screenings (Type XX)	TON		x		=	$ -
377501	Slurry Seal	TON		x		=	$ -
390095	Replace Asphalt Concrete Surfacing	CY		x		=	$ -
390132	Hot Mix Asphalt (Type A)	TON		x		=	$ -
390136	Minor Hot Mix Asphalt	TON		x		=	$ -
390137	Rubberized Hot Mix Asphalt (Gap Graded)	TON		x		=	$ -
393003	Geosynthetic Pavement Interlayer	SQYD		x		=	$ -
39405X	Shoulder Rumber Strip *(HMA, Type XX Inden*	STA		x		=	$ -
394071	Place Hot Mix Asphalt Dike	LF		x		=	$ -
394090	Place Hot Mix Asphalt (Misc. Area)	SQYD		x		=	$ -
397005	Tack Coat	TON		x		=	$ -
400050	Continuously Reinfored Concrete Pavement	CY	67,803	x	300	=	$ 20,340,900
401108	Replace Concrete Pavement (Rapid Strength	CY		x		=	$ -
404092	Seal Pavement Joint	LF		x		=	$ -
404094	Seal Longitudinal Isolation Joint	LF		x		=	$ -
413112A	Repair Spalled Joints (Polyester Grout)	SQYD		x		=	$ -
413115	Seal Existing Concrete Pavement Joint	LF		x		=	$ -
420102	Groove Existing Concrete Pavement	SQYD		x		=	$ -
420201	Grind Existing Concrete Pavement	SQYD		x		=	$ -
731502	Minor Concrete (Misc. Const)	CY		x		=	$ -
731530	Minor Concrete (Textured Paving)	SQFT		x		=	$ -
XXXXXX	Some Item			x		=	$ -

TOTAL STRUCTURAL SECTION ITEMS $ 26,118,200

SECTION 3: DRAINAGE

Item code		Unit	Quantity		Unit Price ($)			Cost
150206	Abandon Culvert	LF		x		=	$	-
150805	Remove Culvert	LF		x		=	$	-
150820	Modify Inlet	EA		x		=	$	-
152430	Adjust Inlet	LF		x		=	$	-
155003	Cap Inlet	EA		x		=	$	-
193114	Sand Backfill	CY		x		=	$	-
510502	Minor Concrete (Minor Structure)	CY		x		=	$	-
510512	Minor Concrete (Box Culvert)	CY		x		=	$	-
510XXX	Culvert (Roadway Crossing)	EA		x		=	$	-
62XXXX	XXX" APC Pipe	LF		x		=	$	-
64XXXX	XXX" Plastic Pipe	LF		x		=	$	-
65XXXX	XXX" RCP Pipe	LF		x		=	$	-
66XXXX	XXX" CSP Pipe	LF		x		=	$	-
680905	Underdrain (6" Alternative)	LF	12,881	x	36	=	$	463,716
681103	Edge Drain (3" Plastic Pipe)	LF	20,931	x	21	=	$	439,551
69XXXX	XXX" Pipe Downdrain	LF		x		=	$	-
70XXXX	XXX" Pipe Inlet	LF		x		=	$	-
70XXXX	XXX" Pipe Riser	LF		x		=	$	-
70XXXX	XXX" Flared End Section	EA		x		=	$	-
703233	Grated Line Drain	LF		x		=	$	-
72XXXX	Rock Slope Protection (Type and Method)	CY		x		=	$	-
721420	Concrete (Ditch Lining)	CY		x		=	$	-
721430	Concrete (Channel Lining)	CY		x		=	$	-
729010	Rock Slope Protection Fabric	SQYD		x		=	$	-
750001	Miscellaneous Iron and Steel	LB		x		=	$	-
XXXXXX	Additional Drainage (Detention Base, etc)	LS		x		=	$	-
XXXXXX	Some Item			x		=	$	-

TOTAL DRAINAGE ITEMS $ 903,300

SECTION 4: SPECIALTY ITEMS

Item code		Unit	Quantity		Unit Price ($)			Cost
070012	Progress Schedule (Critical Path Method)	LS	1	x	30,000	=	$	30,000
150662	Remove Metal Beam Guard Railing	LF	34,859	x	15	=	$	505,456
150668	Remove Terminal Systems	EA		x		=	$	-
1532XX	Remove Concrete Barrier (25, 50 or 50C*)*	LF	33,339	x	16	=	$	533,424
153250	Remove Sound Wall	SQFT	0	x	25	=	$	-
150606	Remove Fence (BW)	LF		x		=	$	-
190110	Lead Compliance Plan	LS	1	x	18,000	=	$	18,000
49XXXX	CIDH Concrete Piling *(Insert Diameter)*	LF		x		=	$	-
510060	Structural Concrete (Retaining Wall)	CY		x		=	$	-
510133	Class 2 Concrete (Retaining Wall)	CY		x		=	$	-
510XXX	Retaining Wall (MSE)	SQFT	0	x	85	=	$	-
XXXXXX	Sound Wall (On Pile, On Barrier or On Ret. Wall)	SQFT	0	x	40	=	$	-
5110XX	Architectural Treatment *(Insert Type)*	SQFT		x		=	$	-
511048	Apply Anti-Graffiti Coating	SQFT		x		=	$	-
5136XX	Reinforced Concrete Crib Wall *(Insert Type)*	SQFT		x		=	$	-
518002	Sound Wall (Masonry Block)	SQFT		x		=	$	-
520103	Bar Reinf. Steel (Retaining Wall)	LB		x		=	$	-
800007	Fence (BW)	LF		x		=	$	-
832001	Metal Beam Guard Railing	LF	69,718	x	47	=	$	3,241,887
839310	Double Thrie Beam Barrier	LF		x		=	$	-
839521	Cable Railing	LF		x		=	$	-
83954X	Transition Railing *(Insert Type)*	EA		x		=	$	-
8395XX	Terminal System (Type CAT)	EA		x		=	$	-
8395XX	Alternative Flared Terminal System	EA	0	x	1,200	=	$	-
8395XX	End Anchor Assembly (*Insert Type*)	EA		x		=	$	-
839561	Rail Tensioning Assembly	EA		x		=	$	-
839596	Crash Cushion *(G.R.E.A.T)*	EA		x		=	$	-
839701	Concrete Barrier *(50 or 60)*	LF	31,884	x	78	=	$	2,486,952
833128	Concrete Barrier *(25 Modify)*	LF	480	x	128	=	$	61,440
XXXXXX	Some Item			x		=	$	-

TOTAL SPECIALTY ITEMS $ 6,877,200

SECTION 5: ENVIRONMENTAL

5A - ENVIRONMENTAL MITIGATION

Item code		Unit	Quantity		Unit Price ($)			Cost
XXXXXX	Biological Mitigation	LS		x		=	$	-
071325	Temporary Reinforced Silt Fence	LF		x		=	$	-
XXXXXX	Hazardous Material Remediation	LS	1	x	180,000	=	$	180,000
XXXXXX	Permits	LS	1	x	90,000	=	$	90,000
071325	Temporary Fence (Type ESA)	LF		x		=	$	-

Subtotal Environmental *$ 270,000*

5B - LANDSCAPE AND IRRIGATION

Item code		Unit	Quantity		Unit Price ($)			Cost
200001	Highway Planting	ACRE		x		=	$	-
20XXXX	XXX" (*Insert Type*) Conduit *(Use for Irrigation x-*	LF		x		=	$	-
20XXXX	Extend XXX" *(Insert Type)* Conduit	LF		x		=	$	-
201700	Imported Topsoil	CY		x		=	$	-
203015	Erosion Control	ACRE		x		=	$	-
203021	Fiber Rolls	LF		x		=	$	-
203026	Move In/ Move Out (Erosion Control)	EA		x		=	$	-
204099	Plant Establishment Work	LS		x		=	$	-
204101	Extend Plant Establishment (X Years)	LS		x		=	$	-
208000	Irrigation System	LS		x		=	$	-
208304	Water Meter	EA		x		=	$	-
209801	Maintenance Vehicle Pullout	EA		x		=	$	-
XXXXXX	Some Item							

Subtotal Landscape and Irrigation *$ -*

5C - NPDES

Item code		Unit	Quantity		Unit Price ($)			Cost
074016	Construction Site Management	LS	1	x	900,000	=	$	900,000
074017	Prepare WPCP	LS	1	x	20,000	=	$	20,000
074019	Prepare SWPPP	LS	1	x	20,000	=	$	20,000
074023	Temporary Erosion Control	ACRE	47	x	2,500	=	$	117,500
074027	Temporary Erosion Control Blanket	SQYD		x		=	$	-
074028	Temporary Fiber Roll	LF		x		=	$	-
074032	Temporary Concrete Washout Facility	EA		x		=	$	-
074033	Temporary Construction Entrance	EA		x		=	$	-
074035	Temporary Check Dam	LF		x		=	$	-
074037	Move In/ Move Out (Temp Erosion Control)	EA		x		=	$	-
074038	Temp. Drainage Inlet Protection	EA	315	x	60	=	$	18,900
XXXXXX	Site Job Management	LS	1	x	900,000	=	$	900,000
074042	Temporary Concrete Washout (Portable)	LS		x		=	$	-
XXXXXX	Some Item			x		=	$	-

Supplemental Work for NPDES

(These costs are not accounted in total here but under Supplemental Work on sheet 7 of 11).

074021	Water Pollution Control Maintenance Work*	LS	1	x	45,500	=	$	45,500
066596	Additional Water Pollution Control**	LS		x		=	$	-
066597	Storm Water Sampling and Analysis***	LS		x		=	$	-
XXXXXX	Some Item							

Subtotal NPDES (Without Supplemental Work) *$ 1,976,400*

*Applies to all SWPPPs and those WPCPs with sediment control or soil stabilization BMPs.

**Applies to both SWPPPs and WPCP projects.

*** Applies only to project with SWPPPs.

TOTAL ENVIRONMENTAL $ 2,246,400

SECTION 6: TRAFFIC ITEMS

6A - Traffic Electrical

Item code		Unit	Quantity		Unit Price ($)		Cost
150760	Remove Sign Structure	EA		x		=	$ -
151581	Reconstruct Sign Structure	EA		x		=	$ -
152641	Modify Sign Structure	EA		x		=	$ -
5602XX	Furnish Sign Structure	LB		x		=	$ -
5602XX	Install Sign Structure	LB		x		=	$ -
56XXXX	XXX" CIDHC Pile (Sign Foundation)	LF		x		=	$ -
56XXXX	Install Overhead Sign (Two Post)	EA	15	x	400,000	=	$ 6,000,000
56XXXX	Install Overhead Sign (One Post)	EA	10	x	160,000	=	$ 1,600,000
860090	Maintain Existing Traffic Management System	LS	1	x	900,000	=	$ 900,000
860810	Inductive Loop Detectors	EA		x		=	$ -
86055X	Lighting & Sign Illumination	EA	378	x	4,000	=	$ 1,512,000
8607XX	Interconnection Facilities	LS		x		=	$ -
8609XX	Traffic Traffic Monitoring Stations	LS	1	x	200,000	=	$ 200,000
860XXX	Signals & Lighting	LS		x		=	$ -
860XXX	ITS Elements	LS		x		=	$ -
861100	Ramp Metering System (Location X)	LS		x		=	$ -
86XXXX	Fiber Optic Conduit System	LS		x		=	$ -
XXXXXX	Ramp Terminal Intersection Improvement	LS	1	x	1,000,000	=	$ 1,000,000
XXXXXX	Toll Equipment and System Integration (Capital)	LS	1	x	100,000,000	=	$ 100,000,000
XXXXX	Some Item						

Subtotal Traffic Electrical *$ 111,212,000*

6B - Traffic Signing and Striping

Item code		Unit	Quantity		Unit Price ($)		Cost
120090	Construction Area Signs	LS	1	x	900,000	=	$ 900,000
150701	Remove Yellow Painted Traffic Stripe	LF	94,494	x	4	=	$ 377,976
150710	Remove Traffic Stripe	LF	944,940	x	0.25	=	$ 236,235
150713	Remove Pavement Marking	SQFT		x		=	$ -
150742	Remove Roadside Sign	EA	20	x	120	=	$ 2,400
15075X	Remove Sign Structure	EA	30	x	20,000	=	$ 600,000
15075X	Remove Sign Structure (On Bridge)	EA	8	x	5,000	=	$ 40,000
152320	Reset Roadside Sign	EA		x		=	$ -
152390	Relocate Roadside Sign	EA		x		=	$ -
566011	Roadside Sign (One Post)	EA	30	x	340	=	$ 10,200
566012	Roadside Sign (Two Post)	EA	10	x	1,250	=	$ 12,500
560XXX	Furnish Sign Panels	SQFT		x		=	$ -
560XXX	Install Sign Panels	SQFT		x		=	$ -
82010X	Delineator (Class X)	EA		x		=	$ -
84XXXX	Permanent Pavement Delineation	LS	1	x	900,000	=	$ 900,000
840504	Thermoplastic Traffic Strip (4")	LF	944,940	x	0.50	=	$ 472,470

Subtotal Traffic Signing and Striping *$ 3,551,781*

6C - Stage Construction and Traffic Handling

Item code		Unit	Quantity		Unit Price ($)		Cost
120100	Traffic Control System	LS	1	x	4,000,000	=	$ 4,000,000
120120	Type III Barricade	EA		x		=	$ -
120143	Temporary Pavement Delineation	LF		x		=	$ -
120149	Temporary Pavement Marking (Paint)	LS	1	x	90,000	=	$ 90,000
120159	Temporary Traffic Strip (Paint)	LS	1	x	90,000	=	$ 90,000
12016X	Channelizer	EA		x		=	$ -
128650	Portable Changeable Message Signs	EA	18	x	10,000	=	$ 180,000
129000	Temporary Railing (Type K)	LF	6,000	x	17	=	$ 102,000
129100	Temp. Crash Cushion Module	EA	4	x	200	=	$ 800
129099A	Traffic Plastic Drum	EA		x		=	$ -
839603A	Temporary Crash Cushion (ADIEM)	EA		x		=	$ -
XXXXXX	Misc. Items (Traffic Management Plan)	LS	1	x	360,000	=	$ 360,000
XXXXXX	Some Item	LS		x		=	$ -

Subtotal Stage Construction and Traffic Handling *$ 4,822,800*

TOTAL TRAFFIC ITEMS $ 119,586,600

SECTION 7: DETOURS

Include constructing, maintaining, and removal

Item code		Unit	Quantity		Unit Price ($)		Cost
0713XX	Temporary Fence (Type X)	LF		x		=	$ -
07XXXX	Temporary Drainage	LS		x		=	$ -
120143	Temporary Pavement Delineation	LF		x		=	$ -
1286XX	Temporary Signals	EA		x		=	$ -
129000	Temporary Railing (Type K)	LF		x		=	$ -
190101	Roadway Excavation	CY		x		=	$ -
198001	Imported Borrow	CY		x		=	$ -
198050	Embankment	CY		x		=	$ -
250401	Class 4 Aggregate Subbase	CY		x		=	$ -
260201	Class 2 Aggregate Base	CY		x		=	$ -
390132	Hot Mix Asphalt (Type A)	TON		x		=	$ -
XXXXXX	Some Item	LS	1	x	$250,000	=	$ 250,000

TOTAL DETOURS $ 250,000

SUBTOTAL SECTIONS 1-7 $ 158,630,900

SECTION 8: MINOR ITEMS

8A - Americans with Disabilities Act Items						
ADA Items						$ -
8B - Bike Path Items						
Bike Path Items						$ -
8C - Other Minor Items						
Other Minor Items				5.0%		$ 7,931,545
Total of Section 1-7	$	158,630,900	x	5.0%	=	$ 7,931,545

TOTAL MINOR ITEMS $ 7,931,600

SECTIONS 9: MOBILIZATION

Item code							
999990	Total Section 1-8	$	166,562,500	x	10%	=	$16,656,250

TOTAL MOBILIZATION $ 16,656,300

SECTION 10: SUPPLEMENTAL WORK

Item code		Unit	Quantity		Unit Price ($)		Cost
066015	Federal Trainee Program	LS		x		=	$ -
066063	Traffic Management Plan - Public Information	LS		x		=	$ -
066090	Maintain Traffic	LS		x		=	$ -
066094	Value Analysis	LS		x		=	$ -
066204	Remove Rock & Debris	LS		x		=	$ -
066222	Locate Existing Cross-Over	LS		x		=	$ -
066670	Payment Adjustments For Price Index Fluctuations	LS		x		=	$ -
066700	Partnering	LS		x		=	$ -
066866	Operation of Existing Traffic Management System Eler	LS		x		=	$ -
066920	Dispute Review Board	LS		x		=	$ -
066XXX	Some Item	LS		x		=	$ -

*Cost of **NPDES** Supplemental Work specified in Section 5C* = $ 45,500

Total Section 1-8	$	166,562,500	5%	=	$ 8,328,125

TOTAL SUPPLEMENTAL WORK $ 8,373,700

Note: Mobilization item will automatically calculate if working days are 50 or more. For Project less than 50 Working Days Mobilization is not required as a separate contract, however contract item prices should take into consideration mobilization as part of the price. If the building portion of the project is greater than 50% of the total project cost,

If the building portion of the project is greater than 50% of the total project cost, then mobilization is not included.

SECTION 11: STATE FURNISHED MATERIALS AND EXPENSES

Item code		Unit	Quantity		Unit Price ($)		Cost
066063	Public Information	LS	0	x	$100,000	=	$0
066105	RE Office	LS	1	x	$400,000	=	$400,000
066803	Padlocks	LS		x		=	$0
066838	Reflective Numbers and Edge Sealer	LS		x		=	$0
066901	Water Expenses	LS		x		=	$0
066062A	COZEEP Expenses	LS		x		=	$0
06684X	Ramp Meter Controller Assembly	LS		x		=	$0
XXXXXX	Toll Back Office System	LS	1	x	$1,700,000	=	$1,700,000
06684X	TMS Controller Assembly	LS	1	x	$2,000,000	=	$2,000,000
06684X	Traffic Signal Controller Assembly	LS		x		=	$0
XXXXXX	Some Item						
	Total Section 1-8	$	166,562,500		1%	=	$ 1,665,625

TOTAL STATE FURNISHED **$5,765,700**

SECTION 12: TIME-RELATED OVERHEAD

Estimated Time-Releated Overhead (TRO) Percentage (0% to 10%) = 6%

Item code		Unit	Quantity		Unit Price ($)		Cost	
			Total of All Contract Items Only				$ 181,757,200	(used to calculate TF
070018	Time-Related Overhead	$	181,757,200	X	6%	=	$10,905,432	

TOTAL TIME-RELATED OVERHEAD **$10,905,432**

SECTION 13: CONTINGENCY

Total Section 1-12	$	208,263,632	x	20%	=	$41,652,727

TOTAL CONTINGENCY **$41,652,800**

Note: TRO is a contract item if total project cost is (non-escalated) over $5 million AND 100 or more working days.
If the building portion of the project is greater than 50% of the total project cost, then TRO is not included.
TRO calculated for you as percentage of the sum of all contract items only;
excluding mobilization, supplemental work, state furnished materials and expenses, and contingency.

II. STRUCTURE ITEMS

	Bridge 1		Bridge 2		Bridge 3
DATE OF ESTIMATE	Dec, 2019		Dec, 2019		Dec, 2019
Bridge Name	ALAMADEN UC		CAMDEN UC		OKA UC
Bridge Number					
Structure Type	CIP/PS Box Girder		CIP/PS Box Girder		CIP/PS Box Girder
Width (Feet) [out to out]	50 LF		45 LF		33 LF
Total Bridge Length (Feet)	238 LF		210 LF		102 LF
Total Area (Square Feet)	11,900 SQFT		9,450 SQFT		3,366 SQFT
Structure Depth (Feet)	LF		LF		LF
Footing Type (pile or spread)	None		Pile		Pile
Cost Per Square Foot	$300		$300		$300
COST OF EACH STRUCTURE	**$3,570,000**		**$2,835,000**		**$1,009,800**

	Bridge 4		Bridge 5		Bridge 6
DATE OF ESTIMATE	Dec, 2019		Dec, 2019		Dec, 2019
Bridge Name	LOS GATOS CREEK BRIDGE		POLLARD UC		SAN TOMAS AQUINAS CREEK
Bridge Number					
Structure Type	CIP/PS Box Girder		CIP/PS Box Girder		CIP/PS Box Girder
Width (Feet) [out to out]	29 LF		23 LF		23 LF
Total Bridge Length (Feet)	178 LF		196 LF		105 LF
Total Area (Square Feet)	5,162 SQFT		4,508 SQFT		2,415 SQFT
Structure Depth (Feet)	LF		LF		LF
Footing Type (pile or spread)	Pile		Pile		Pile
Cost Per Square Foot	$300		$300		$300
COST OF EACH STRUCTURE	**$1,548,600**		**$1,352,400**		**$724,500**

	Bridge 7		Bridge 8		Bridge 9
DATE OF ESTIMATE	Dec, 2019		Dec, 2019		Dec, 2019
Bridge Name	SARATOGA UC		SARATOGA CREEK BRIDGE		CALABAZAS CREEK BRG
Bridge Number					
Structure Type	CIP/PS Box Girder		CIP/PS Box Girder		CIP/PS Box Girder
Width (Feet) [out to out]	23 LF		23 LF		22 LF
#REF!	192 LF		100 LF		156 LF
Total Area (Square Feet)	4,416 SQFT		2,300 SQFT		3,432 SQFT
Structure Depth (Feet)	LF		LF		LF
Footing Type (pile or spread)	Pile		Pile		Pile
Cost Per Square Foot	$300		$300		$300
COST OF EACH	**$1,324,800**		**$690,000**		**$1,029,600**

	Bridge 10				
DATE OF ESTIMATE	Dec, 2019				
Bridge Name	Pedestrian Bridge (Dalles Ave)				
Bridge Number					
Structure Type	CIP/PS Box Girder				
Width (Feet) [out to out]	10 LF				
#REF!	370 LF				
Total Area (Square Feet)	3,700 SQFT				
Structure Depth (Feet)	LF				
Footing Type (pile or spread)	Pile				
Cost Per Square Foot	$300				
COST OF EACH	**$1,110,000**				
TOTAL COST OF STRUCTURES[1]					**15,194,700**

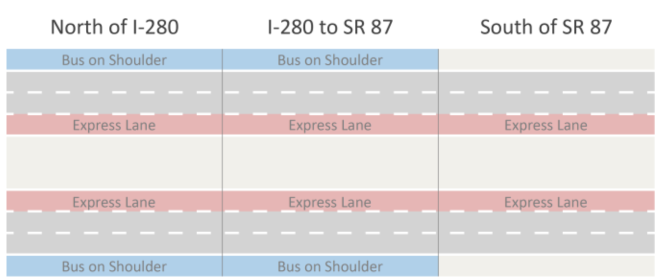
Estimate Prepared By: ______________________ ______________________

XXXXXXXXXXXXXXXXX ------ Division of Structures Date

[1]Structure's Estimate includes Overhead and Mobilization are based on 2019 CALTRAN's "COMPARATIVE BRIDGE COSTS".

Alternative 3-6: Long Bus on Right-side Shoulder

- Convert existing HOV lane in each direction from Bernal Road, near U.S. 101 in south San Jose to Moffett Boulevard, near U.S. 101 in Mountain View, a distance of 23.2 miles, to operate as a single express lane.
- Provide continuous access to express lane from the adjacent general-purpose lanes.
- Install toll infrastructure in median to support express lanes.
- Reconstruct concrete median barrier south of Santa Teresa Boulevard and north of Stelling Road to accommodate toll gantries and dynamic message signs.
- Widen paved median shoulder to 14 feet in both directions from Santa Teresa Boulevard to South Stelling Road (excepting structures) to provide continuous CHP enforcement area.
- Widen right-side shoulders to meet Highway Design Manual standards (10 feet). Relocate drainage inlets as needed to the outside edge of shoulder.
- Install double-luminaire mast arm lighting at 250- to 400-foot intervals from postmile (PM) 6.00 (Almaden Expressway) to PM 17.70 (Stevens Creek Boulevard) and from PM 18.86 (Homestead Road) to PM 23.44 (Moffett Boulevard).
- Install high mast lighting at SR 17 and I-280 interchanges as needed to supplement existing.
- For Alternative 3-6, the right-side shoulder is assumed to be paved with full depth AC or PCC to provide a 12-foot-wide part-time travel lane and a total width of 14 feet where space permits. In many to most cases, widening the right-side shoulders will involve widening the median shoulder with full depth PCC and relocating the lane markings and delineators. This will avoid the need for retaining the side slopes, reconstructing existing retaining walls and/or soundwalls.
- At structures, shoulders used by buses will be a minimum of 11.5 feet wide.
- Replace Dalles Avenue pedestrian bridge.
- Convert SR 85 interchange at El Camino Real from a cloverleaf Type L-10 ramp configuration to a spread diamond Type L-2 ramp configuration.



Alternative 3-6: Long Bus on Right-side Shoulder

Engineer Cost Estimate --- Alternative 3-6
Preliminary Project Study Report

Project ID: XXXXXX

Type of Estimate :	Preliminary Project Study Report (Dec 2019)
Program Code :	04-XXXXX
Project Limits :	From Hwy 101 Interchange in Santa Jose to South of Hwy 101 Interchange in Mt. View
Description:	From PM 0.00 to PM 23.68
Scope :	Widen the Right-Side Existing Shoulder to Provide Enough Space to Accommodate the Bus Operations
Alternative :	Alternative 3-6 Long Shoulder (Right-Side)

		Current Cost		Escalated Cost
ROADWAY ITEMS	$	247,871,504	$	332,111,500
STRUCTURE ITEMS	$	1,110,000	$	1,487,300
SUBTOTAL CONSTRUCTION COST	$	248,981,504	$	333,598,800
RIGHT OF WAY	$	-	$	-
TOTAL CAPITAL OUTLAY COST	$	248,982,000	$	333,599,000
PR/ED SUPPORT (3%)	$	7,470,000	$	10,008,000
PS&E SUPPORT (12%)	$	29,878,000	$	40,032,000
RIGHT OF WAY SUPPORT				
CONSTRUCTION SUPPORT (12%)	$	29,878,000	$	40,032,000
AGENCY SUPPORT (8%)	$	19,919,000	$	26,688,000
TOTAL CAPITAL OUTLAY SUPPORT COST*	$	87,145,000	$	116,760,000
TOTAL PROJECT COST	$	336,127,000	$	451,000,000

If Project has been programmed enter Programmed Amount

	Month	/	Year
Date of Estimate (Month/Year)	12	/	2019
Estimated Date of Construction Start (Month/Year)	10	/	2023
Number of Working Days	1500		Working Days
Estimated Mid-Point of Construction (Month/Year)	10	/	2026
Number of Plant Establishment Days			Days

Estimated Project Schedule

PID Approval
PA/ED Approval
PS&E
RTL
Begin Construction

Approved by Project Manager

Project Manager	**Date**	**Phone**

I. ROADWAY ITEMS SUMMARY

	Section	Cost
1	**Earthwork**	$ 919,400
2	**Pavement Structural Section**	$ 23,636,700
3	**Drainage**	$ 903,300
4	**Specialty Items**	$ 10,236,400
5	**Environmental**	$ 2,238,900
6	**Traffic Items**	$ 119,775,600
7	**Detours**	$ 250,000
8	**Minor Items**	$ 7,898,100
9	**Roadway Mobilization**	$ 16,585,900
10	**Supplemental Work**	$ 8,338,500
11	**State Furnished**	$ 5,758,600
12	**Contingencies**	$ 41,312,000
13	**Overhead**	$ 10,018,104

TOTAL ROADWAY ITEMS	$ 247,871,504

Estimate Prepared By :

Name and Title Date Phone

Estimate Reviewed By :

Name and Title Date Phone

SECTION 1: EARTHWORK

Item code		Unit	Quantity		Unit Price ($)		Cost
160101	Clearing & Grubbing	AC	44	x	1,725	=	$75,900
170101	Develop Water Supply	LS	1	x	50,000	=	$50,000
190101	Roadway Excavation	CY	27,744	x	29	=	$793,478
190103	Roadway Excavation (Type Y) ADL	CY		x		=	$0
190105	Roadway Excavation (Type Z-2) ADL	CY		x		=	$0
192037	Structure Excavation (Retaining Wall)	CY		x		=	$0
193013	Structure Backfill (Retaining Wall)	CY		x		=	$0
193031	Pervious Backfill Material (Retaining Wall)	CY		x		=	$0
194001	Ditch Excavation	CY		x		=	$0
198001	Impored Borrow	CY	0	x	17	=	$0
198007	Imported Material (Shoulder Backing)	TON		x		=	$0
XXXXXX	Some Item			x		=	$0

TOTAL EARTHWORK SECTION ITEMS $ 919,400

SECTION 2: PAVEMENT STRUCTURAL SECTION

Item code		Unit	Quantity		Unit Price ($)			Cost
150771	Remove Asphalt Concrete Dike	LF	176,952	x		=	$	-
150860	Remove Base and Surfacing	CY	0	x	12.5	=	$	-
153103	Cold Plane Asphalt Concrete Pavement	SQYD	0	x	8	=	$	-
150854	Remove Concrete Pavement	CY	53,129	x	156	=	$	8,288,124
260201	Class 4 Aggregate Base	CY	305	x	61	=	$	18,453
250401	Class 4 Aggregate Subbase	CY	583	x	38	=	$	22,154
290201	Asphalt Treated Permeable Base	CY	218	x	160	=	$	34,880
365001	Sand Cover	TON		x		=	$	-
374002	Asphaltic Emulsion (Fog Seal Coat)	TON		x		=	$	-
374492	Asphaltic Emulsion (Polymer Modified)	TON		x		=	$	-
3750XX	Screenings (Type XX)	TON		x		=	$	-
377501	Slurry Seal	TON		x		=	$	-
390095	Replace Asphalt Concrete Surfacing	CY		x		=	$	-
390132	Hot Mix Asphalt (Type A)	TON		x		=	$	-
390136	Minor Hot Mix Asphalt	TON		x		=	$	-
390137	Rubberized Hot Mix Asphalt (Gap Graded)	TON		x		=	$	-
393003	Geosynthetic Pavement Interlayer	SQYD		x		=	$	-
39405X	Shoulder Rumber Strip *(HMA, Type XX Indent*	STA		x		=	$	-
394071	Place Hot Mix Asphalt Dike	LF	176,952	x		=	$	-
394090	Place Hot Mix Asphalt (Misc. Area)	SQYD		x		=	$	-
397005	Tack Coat	TON		x		=	$	-
400050	Continuously Reinfored Concrete Pavement	CY	50,910	x	300	=	$	15,273,000
401108	Replace Concrete Pavement (Rapid Strength	CY		x		=	$	-
404092	Seal Pavement Joint	LF		x		=	$	-
404094	Seal Longitudinal Isolation Joint	LF		x		=	$	-
413112A	Repair Spalled Joints (Polyester Grout)	SQYD		x		=	$	-
413115	Seal Existing Concrete Pavement Joint	LF		x		=	$	-
420102	Groove Existing Concrete Pavement	SQYD		x		=	$	-
420201	Grind Existing Concrete Pavement	SQYD		x		=	$	-
731502	Minor Concrete (Misc. Const)	CY		x		=	$	-
731530	Minor Concrete (Textured Paving)	SQFT		x		=	$	-
XXXXXX	Some Item			x		=	$	-

TOTAL STRUCTURAL SECTION ITEMS $ 23,636,700

SECTION 3: DRAINAGE

Item code		Unit	Quantity		Unit Price ($)			Cost
150206	Abandon Culvert	LF		x		=	$	-
150805	Remove Culvert	LF		x		=	$	-
150820	Modify Inlet	EA		x		=	$	-
152430	Adjust Inlet	LF		x		=	$	-
155003	Cap Inlet	EA		x		=	$	-
193114	Sand Backfill	CY		x		=	$	-
510502	Minor Concrete (Minor Structure)	CY		x		=	$	-
510512	Minor Concrete (Box Culvert)	CY		x		=	$	-
510XXX	Culvert (Roadway Crossing)	EA		x		=	$	-
62XXXX	XXX" APC Pipe	LF		x		=	$	-
64XXXX	XXX" Plastic Pipe	LF		x		=	$	-
65XXXX	XXX" RCP Pipe	LF		x		=	$	-
66XXXX	XXX" CSP Pipe	LF		x		=	$	-
680905	Underdrain (6" Alternative)	LF	12,881	x	36	=	$	463,716
681103	Edge Drain (3" Plastic Pipe)	LF	20,931	x	21	=	$	439,551
69XXXX	XXX" Pipe Downdrain	LF		x		=	$	-
70XXXX	XXX" Pipe Inlet	LF		x		=	$	-
70XXXX	XXX" Pipe Riser	LF		x		=	$	-
70XXXX	XXX" Flared End Section	EA		x		=	$	-
703233	Grated Line Drain	LF		x		=	$	-
72XXXX	Rock Slope Protection (Type and Method)	CY		x		=	$	-
721420	Concrete (Ditch Lining)	CY		x		=	$	-
721430	Concrete (Channel Lining)	CY		x		=	$	-
729010	Rock Slope Protection Fabric	SQYD		x		=	$	-
750001	Miscellaneous Iron and Steel	LB		x		=	$	-
XXXXXX	Additional Drainage (Detention Base, etc)	LS		x		=	$	-
XXXXXX	Some Item			x		=	$	-

TOTAL DRAINAGE ITEMS $ 903,300

SECTION 4: SPECIALTY ITEMS

Item code		Unit	Quantity		Unit Price ($)			Cost
070012	Progress Schedule (Critical Path Method)	LS	1	x	30,000	=	$	30,000
150662	Remove Metal Beam Guard Railing	LF	34,859	x	15	=	$	505,456
150668	Remove Terminal Systems	EA		x		=	$	-
1532XX	Remove Concrete Barrier (25, 50 or 50C)	LF	33,339	x	16	=	$	533,424
153250	Remove Sound Wall	SQFT	0	x	25	=	$	-
150606	Remove Fence (BW)	LF		x		=	$	-
190110	Lead Compliance Plan	LS	1	x	18,000	=	$	18,000
49XXXX	CIDH Concrete Piling *(Insert Diameter)*	LF		x		=	$	-
510060	Structural Concrete (Retaining Wall)	CY		x		=	$	-
510133	Class 2 Concrete (Retaining Wall)	CY		x		=	$	-
510XXX	Retaining Wall (MSE)	SQFT	39,520	x	85	=	$	3,359,200
XXXXXX	Sound Wall (On Pile, On Barrier or On Ret. Wall)	SQFT	0	x	40	=	$	-
5110XX	Architectural Treatment *(Insert Type)*	SQFT		x		=	$	-
511048	Apply Anti-Graffiti Coating	SQFT		x		=	$	-
5136XX	Reinforced Concrete Crib Wall *(Insert Type)*	SQFT		x		=	$	-
518002	Sound Wall (Masonry Block)	SQFT		x		=	$	-
520103	Bar Reinf. Steel (Retaining Wall)	LB		x		=	$	-
800007	Fence (BW)	LF		x		=	$	-
832001	Metal Beam Guard Railing	LF	69,718	x	47	=	$	3,241,887
839310	Double Thrie Beam Barrier	LF		x		=	$	-
839521	Cable Railing	LF		x		=	$	-
83954X	Transition Railing *(Insert Type)*	EA		x		=	$	-
8395XX	Terminal System (Type CAT)	EA		x		=	$	-
8395XX	Alternative Flared Terminal System	EA	0	x	1,200	=	$	-
8395XX	End Anchor Assembly (*Insert Type*)	EA		x		=	$	-
839561	Rail Tensioning Assembly	EA		x		=	$	-
839596	Crash Cushion *(G.R.E.A.T)*	EA		x		=	$	-
839701	Concrete Barrier *(50 or 60)*	LF	31,884	x	78	=	$	2,486,952
833128	Concrete Barrier *(25 Modify)*	LF	480	x	128	=	$	61,440
XXXXXX	Some Item			x		=	$	-

TOTAL SPECIALTY ITEMS $ 10,236,400

SECTION 5: ENVIRONMENTAL

5A - ENVIRONMENTAL MITIGATION

Item code		Unit	Quantity		Unit Price ($)			Cost
XXXXXX	Biological Mitigation	LS		x		=	$	-
071325	Temporary Reinforced Silt Fence	LF		x		=	$	-
XXXXXX	Hazardous Material Remediation	LS	1	x	180,000	=	$	180,000
XXXXXX	Permits	LS	1	x	90,000	=	$	90,000
071325	Temporary Fence (Type ESA)	LF		x		=	$	-

Subtotal Environmental *$ 270,000*

5B - LANDSCAPE AND IRRIGATION

Item code		Unit	Quantity		Unit Price ($)			Cost
200001	Highway Planting	ACRE		x		=	$	-
20XXXX	XXX" (*Insert Type*) Conduit *(Use for Irrigation x-*	LF		x		=	$	-
20XXXX	Extend XXX" *(Insert Type)* Conduit	LF		x		=	$	-
201700	Imported Topsoil	CY		x		=	$	-
203015	Erosion Control	ACRE		x		=	$	-
203021	Fiber Rolls	LF		x		=	$	-
203026	Move In/ Move Out (Erosion Control)	EA		x		=	$	-
204099	Plant Establishment Work	LS		x		=	$	-
204101	Extend Plant Establishment (X Years)	LS		x		=	$	-
208000	Irrigation System	LS		x		=	$	-
208304	Water Meter	EA		x		=	$	-
209801	Maintenance Vehicle Pullout	EA		x		=	$	-
XXXXXX	Some Item							

Subtotal Landscape and Irrigation *$ -*

5C - NPDES

Item code		Unit	Quantity		Unit Price ($)			Cost
074016	Construction Site Management	LS	1	x	900,000	=	$	900,000
074017	Prepare WPCP	LS	1	x	20,000	=	$	20,000
074019	Prepare SWPPP	LS	1	x	20,000	=	$	20,000
074023	Temporary Erosion Control	ACRE	44	x	2,500	=	$	110,000
074027	Temporary Erosion Control Blanket	SQYD		x		=	$	-
074028	Temporary Fiber Roll	LF		x		=	$	-
074032	Temporary Concrete Washout Facility	EA		x		=	$	-
074033	Temporary Construction Entrance	EA		x		=	$	-
074035	Temporary Check Dam	LF		x		=	$	-
074037	Move In/ Move Out (Temp Erosion Control)	EA		x		=	$	-
074038	Temp. Drainage Inlet Protection	EA	315	x	60	=	$	18,900
XXXXXX	Site Job Management	LS	1	x	900,000	=	$	900,000
074042	Temporary Concrete Washout (Portable)	LS		x		=	$	-
XXXXXX	Some Item			x		=	$	-

Supplemental Work for NPDES

(These costs are not accounted in total here but under Supplemental Work on sheet 7 of 11).

074021	Water Pollution Control Maintenance Work*	LS	1	x	45,500	=	$	45,500
066596	Additional Water Pollution Control**	LS		x		=	$	-
066597	Storm Water Sampling and Analysis***	LS		x		=	$	-
XXXXXX	Some Item							

Subtotal NPDES (Without Supplemental Work) *$ 1,968,900*

*Applies to all SWPPPs and those WPCPs with sediment control or soil stabilization BMPs.

**Applies to both SWPPPs and WPCP projects.

*** Applies only to project with SWPPPs.

TOTAL ENVIRONMENTAL $ 2,238,900

SECTION 6: TRAFFIC ITEMS

6A - Traffic Electrical

Item code		Unit	Quantity		Unit Price ($)			Cost
150760	Remove Sign Structure	EA		x		=	$	-
151581	Reconstruct Sign Structure	EA		x		=	$	-
152641	Modify Sign Structure	EA		x		=	$	-
5602XX	Furnish Sign Structure	LB		x		=	$	-
5602XX	Install Sign Structure	LB		x		=	$	-
56XXXX	XXX" CIDHC Pile (Sign Foundation)	LF		x		=	$	-
56XXXX	Install Overhead Sign (Two Post)	EA	15	x	400,000	=	$	6,000,000
56XXXX	Install Overhead Sign (One Post)	EA	10	x	160,000	=	$	1,600,000
860090	Maintain Existing Traffic Management System	LS	1	x	900,000	=	$	900,000
860810	Inductive Loop Detectors	EA		x		=	$	-
86055X	Lighting & Sign Illumination	EA	378	x	4,000	=	$	1,512,000
8607XX	Interconnection Facilities	LS		x		=	$	-
8609XX	Traffic Traffic Monitoring Stations	LS	1	x	200,000	=	$	200,000
860XXX	Signals & Lighting	LS		x		=	$	-
860XXX	ITS Elements	LS		x		=	$	-
861100	Ramp Metering System	LS		x		=	$	-
86XXXX	Fiber Optic Conduit System	LS		x		=	$	-
XXXXXX	Ramp Terminal Intersection Improvement	LS	1	x	1,000,000	=	$	1,000,000
XXXXXX	Toll Equipment and System Integration (Capital)	LS	1	x	100,000,000	=	$	100,000,000
XXXXXX	Some Item							

Subtotal Traffic Electrical *$ 111,212,000*

6B - Traffic Signing and Striping

Item code		Unit	Quantity		Unit Price ($)			Cost
120090	Construction Area Signs	LS	1	x	900,000	=	$	900,000
150701	Remove Yellow Painted Traffic Stripe	LF	94,494	x	4	=	$	377,976
150710	Remove Traffic Stripe	LF	944,940	x	0.25	=	$	236,235
150713	Remove Pavement Marking	SQFT		x		=	$	-
150742	Remove Roadside Sign	EA	20	x	120	=	$	2,400
15075X	Remove Sign Structure	EA	30	x	20,000	=	$	600,000
15075X	Remove Sign Structure (On Bridge)	EA	8	x	5,000	=	$	40,000
152320	Reset Roadside Sign	EA		x		=	$	-
152390	Relocate Roadside Sign	EA		x		=	$	-
566011	Roadside Sign (One Post)	EA	30	x	340	=	$	10,200
566012	Roadside Sign (Two Post)	EA	10	x	1,250	=	$	12,500
560XXX	Furnish Sign Panels	SQFT		x		=	$	-
560XXX	Install Sign Panels	SQFT		x		=	$	-
82010X	Delineator (Class X)	EA		x		=	$	-
84XXXX	Permanent Pavement Delineation	LS	1	x	900,000	=	$	900,000
840504	Thermoplastic Traffic Strip (4")	LF	1,322,916	x	0.50	=	$	661,458

Subtotal Traffic Signing and Striping *$ 3,740,769*

6C - Stage Construction and Traffic Handling

Item code		Unit	Quantity		Unit Price ($)			Cost
120100	Traffic Control System	LS	1	x	4,000,000	=	$	4,000,000
120120	Type III Barricade	EA		x		=	$	-
120143	Temporary Pavement Delineation	LF		x		=	$	-
120149	Temporary Pavement Marking (Paint)	LS	1	x	90,000	=	$	90,000
120159	Temporary Traffic Strip (Paint)	LS	1	x	90,000	=	$	90,000
12016X	Channelizer	EA		x		=	$	-
128650	Portable Changeable Message Signs	EA	18	x	10,000	=	$	180,000
129000	Temporary Railing (Type K)	LF	6,000	x	17	=	$	102,000
129100	Temp. Crash Cushion Module	EA	4	x	200	=	$	800
129099A	Traffic Plastic Drum	EA		x		=	$	-
839603A	Temporary Crash Cushion (ADIEM)	EA		x		=	$	-
XXXXXX	Misc. Items (Traffic Management Plan)	LS	1	x	360,000	=	$	360,000
XXXXXX	Some Item	LS		x		=	$	-

Subtotal Stage Construction and Traffic Handling *$ 4,822,800*

TOTAL TRAFFIC ITEMS $ 119,775,600

SECTION 7: DETOURS

Include constructing, maintaining, and removal

Item code		Unit	Quantity		Unit Price ($)		Cost
0713XX	Temporary Fence (Type X)	LF		x		=	$ -
07XXXX	Temporary Drainage	LS		x		=	$ -
120143	Temporary Pavement Delineation	LF		x		=	$ -
1286XX	Temporary Signals	EA		x		=	$ -
129000	Temporary Railing (Type K)	LF		x		=	$ -
190101	Roadway Excavation	CY		x		=	$ -
198001	Imported Borrow	CY		x		=	$ -
198050	Embankment	CY		x		=	$ -
250401	Class 4 Aggregate Subbase	CY		x		=	$ -
260201	Class 2 Aggregate Base	CY		x		=	$ -
390132	Hot Mix Asphalt (Type A)	TON		x		=	$ -
XXXXXX	Some Item	LS	1	x	$250,000	=	$ 250,000

TOTAL DETOURS $ 250,000

SUBTOTAL SECTIONS 1-7 $ 157,960,300

SECTION 8: MINOR ITEMS

8A - Americans with Disabilities Act Items						
ADA Items						$ -
8B - Bike Path Items						
Bike Path Items						$ -
8C - Other Minor Items						
Other Minor Items				5.0%		$ 7,898,015
Total of Section 1-7	$	157,960,300	x	5.0%	=	$ 7,898,015

TOTAL MINOR ITEMS $ 7,898,100

SECTIONS 9: MOBILIZATION

Item code							
999990	Total Section 1-8	$	165,858,400	x	10%	=	$16,585,840

TOTAL MOBILIZATION $ 16,585,900

SECTION 10: SUPPLEMENTAL WORK

Item code		Unit	Quantity		Unit Price ($)		Cost
066015	Federal Trainee Program	LS		x		=	$ -
066063	Traffic Management Plan - Public Information	LS		x		=	$ -
066090	Maintain Traffic	LS		x		=	$ -
066094	Value Analysis	LS		x		=	$ -
066204	Remove Rock & Debris	LS		x		=	$ -
066222	Locate Existing Cross-Over	LS		x		=	$ -
066670	Payment Adjustments For Price Index Fluctuations	LS		x		=	$ -
066700	Partnering	LS		x		=	$ -
066866	Operation of Existing Traffic Management System Eler	LS		x		=	$ -
066920	Dispute Review Board	LS		x		=	$ -
066XXX	Some Item	LS		x		=	$ -

*Cost of **NPDES** Supplemental Work specified in Section 5C* = $ 45,500

Total Section 1-8	$	165,858,400	5%	=	$ 8,292,920

TOTAL SUPPLEMENTAL WORK $ 8,338,500

Note: Mobilization item will automatically calculate if working days are 50 or more. For Project less than 50 Working Days Mobilization is not required as a separate contract, however contract item prices should take into consideration mobilization as part of the price. If the building portion of the project is greater than 50% of the total project cost,
If the building portion of the project is greater than 50% of the total project cost, then mobilization is not included.

SECTION 11: STATE FURNISHED MATERIALS AND EXPENSES

Item code		Unit	Quantity		Unit Price ($)		Cost
066063	Public Information	LS	0	x	$100,000	=	$0
066105	RE Office	LS	1	x	$400,000	=	$400,000
066803	Padlocks	LS		x		=	$0
066838	Reflective Numbers and Edge Sealer	LS		x		=	$0
066901	Water Expenses	LS		x		=	$0
066062A	COZEEP Expenses	LS		x		=	$0
06684X	Ramp Meter Controller Assembly	LS		x		=	$0
XXXXXX	Toll Back Office System	LS	1	x	$1,700,000	=	$1,700,000
06684X	TMS Controller Assembly	LS	1	x	$2,000,000	=	$2,000,000
06684X	Traffic Signal Controller Assembly	LS		x		=	$0
XXXXXX	Some Item						
	Total Section 1-8	$	165,858,400		1%	=	$ 1,658,584

TOTAL STATE FURNISHED $5,758,600

SECTION 12: TIME-RELATED OVERHEAD

Estimated Time-Releated Overhead (TRO) Percentage (0% to 10%) = 6%

Item code		Unit	Quantity		Unit Price ($)		Cost	
			Total of All Contract Items Only				$ 166,968,400	(used to calculate TR
070018	Time-Related Overhead	$	166,968,400	X	6%	=	$10,018,104	

TOTAL TIME-RELATED OVERHEAD $10,018,104

SECTION 13: CONTINGENCY

Total Section 1-12	$	206,559,504	x	20%	=	$41,311,901

TOTAL CONTINGENCY $41,312,000

Note: TRO is a contract item if total project cost is (non-escalated) over $5 million AND 100 or more working days.
If the building portion of the project is greater than 50% of the total project cost, then TRO is not included.
TRO calculated for you as percentage of the sum of all contract items only;
excluding mobilization, supplemental work, state furnished materials and expenses, and contingency.

II. STRUCTURE ITEMS

	Bridge 1	Bridge 2	Bridge 3
DATE OF ESTIMATE	Dec, 2019	Dec, 2019	Dec, 2019
Bridge Name	ALAMADEN UC	CAMDEN UC	OKA UC
Bridge Number			
Structure Type	CIP/PS Box Girder	CIP/PS Box Girder	CIP/PS Box Girder
Width (Feet) [out to out]	0 LF	0 LF	0 LF
Total Bridge Length (Feet)	238 LF	210 LF	102 LF
Total Area (Square Feet)	0 SQFT	0 SQFT	0 SQFT
Structure Depth (Feet)	LF	LF	LF
Footing Type (pile or spread)	None	Pile	Pile
Cost Per Square Foot	$300	$300	$300
COST OF EACH STRUCTURE	**$0**	**$0**	**$0**

	Bridge 4	Bridge 5	Bridge 6
DATE OF ESTIMATE	Dec, 2019	Dec, 2019	Dec, 2019
Bridge Name	LOS GATOS CREEK BRIDGE	POLLARD UC	SAN TOMAS AQUINAS CREEK
Bridge Number			
Structure Type	CIP/PS Box Girder	CIP/PS Box Girder	CIP/PS Box Girder
Width (Feet) [out to out]	0 LF	0 LF	0 LF
Total Bridge Length (Feet)	178 LF	196 LF	105 LF
Total Area (Square Feet)	0 SQFT	0 SQFT	0 SQFT
Structure Depth (Feet)	LF	LF	LF
Footing Type (pile or spread)	Pile	Pile	Pile
Cost Per Square Foot	$300	$300	$300
COST OF EACH STRUCTURE	**$0**	**$0**	**$0**

	Bridge 7	Bridge 8	Bridge 9
DATE OF ESTIMATE	Dec, 2019	Dec, 2019	Dec, 2019
Bridge Name	SARATOGA UC	SARATOGA CREEK BRIDGE	CALABAZAS CREEK BRG
Bridge Number			
Structure Type	CIP/PS Box Girder	CIP/PS Box Girder	CIP/PS Box Girder
Width (Feet) [out to out]	0 LF	0 LF	0 LF
#REF!	192 LF	100 LF	156 LF
Total Area (Square Feet)	0 SQFT	0 SQFT	0 SQFT
Structure Depth (Feet)	LF	LF	LF
Footing Type (pile or spread)	Pile	Pile	Pile
Cost Per Square Foot	$300	$300	$300
COST OF EACH	**$0**	**$0**	**$0**

	Bridge 10		
DATE OF ESTIMATE	Dec, 2019		
Bridge Name	Pedestrian Bridge (Dalles Ave)		
Bridge Number			
Structure Type	CIP/PS Box Girder		
Width (Feet) [out to out]	10 LF		
#REF!	370 LF		
Total Area (Square Feet)	3,700 SQFT		
Structure Depth (Feet)	LF		
Footing Type (pile or spread)	Pile		
Cost Per Square Foot	$300		
COST OF EACH	**$1,110,000**		
TOTAL COST OF STRUCTURES[1]			**1,110,000**

Estimate Prepared By: ______________________ ______________________

XXXXXXXXXXXXXXXX ------ Division of Structures Date

[1]Structure's Estimate includes Overhead and Mobilization are based on 2019 CALTRAN's "COMPARATIVE BRIDGE COSTS".

Capital Cost Estimates for Stations

- Summary of Conceptual Capital Costs
- Median Crossover Station
- Median Split Platform Station
- Side Platform Station
- Additional SR 85 Widening for Median Crossover Station at Bascom Avenue
- Additional SR 85 Widening for Split Platform Station at Saratoga Avenue
- Additional SR 85 Widening for Median Crossover Station at Stevens Creek Boulevard
- Additional SR 85 Widening for Split Platform Station at El Camino Real

Station Configurations and Summary of Conceptual Capital Costs ($, millions)

Alternative		Bascom Avenue	Saratoga Avenue	Stevens Creek Boulevard	El Camino Real	Total Capital Cost	
						Current	Escalated
1-1	No Build	—	—	—	—	$ 0	$ 0
1-2	HOV to Express Lane Conversion	—	—	—	—	$ 0	$ 0
2-1	Express Lanes Project	—	—	—	—	$ 0	$ 0
2-2	Long Express Lanes Project	—	—	—	—	$ 0	$ 0
3-1	Long Transit Lane (Median Adjacent Lane)	Crossover $10.01	Split $12.24	Crossover $10.05	Split $12.96	$45.26	$60.68
3-2	Long Transit Lane (Right-side Lane)	Side $ 2.45	Ramps $ 1.65	NB ramp SB side $ 2.05	Side $ 2.45	$ 8.60	$11.53
3-3	Long Transit Lane (Hybrid)	TBD	TBD	TBD	TBD	TBD	TBD
3-4	Short Transit Lane	Crossover $10.01	Split $12.24	Crossover $10.05	Ramps $ 1.65	$33.95	$45.52
3-5	Long Shoulder (Median)	Crossover $10.01	Split $12.24	Crossover $10.05	Split $12.96	$45.26	$60.68
3-6	Long Shoulder (Right-side)	Side $ 2.45	Ramps $ 1.65	NB ramp SB side $ 2.05	Side $ 2.45	$ 8.60	$11.53

Notes:
Crossover = Median crossover station
Split = Median split platform station
Side = Side platform station
Ramps = Platforms along off/on ramp

Parsons Transportation Group

PARSONS

SR85 BRT Stations
Estimate of Probable Construction Cost

SUMMARY REPORT

Estimate Date: **12/16/19** ; *Rev. No.* ***01***
Client:
Estimator **C. Gidlof**
Checked By: **B Scales**
Doc Scope Date: **12/01/19**

LEVEL DESCRIPTION	TOTAL
1 SR85 BRT Stations	**$42,891,904**
A Construction	**$42,891,904**
02 Station Cost	**$42,891,904**
A Bascom Avenue - Median Crossover Station (2 stations)	**$8,808,777**
1 Construction	**$6,525,020**
03 Roadway	$1,884,972
001 Site Preparation	$412,711
002 Excavation	$249,605
004 Site Civil/Mechanical Utilities	$65,343
006 Paving	$1,157,313
Station	$4,640,048
Median Station	$2,750,936
Station Apputanances	$711,539
Elevator/Vertical	$1,177,573
B PR/ED Support 3%	**$195,751**
C PS&E Support 12%	**$783,002**
D Construction Support 12%	**$783,002**
E Agency Support 8%	**$522,002**
B Stevens Creek Boulevard - Median Crossover Station (2 stations)	**$8,808,777**
1 Construction	**$6,525,020**
03 Roadway	$1,884,972
001 Site Preparation	$412,711
002 Excavation	$249,605
004 Site Civil/Mechanical Utilities	$65,343
006 Paving	$1,157,313
Station	$4,640,048
Median Station	$2,750,936
Station Apputanances	$711,539
Elevator/Vertical	$1,177,573
B PR/ED Support 3%	**$195,751**
C PS&E Support 12%	**$783,002**
D Construction Support 12%	**$783,002**
E Agency Support 8%	**$522,002**
C Saratoga Ave - Median Split Platform Station (2 stations)	**$11,412,137**
1 Construction	**$8,453,435**
03 Roadway 2 x 187' x 36'x 2 ea PCC	$1,023,330
001 Site Preparation	$355,450
002 Excavation	$44,243
004 Site Civil/Mechanical Utilities	$136,480
005 Site Electrical Utilities	$89,585
006 Concrete Paving 2 x 187' x 36' x 2 ea (allow 187'/2 before & after)	$353,109
007 Landscaping	$44,463
Station	$7,430,105
Split Platform Station 187' x 14-20'	$2,367,418
Walkway (2 ea)	$3,273,600
Station Apputanances	$611,514

Parsons Transportation Group

SR85 BRT Stations
Estimate of Probable Construction Cost

SUMMARY REPORT

Estimate Date: **12/16/19** ; *Rev. No.* ***01***
Client:
Estimator **C. Gidlof**
Checked By: **B Scales**
Doc Scope Date: **12/01/19**

LEVEL DESCRIPTION	TOTAL
Elevator/Vertical	$1,177,573
B PR/ED Support 3%	**$253,603**
C PS&E Support 12%	**$1,014,412**
D Construction Support 12%	**$1,014,412**
E Agency Support 8%	**$676,275**
D El Camino Real - Median Split Platform Station (2 stations)	**$11,412,137**
1 Construction	**$8,453,435**
03 Roadway 2 x 187' x 36'x 2 ea PCC	$1,023,330
001 Site Preparation	$355,450
002 Excavation	$44,243
004 Site Civil/Mechanical Utilities	$136,480
005 Site Electrical Utilities	$89,585
006 Concrete Paving 2 x 187' x 36' x 2 ea (allow 187'/2 before & after)	$353,109
007 Landscaping	$44,463
Station	$7,430,105
Split Platform Station 187' x 14-20'	$2,367,418
Walkway (2 ea)	$3,273,600
Station Apputanances	$611,514
Elevator/Vertical	$1,177,573
B PR/ED Support 3%	**$253,603**
C PS&E Support 12%	**$1,014,412**
D Construction Support 12%	**$1,014,412**
E Agency Support 8%	**$676,275**
Side Station Alternate (2 stations)	**$2,450,077**
Construction	**$1,814,872**
Side Station	$896,996
Station Apputanances	$323,443
Furniture/Signage	$109,754
Electrical & Lighting	$106,950
Concrete Accessories	$48,659
Other Station Costs	$58,080
Elevator/Vertical	$594,433
STRUCTURAL SLAB ON GRADE 15'x 15'	$364,546
BASEMENT EXCAVATION	$5,506
BASEMENT WALLS 15' x 15' x 3' x 2	$28,658
STAIR CONSTRUCTION	$35,871
MISCELLANEOUS METALS (4 x 15' x 2)	$20,841
CONVEYING SYSTEMS	$139,010
B PR/ED Support 3%	**$54,446**
C PS&E Support 12%	**$217,785**
D Construction Support 12%	**$217,785**
E Agency Support 8%	**$145,190**

Engineer Cost Estimate --- Bascom Ave CrossOver Station Extra
Preliminary Project Study Report

Project ID: XXXXXX

Type of Estimate :	Preliminary Project Study Report (Dec 2019)
Program Code :	04-XXXXX
Project Limits :	From Hwy 101 Interchange in Santa Jose to South of Hwy 101 Interchange in Mt. View
Description:	From PM 0.00 to PM 23.68
Scope :	Construct Extra SR 85 Highway Widening for Crossover Station at Bascom Ave
Alternative :	Alternative 3-1 or 3-5

	Current Cost		Escalated Cost	
ROADWAY ITEMS	**$**	**886,600**		
STRUCTURE ITEMS	**$**	**-**	**$**	**-**
SUBTOTAL CONSTRUCTION COST	**$**	**886,600**		
RIGHT OF WAY	**$**	**-**	**$**	**-**
TOTAL CAPITAL OUTLAY COST	**$**	**887,000**		
PR/ED SUPPORT (3%)	**$**	**27,000**		
PS&E SUPPORT (12%)	**$**	**107,000**		
RIGHT OF WAY SUPPORT				
CONSTRUCTION SUPPORT (12%)	**$**	**107,000**		
AGENCY SUPPORT (8%)	**$**	**71,000**		
TOTAL CAPITAL OUTLAY SUPPORT COST*	**$**	**312,000**		
TOTAL PROJECT COST	**$**	**1,199,000**		

If Project has been programmed enter Programmed Amount

	Month	/	Year
Date of Estimate (Month/Year)	12	/	2019
Estimated Date of Construction Start (Month/Year)	10	/	2023
Number of Working Days	90		Working Days
Estimated Mid-Point of Construction (Month/Year)	12	/	2023
Number of Plant Establishment Days			Days

Estimated Project Schedule

PID Approval
PA/ED Approval
PS&E
RTL
Begin Construction

Approved by Project Manager

Project Manager	**Date**	**Phone**

I. ROADWAY ITEMS SUMMARY

	Section	Cost
1	**Earthwork**	$ 31,000
2	**Pavement Structural Section**	$ 346,700
3	**Drainage**	$ -
4	**Specialty Items**	$ 272,700
5	**Environmental**	$ -
6	**Traffic Items**	$ 13,300
7	**Detours**	$ -
8	**Minor Items**	$ 33,200
9	**Roadway Mobilization**	$ -
10	**Supplemental Work**	$ 34,900
11	**State Furnished**	$ 7,000
12	**Contingencies**	$ 147,800
13	**Overhead**	$ -

TOTAL ROADWAY ITEMS	**$ 886,600**

Estimate Prepared By : ______________________

Name and Title　　Date　　Phone

Estimate Reviewed By : ______________________

Name and Title　　Date　　Phone

SECTION 1: EARTHWORK

Item code		Unit	Quantity		Unit Price ($)			Cost
160101	Clearing & Grubbing	AC	0.8	x	1,725	=		$1,725
170101	Develop Water Supply	LS	1	x	3,000	=		$3,000
190101	Roadway Excavation	CY	200	x	29	=		$5,720
190103	Roadway Excavation (Type Y) ADL	CY		x		=		$0
190105	Roadway Excavation (Type Z-2) ADL	CY		x		=		$0
192037	Structure Excavation (Retaining Wall)	CY		x		=		$0
193013	Structure Backfill (Retaining Wall)	CY		x		=		$0
193031	Pervious Backfill Material (Retaining Wall)	CY		x		=		$0
194001	Ditch Excavation	CY		x		=		$0
198001	Impored Borrow	CY	1,241	x	17	=		$20,477
198007	Imported Material (Shoulder Backing)	TON		x		=		$0
XXXXXX	Some Item			x		=		$0

TOTAL EARTHWORK SECTION ITEMS $ 31,000

SECTION 2: PAVEMENT STRUCTURAL SECTION

Item code		Unit	Quantity		Unit Price ($)			Cost
150771	Remove Asphalt Concrete Dike	LF		x		=	$	-
150860	Remove Base and Surfacing	CY		x		=	$	-
153103	Cold Plane Asphalt Concrete Pavement	SQYD	0	x	8	=	$	-
150854	Remove Concrete Pavement	CY	0	x	156	=	$	-
260201	Class 4 Aggregate Base	CY	680	x	61	=	$	41,140
250401	Class 4 Aggregate Subbase	CY	237	x	38	=	$	9,006
290201	Asphalt Treated Permeable Base	CY	74	x	160	=	$	11,840
365001	Sand Cover	TON		x		=	$	-
374002	Asphaltic Emulsion (Fog Seal Coat)	TON		x		=	$	-
374492	Asphaltic Emulsion (Polymer Modified)	TON		x		=	$	-
3750XX	Screenings (Type XX)	TON		x		=	$	-
377501	Slurry Seal	TON		x		=	$	-
390095	Replace Asphalt Concrete Surfacing	CY		x		=	$	-
390132	Hot Mix Asphalt (Type A)	TON		x		=	$	-
390136	Minor Hot Mix Asphalt	TON		x		=	$	-
390137	Rubberized Hot Mix Asphalt (Gap Graded)	TON		x		=	$	-
393003	Geosynthetic Pavement Interlayer	SQYD		x		=	$	-
39405X	Shoulder Rumber Strip *(HMA, Type XX Indent*	STA		x		=	$	-
394071	Place Hot Mix Asphalt Dike	LF		x		=	$	-
394090	Place Hot Mix Asphalt (Misc. Area)	SQYD		x		=	$	-
397005	Tack Coat	TON		x		=	$	-
400050	Continuously Reinfored Concrete Pavement	CY	506	x	300	=	$	151,800
401108	Replace Concrete Pavement (Rapid Strength	CY		x		=	$	-
404092	Seal Pavement Joint	LF		x		=	$	-
404094	Seal Longitudinal Isolation Joint	LF		x		=	$	-
413112A	Repair Spalled Joints (Polyester Grout)	SQYD		x		=	$	-
413115	Seal Existing Concrete Pavement Joint	LF		x		=	$	-
420102	Groove Existing Concrete Pavement	SQYD		x		=	$	-
420201	Grind Existing Concrete Pavement	SQYD		x		=	$	-
731502	Minor Concrete (Misc. Const)	CY		x		=	$	-
730010	Minor Concrete (Curb)	LF	2,768	x	48	=	$	132,864
731530	Minor Concrete (Textured Paving)	SQFT		x		=	$	-
XXXXXX	Some Item			x		=	$	-

TOTAL STRUCTURAL SECTION ITEMS $ 346,700

SECTION 3: DRAINAGE

Item code		Unit	Quantity		Unit Price ($)			Cost
150206	Abandon Culvert	LF		x		=	$	-
150805	Remove Culvert	LF		x		=	$	-
150820	Modify Inlet	EA		x		=	$	-
152430	Adjust Inlet	LF		x		=	$	-
155003	Cap Inlet	EA		x		=	$	-
193114	Sand Backfill	CY		x		=	$	-
510502	Minor Concrete (Minor Structure)	CY		x		=	$	-
510512	Minor Concrete (Box Culvert)	CY		x		=	$	-
510XXX	Culvert (Roadway Crossing)	EA		x		=	$	-
62XXXX	XXX" APC Pipe	LF		x		=	$	-
64XXXX	XXX" Plastic Pipe	LF		x		=	$	-
65XXXX	XXX" RCP Pipe	LF		x		=	$	-
66XXXX	XXX" CSP Pipe	LF		x		=	$	-
680905	Underdrain (6" Alternative)	LF	0	x	36	=	$	-
681103	Edge Drain (3" Plastic Pipe)	LF	0	x	21	=	$	-
69XXXX	XXX" Pipe Downdrain	LF		x		=	$	-
70XXXX	XXX" Pipe Inlet	LF		x		=	$	-
70XXXX	XXX" Pipe Riser	LF		x		=	$	-
70XXXX	XXX" Flared End Section	EA		x		=	$	-
703233	Grated Line Drain	LF		x		=	$	-
72XXXX	Rock Slope Protection (Type and Method)	CY		x		=	$	-
721420	Concrete (Ditch Lining)	CY		x		=	$	-
721430	Concrete (Channel Lining)	CY		x		=	$	-
729010	Rock Slope Protection Fabric	SQYD		x		=	$	-
750001	Miscellaneous Iron and Steel	LB		x		=	$	-
XXXXXX	Additional Drainage (Detention Base, etc)	LS		x		=	$	-
XXXXXX	Some Item			x		=	$	-

TOTAL DRAINAGE ITEMS $ -

SECTION 4: SPECIALTY ITEMS

Item code		Unit	Quantity		Unit Price ($)			Cost
070012	Progress Schedule (Critical Path Method)	LS	0	x	30,000	=	$	-
150662	Remove Metal Beam Guard Railing	LF	0	x	15	=	$	-
150668	Remove Terminal Systems	EA		x		=	$	-
1532XX	Remove Concrete Barrier (25, 50 or 50C)	LF	0	x	16	=	$	-
153250	Remove Sound Wall	SQFT	0	x	25	=	$	-
150606	Remove Fence (BW)	LF		x		=	$	-
190110	Lead Compliance Plan	LS	0	x	18,000	=	$	-
49XXXX	CIDH Concrete Piling *(Insert Diameter)*	LF		x		=	$	-
510060	Structural Concrete (Retaining Wall)	CY		x		=	$	-
510133	Class 2 Concrete (Retaining Wall)	CY		x		=	$	-
510XXX	Retaining Wall (MSE)	SQFT	0	x	85	=	$	-
XXXXXX	Sound Wall (On Pile, On Barrier or On Ret. Wall)	SQFT	0	x	40	=	$	-
5110XX	Architectural Treatment *(Insert Type)*	SQFT		x		=	$	-
511048	Apply Anti-Graffiti Coating	SQFT		x		=	$	-
5136XX	Reinforced Concrete Crib Wall *(Insert Type)*	SQFT		x		=	$	-
518002	Sound Wall (Masonry Block)	SQFT		x		=	$	-
520103	Bar Reinf. Steel (Retaining Wall)	LB		x		=	$	-
800007	Fence (BW)	LF		x		=	$	-
832001	Metal Beam Guard Railing	LF	0	x	47	=	$	-
839310	Double Thrie Beam Barrier	LF		x		=	$	-
839521	Cable Railing	LF		x		=	$	-
83954X	Transition Railing *(Insert Type)*	EA		x		=	$	-
8395XX	Terminal System (Type CAT)	EA		x		=	$	-
8395XX	Alternative Flared Terminal System	EA	0	x	1,200	=	$	-
8395XX	End Anchor Assembly (*Insert Type*)	EA		x		=	$	-
839561	Rail Tensioning Assembly	EA		x		=	$	-
839596	Crash Cushion *(G.R.E.A.T)*	EA		x		=	$	-
839701	Concrete Barrier *(50 or 60)*	LF	3,495	x	78	=	$	272,610
833128	Concrete Barrier *(25 Modify)*	LF	0	x	128	=	$	-
XXXXXX	Some Item			x		=	$	-

TOTAL SPECIALTY ITEMS $ 272,700

SECTION 5: ENVIRONMENTAL

5A - ENVIRONMENTAL MITIGATION

Item code		Unit	Quantity		Unit Price ($)			Cost
XXXXXX	Biological Mitigation	LS		x		=	$	-
071325	Temporary Reinforced Silt Fence	LF		x		=	$	-
XXXXXX	Hazardous Material Remediation	LS	0	x	45,000	=	$	-
XXXXXX	Permits	LS	0	x	45,000	=	$	-
071325	Temporary Fence (Type ESA)	LF		x		=	$	-

Subtotal Environmental $ -

5B - LANDSCAPE AND IRRIGATION

Item code		Unit	Quantity		Unit Price ($)			Cost
200001	Highway Planting	ACRE		x		=	$	-
20XXXX	XXX" (*Insert Type*) Conduit *(Use for Irrigation x-*	LF		x		=	$	-
20XXXX	Extend XXX" *(Insert Type)* Conduit	LF		x		=	$	-
201700	Imported Topsoil	CY		x		=	$	-
203015	Erosion Control	ACRE		x		=	$	-
203021	Fiber Rolls	LF		x		=	$	-
203026	Move In/ Move Out (Erosion Control)	EA		x		=	$	-
204099	Plant Establishment Work	LS		x		=	$	-
204101	Extend Plant Establishment (X Years)	LS		x		=	$	-
208000	Irrigation System	LS		x		=	$	-
208304	Water Meter	EA		x		=	$	-
209801	Maintenance Vehicle Pullout	EA		x		=	$	-
XXXXXX	Some Item							

Subtotal Landscape and Irrigation $ -

5C - NPDES

Item code		Unit	Quantity		Unit Price ($)			Cost
074016	Construction Site Management	LS	0	x	450,000	=	$	-
074017	Prepare WPCP	LS	0	x	10,000	=	$	-
074019	Prepare SWPPP	LS	0	x	10,000	=	$	-
074023	Temporary Erosion Control	ACRE	0	x	2,500	=	$	-
074027	Temporary Erosion Control Blanket	SQYD		x		=	$	-
074028	Temporary Fiber Roll	LF		x		=	$	-
074032	Temporary Concrete Washout Facility	EA		x		=	$	-
074033	Temporary Construction Entrance	EA		x		=	$	-
074035	Temporary Check Dam	LF		x		=	$	-
074037	Move In/ Move Out (Temp Erosion Control)	EA		x		=	$	-
074038	Temp. Drainage Inlet Protection	EA	0	x	60	=	$	-
XXXXXX	Site Job Management	LS	0	x	450,000	=	$	-
074042	Temporary Concrete Washout (Portable)	LS		x		=	$	-
XXXXXX	Some Item			x		=	$	-

Supplemental Work for NPDES

(These costs are not accounted in total here but under Supplemental Work on sheet 7 of 11).

074021	Water Pollution Control Maintenance Work*	LS	0	x	25,500	=	$	-
066596	Additional Water Pollution Control**	LS		x		=	$	-
066597	Storm Water Sampling and Analysis***	LS		x		=	$	-
XXXXXX	Some Item							

Subtotal NPDES (Without Supplemental Work) $ -

*Applies to all SWPPPs and those WPCPs with sediment control or soil stabilization BMPs.

**Applies to both SWPPPs and WPCP projects.

*** Applies only to project with SWPPPs.

TOTAL ENVIRONMENTAL $ -

SECTION 6: TRAFFIC ITEMS

6A - Traffic Electrical

Item code		Unit	Quantity		Unit Price ($)		Cost	
150760	Remove Sign Structure	EA		x		=	$	-
151581	Reconstruct Sign Structure	EA		x		=	$	-
152641	Modify Sign Structure	EA		x		=	$	-
5602XX	Furnish Sign Structure	LB		x		=	$	-
5602XX	Install Sign Structure	LB		x		=	$	-
56XXXX	XXX" CIDHC Pile (Sign Foundation)	LF		x		=	$	-
56XXXX	Install Overhead Sign (Two Post)	EA	0	x	400,000	=	$	-
56XXXX	Install Overhead Sign (One Post)	EA	0	x	160,000	=	$	-
860090	Maintain Existing Traffic Management System	LS	0	x	900,000	=	$	-
860810	Inductive Loop Detectors	EA		x		=	$	-
86055X	Lighting & Sign Illumination	EA	0	x	4,000	=	$	-
8607XX	Interconnection Facilities	LS		x		=	$	-
8609XX	Traffic Traffic Monitoring Stations	LS	0	x	200,000	=	$	-
860XXX	Signals & Lighting	LS		x		=	$	-
860XXX	ITS Elements	LS		x		=	$	-
861100	Ramp Metering System (Location X)	LS		x		=	$	-
86XXXX	Fiber Optic Conduit System	LS		x		=	$	-
XXXXXX	Ramp Terminal Intersection Improvement	LS	0	x	1,000,000	=	$	-
XXXXXX	Toll Equipment and System Integration (Capital)	LS	0	x	100,000,000	=	$	-
XXXXX	Some Item							

Subtotal Traffic Electrical *$ -*

6B - Traffic Signing and Striping

Item code		Unit	Quantity		Unit Price ($)		Cost	
120090	Construction Area Signs	LS	0	x	900,000	=	$	-
150701	Remove Yellow Painted Traffic Stripe	LF	0	x	4	=	$	-
150710	Remove Traffic Stripe	LF	0	x	0.25	=	$	-
150713	Remove Pavement Marking	SQFT		x		=	$	-
150742	Remove Roadside Sign	EA	0	x	120	=	$	-
15075X	Remove Sign Structure	EA	0	x	20,000	=	$	-
15075X	Remove Sign Structure (On Bridge)	EA	0	x	5,000	=	$	-
152320	Reset Roadside Sign	EA		x		=	$	-
152390	Relocate Roadside Sign	EA		x		=	$	-
566011	Roadside Sign (One Post)	EA	0	x	340	=	$	-
566012	Roadside Sign (Two Post)	EA	0	x	1,250	=	$	-
560XXX	Furnish Sign Panels	SQFT		x		=	$	-
560XXX	Install Sign Panels	SQFT		x		=	$	-
82010X	Delineator (Class X)	EA		x		=	$	-
84XXXX	Permanent Pavement Delineation	LS	1	x	10,000	=	$	10,000
840504	Thermoplastic Traffic Strip (4")	LF	6,600	x	0.50	=	$	3,300

Subtotal Traffic Signing and Striping *$ 13,300*

6C - Stage Construction and Traffic Handling

Item code		Unit	Quantity		Unit Price ($)		Cost	
120100	Traffic Control System	LS	0	x	4,000,000	=	$	-
120120	Type III Barricade	EA		x		=	$	-
120143	Temporary Pavement Delineation	LF		x		=	$	-
120149	Temporary Pavement Marking (Paint)	LS	0	x	90,000	=	$	-
120159	Temporary Traffic Strip (Paint)	LS	0	x	90,000	=	$	-
12016X	Channelizer	EA		x		=	$	-
128650	Portable Changeable Message Signs	EA	0	x	10,000	=	$	-
129000	Temporary Railing (Type K)	LF	0	x	17	=	$	-
129100	Temp. Crash Cushion Module	EA	0	x	200	=	$	-
129099A	Traffic Plastic Drum	EA		x		=	$	-
839603A	Temporary Crash Cushion (ADIEM)	EA		x		=	$	-
XXXXXX	Misc. Items (Traffic Management Plan)	LS	0	x	180,000	=	$	-
XXXXXX	Some Item	LS		x		=	$	-

Subtotal Stage Construction and Traffic Handling *$ -*

TOTAL TRAFFIC ITEMS $ 13,300

SECTION 7: DETOURS

Include constructing, maintaining, and removal

Item code		Unit	Quantity		Unit Price ($)		Cost
0713XX	Temporary Fence (Type X)	LF		x		=	$ -
07XXXX	Temporary Drainage	LS		x		=	$ -
120143	Temporary Pavement Delineation	LF		x		=	$ -
1286XX	Temporary Signals	EA		x		=	$ -
129000	Temporary Railing (Type K)	LF		x		=	$ -
190101	Roadway Excavation	CY		x		=	$ -
198001	Imported Borrow	CY		x		=	$ -
198050	Embankment	CY		x		=	$ -
250401	Class 4 Aggregate Subbase	CY		x		=	$ -
260201	Class 2 Aggregate Base	CY		x		=	$ -
390132	Hot Mix Asphalt (Type A)	TON		x		=	$ -
XXXXXX	Some Item	LS	0	x	$150,000	=	$ -

TOTAL DETOURS $ -

SUBTOTAL SECTIONS 1-7 $ 663,700

SECTION 8: MINOR ITEMS

8A - Americans with Disabilities Act Items

ADA Items $ -

8B - Bike Path Items

Bike Path Items $ -

8C - Other Minor Items

Other Minor Items 5.0% $ 33,185

Total of Section 1-7 $ 663,700 x 5.0% = $ 33,185

TOTAL MINOR ITEMS $ 33,200

SECTIONS 9: MOBILIZATION

Item code							
999990	Total Section 1-8	$	696,900	x	0%	=	$ -

TOTAL MOBILIZATION $ -

SECTION 10: SUPPLEMENTAL WORK

Item code		Unit	Quantity		Unit Price ($)		Cost
066015	Federal Trainee Program	LS		x		=	$ -
066063	Traffic Management Plan - Public Information	LS		x		=	$ -
066090	Maintain Traffic	LS		x		=	$ -
066094	Value Analysis	LS		x		=	$ -
066204	Remove Rock & Debris	LS		x		=	$ -
066222	Locate Existing Cross-Over	LS		x		=	$ -
066670	Payment Adjustments For Price Index Fluctuations	LS		x		=	$ -
066700	Partnering	LS		x		=	$ -
066866	Operation of Existing Traffic Management System Eler	LS		x		=	$ -
066920	Dispute Review Board	LS		x		=	$ -
066XXX	Some Item	LS		x		=	$ -

Cost of ***NPDES*** *Supplemental Work specified in Section 5C* = $ -

Total Section 1-8 $ 696,900 5% = $ 34,845

TOTAL SUPPLEMENTAL WORK $ 34,900

Note: Mobilization item will automatically calculate if working days are 50 or more. For Project less than 50 Working Days Mobilization is not required as a separate contract, however contract item prices should take into consideration mobilization as part of the price. If the building portion of the project is greater than 50% of the total project cost,

If the building portion of the project is greater than 50% of the total project cost, then mobilization is not included.

SECTION 11: STATE FURNISHED MATERIALS AND EXPENSES

Item code		Unit	Quantity		Unit Price ($)		Cost
066063	Public Information	LS	0	x	$100,000	=	$0
066105	RE Office	LS	0	x	$400,000	=	$0
066803	Padlocks	LS		x		=	$0
066838	Reflective Numbers and Edge Sealer	LS		x		=	$0
066901	Water Expenses	LS		x		=	$0
066062A	COZEEP Expenses	LS		x		=	$0
06684X	Ramp Meter Controller Assembly	LS		x		=	$0
XXXXXX	Toll Back Office System	LS	0	x	$1,700,000	=	$0
06684X	TMS Controller Assembly	LS	0	x	$2,000,000	=	$0
06684X	Traffic Signal Controller Assembly	LS		x		=	$0
XXXXXX	Some Item						
	Total Section 1-8	$	696,900		1%	=	$ 6,969

TOTAL STATE FURNISHED **$7,000**

SECTION 12: TIME-RELATED OVERHEAD

Estimated Time-Releated Overhead (TRO) Percentage (0% to 10%) = 0%

Item code		Unit	Quantity		Unit Price ($)		Cost	
			Total of All Contract Items Only			$	696,900	(used to calculate TR
070018	Time-Related Overhead	$	696,900	X	0%	=	$0	

TOTAL TIME-RELATED OVERHEAD **$0**

SECTION 13: CONTINGENCY

Total Section 1-12	$	738,800	x	20%	=	$147,760

TOTAL CONTINGENCY **$147,800**

Note: TRO is a contract item if total project cost is (non-escalated) over $5 million AND 100 or more working days.
If the building portion of the project is greater than 50% of the total project cost, then TRO is not included.
TRO calculated for you as percentage of the sum of all contract items only;
excluding mobilization, supplemental work, state furnished materials and expenses, and contingency.

Engineer Cost Estimate --- Saratoga Ave Split Station Extra
Preliminary Project Study Report

Project ID: XXXXXX

Type of Estimate : Preliminary Project Study Report (Dec 2019)
Program Code : 04-XXXXX
Project Limits : From Hwy 101 Interchange in Santa Jose to South of Hwy 101 Interchange in Mt. View
Description: From PM 0.00 to PM 23.68

Scope : Construct Extra SR 85 Highway Widening for Split Station at Saratoga Ave

Alternative : Alternative 3-1 or 3-5

	Current Cost	Escalated Cost
ROADWAY ITEMS	$ 611,900	
STRUCTURE ITEMS	$ -	$ -
SUBTOTAL CONSTRUCTION COST	$ 611,900	
RIGHT OF WAY	$ -	$ -
TOTAL CAPITAL OUTLAY COST	**$ 612,000**	
PR/ED SUPPORT (3%)	$ 19,000	
PS&E SUPPORT (12%)	$ 74,000	
RIGHT OF WAY SUPPORT		
CONSTRUCTION SUPPORT (12%)	$ 74,000	
AGENCY SUPPORT (8%)	$ 49,000	
TOTAL CAPITAL OUTLAY SUPPORT COST*	**$ 216,000**	
TOTAL PROJECT COST	**$ 828,000**	

If Project has been programmed enter Programmed Amount

	Month	/	Year
Date of Estimate (Month/Year)	12	/	2019
Estimated Date of Construction Start (Month/Year)	10	/	2023
Number of Working Days	90		Working Days
Estimated Mid-Point of Construction (Month/Year)	12	/	2023
Number of Plant Establishment Days			Days

Estimated Project Schedule
PID Approval
PA/ED Approval
PS&E
RTL
Begin Construction

Approved by Project Manager

Project Manager	**Date**	**Phone**

I. ROADWAY ITEMS SUMMARY

	Section		Cost
1	Earthwork	$	17,900
2	Pavement Structural Section	$	186,900
3	Drainage	$	-
4	Specialty Items	$	240,700
5	Environmental	$	-
6	Traffic Items	$	12,500
7	Detours	$	-
8	Minor Items	$	22,900
9	Roadway Mobilization	$	-
10	Supplemental Work	$	24,100
11	State Furnished	$	4,900
12	Contingencies	$	102,000
13	Overhead	$	-

TOTAL ROADWAY ITEMS	$	611,900

Estimate Prepared By : ______________________
Name and Title — Date — Phone

Estimate Reviewed By : ______________________
Name and Title — Date — Phone

SECTION 1: EARTHWORK

Item code		Unit	Quantity		Unit Price ($)		Cost
160101	Clearing & Grubbing	AC	0.3	x	1,725	=	$0
170101	Develop Water Supply	LS	1	x	3,000	=	$3,000
190101	Roadway Excavation	CY	200	x	29	=	$5,720
190103	Roadway Excavation (Type Y) ADL	CY		x		=	$0
190105	Roadway Excavation (Type Z-2) ADL	CY		x		=	$0
192037	Structure Excavation (Retaining Wall)	CY		x		=	$0
193013	Structure Backfill (Retaining Wall)	CY		x		=	$0
193031	Pervious Backfill Material (Retaining Wall)	CY		x		=	$0
194001	Ditch Excavation	CY		x		=	$0
198001	Impored Borrow	CY	553	x	17	=	$9,125
198007	Imported Material (Shoulder Backing)	TON		x		=	$0
XXXXXX	Some Item			x		=	$0

TOTAL EARTHWORK SECTION ITEMS $ 17,900

SECTION 2: PAVEMENT STRUCTURAL SECTION

Item code		Unit	Quantity		Unit Price ($)			Cost
150771	Remove Asphalt Concrete Dike	LF		x		=	$	-
150860	Remove Base and Surfacing	CY		x		=	$	-
153103	Cold Plane Asphalt Concrete Pavement	SQYD	0	x	8	=	$	-
150854	Remove Concrete Pavement	CY	0	x	156	=	$	-
260201	Class 4 Aggregate Base	CY	387	x	61	=	$	23,414
250401	Class 4 Aggregate Subbase	CY	443	x	38	=	$	16,834
290201	Asphalt Treated Permeable Base	CY	138	x	160	=	$	22,080
365001	Sand Cover	TON		x		=	$	-
374002	Asphaltic Emulsion (Fog Seal Coat)	TON		x		=	$	-
374492	Asphaltic Emulsion (Polymer Modified)	TON		x		=	$	-
3750XX	Screenings (Type XX)	TON		x		=	$	-
377501	Slurry Seal	TON		x		=	$	-
390095	Replace Asphalt Concrete Surfacing	CY		x		=	$	-
390132	Hot Mix Asphalt (Type A)	TON		x		=	$	-
390136	Minor Hot Mix Asphalt	TON		x		=	$	-
390137	Rubberized Hot Mix Asphalt (Gap Graded)	TON		x		=	$	-
393003	Geosynthetic Pavement Interlayer	SQYD		x		=	$	-
39405X	Shoulder Rumber Strip *(HMA, Type XX Inden*	STA		x		=	$	-
394071	Place Hot Mix Asphalt Dike	LF		x		=	$	-
394090	Place Hot Mix Asphalt (Misc. Area)	SQYD		x		=	$	-
397005	Tack Coat	TON		x		=	$	-
400050	Continuously Reinfored Concrete Pavement	CY	415	x	300	=	$	124,500
401108	Replace Concrete Pavement (Rapid Strength	CY		x		=	$	-
404092	Seal Pavement Joint	LF		x		=	$	-
404094	Seal Longitudinal Isolation Joint	LF		x		=	$	-
413112A	Repair Spalled Joints (Polyester Grout)	SQYD		x		=	$	-
413115	Seal Existing Concrete Pavement Joint	LF		x		=	$	-
420102	Groove Existing Concrete Pavement	SQYD		x		=	$	-
420201	Grind Existing Concrete Pavement	SQYD		x		=	$	-
731502	Minor Concrete (Misc. Const)	CY		x		=	$	-
731530	Minor Concrete (Textured Paving)	SQFT		x		=	$	-
XXXXXX	Some Item			x		=	$	-

TOTAL STRUCTURAL SECTION ITEMS $ 186,900

SECTION 3: DRAINAGE

Item code		Unit	Quantity		Unit Price ($)			Cost
150206	Abandon Culvert	LF		x		=	$	-
150805	Remove Culvert	LF		x		=	$	-
150820	Modify Inlet	EA		x		=	$	-
152430	Adjust Inlet	LF		x		=	$	-
155003	Cap Inlet	EA		x		=	$	-
193114	Sand Backfill	CY		x		=	$	-
510502	Minor Concrete (Minor Structure)	CY		x		=	$	-
510512	Minor Concrete (Box Culvert)	CY		x		=	$	-
510XXX	Culvert (Roadway Crossing)	EA		x		=	$	-
62XXXX	XXX" APC Pipe	LF		x		=	$	-
64XXXX	XXX" Plastic Pipe	LF		x		=	$	-
65XXXX	XXX" RCP Pipe	LF		x		=	$	-
66XXXX	XXX" CSP Pipe	LF		x		=	$	-
680905	Underdrain (6" Alternative)	LF	0	x	36	=	$	-
681103	Edge Drain (3" Plastic Pipe)	LF	0	x	21	=	$	-
69XXXX	XXX" Pipe Downdrain	LF		x		=	$	-
70XXXX	XXX" Pipe Inlet	LF		x		=	$	-
70XXXX	XXX" Pipe Riser	LF		x		=	$	-
70XXXX	XXX" Flared End Section	EA		x		=	$	-
703233	Grated Line Drain	LF		x		=	$	-
72XXXX	Rock Slope Protection (Type and Method)	CY		x		=	$	-
721420	Concrete (Ditch Lining)	CY		x		=	$	-
721430	Concrete (Channel Lining)	CY		x		=	$	-
729010	Rock Slope Protection Fabric	SQYD		x		=	$	-
750001	Miscellaneous Iron and Steel	LB		x		=	$	-
XXXXXX	Additional Drainage (Detention Base, etc)	LS		x		=	$	-
XXXXXX	Some Item			x		=	$	-

TOTAL DRAINAGE ITEMS $ -

SECTION 4: SPECIALTY ITEMS

Item code		Unit	Quantity		Unit Price ($)			Cost
070012	Progress Schedule (Critical Path Method)	LS	0	x	30,000	=	$	-
150662	Remove Metal Beam Guard Railing	LF	0	x	15	=	$	-
150668	Remove Terminal Systems	EA		x		=	$	-
1532XX	Remove Concrete Barrier (25, 50 or 50C)	LF	0	x	16	=	$	-
153250	Remove Sound Wall	SQFT	0	x	25	=	$	-
150606	Remove Fence (BW)	LF		x		=	$	-
190110	Lead Compliance Plan	LS	0	x	18,000	=	$	-
49XXXX	CIDH Concrete Piling *(Insert Diameter)*	LF		x		=	$	-
510060	Structural Concrete (Retaining Wall)	CY		x		=	$	-
510133	Class 2 Concrete (Retaining Wall)	CY		x		=	$	-
510XXX	Retaining Wall (MSE)	SQFT	0	x	85	=	$	-
XXXXXX	Sound Wall (On Pile, On Barrier or On Ret. Wall)	SQFT	0	x	40	=	$	-
5110XX	Architectural Treatment *(Insert Type)*	SQFT		x		=	$	-
511048	Apply Anti-Graffiti Coating	SQFT		x		=	$	-
5136XX	Reinforced Concrete Crib Wall *(Insert Type)*	SQFT		x		=	$	-
518002	Sound Wall (Masonry Block)	SQFT		x		=	$	-
520103	Bar Reinf. Steel (Retaining Wall)	LB		x		=	$	-
800007	Fence (BW)	LF		x		=	$	-
832001	Metal Beam Guard Railing	LF	0	x	47	=	$	-
839310	Double Thrie Beam Barrier	LF		x		=	$	-
839521	Cable Railing	LF		x		=	$	-
83954X	Transition Railing *(Insert Type)*	EA		x		=	$	-
8395XX	Terminal System (Type CAT)	EA		x		=	$	-
8395XX	Alternative Flared Terminal System	EA	0	x	1,200	=	$	-
8395XX	End Anchor Assembly (*Insert Type*)	EA		x		=	$	-
839561	Rail Tensioning Assembly	EA		x		=	$	-
839596	Crash Cushion *(G.R.E.A.T)*	EA		x		=	$	-
839701	Concrete Barrier *(50 or 60)*	LF	3,085	x	78	=	$	240,630
833128	Concrete Barrier *(25 Modify)*	LF	0	x	128	=	$	-
XXXXXX	Some Item			x		=	$	-

TOTAL SPECIALTY ITEMS $ 240,700

SECTION 5: ENVIRONMENTAL

5A - ENVIRONMENTAL MITIGATION

Item code		Unit	Quantity		Unit Price ($)			Cost
XXXXXX	Biological Mitigation	LS		x		=	$	-
071325	Temporary Reinforced Silt Fence	LF		x		=	$	-
XXXXXX	Hazardous Material Remediation	LS	0	x	45,000	=	$	-
XXXXXX	Permits	LS	0	x	45,000	=	$	-
071325	Temporary Fence (Type ESA)	LF		x		=	$	-

Subtotal Environmental $ -

5B - LANDSCAPE AND IRRIGATION

Item code		Unit	Quantity		Unit Price ($)			Cost
200001	Highway Planting	ACRE		x		=	$	-
20XXXX	XXX" (*Insert Type*) Conduit *(Use for Irrigation x-*	LF		x		=	$	-
20XXXX	Extend XXX" *(Insert Type)* Conduit	LF		x		=	$	-
201700	Imported Topsoil	CY		x		=	$	-
203015	Erosion Control	ACRE		x		=	$	-
203021	Fiber Rolls	LF		x		=	$	-
203026	Move In/ Move Out (Erosion Control)	EA		x		=	$	-
204099	Plant Establishment Work	LS		x		=	$	-
204101	Extend Plant Establishment (X Years)	LS		x		=	$	-
208000	Irrigation System	LS		x		=	$	-
208304	Water Meter	EA		x		=	$	-
209801	Maintenance Vehicle Pullout	EA		x		=	$	-
XXXXXX	Some Item							

Subtotal Landscape and Irrigation $ -

5C - NPDES

Item code		Unit	Quantity		Unit Price ($)			Cost
074016	Construction Site Management	LS	0	x	450,000	=	$	-
074017	Prepare WPCP	LS	0	x	10,000	=	$	-
074019	Prepare SWPPP	LS	0	x	10,000	=	$	-
074023	Temporary Erosion Control	ACRE	0	x	2,500	=	$	-
074027	Temporary Erosion Control Blanket	SQYD		x		=	$	-
074028	Temporary Fiber Roll	LF		x		=	$	-
074032	Temporary Concrete Washout Facility	EA		x		=	$	-
074033	Temporary Construction Entrance	EA		x		=	$	-
074035	Temporary Check Dam	LF		x		=	$	-
074037	Move In/ Move Out (Temp Erosion Control)	EA		x		=	$	-
074038	Temp. Drainage Inlet Protection	EA	0	x	60	=	$	-
XXXXXX	Site Job Management	LS	0	x	450,000	=	$	-
074042	Temporary Concrete Washout (Portable)	LS		x		=	$	-
XXXXXX	Some Item			x		=	$	-

Supplemental Work for NPDES

(These costs are not accounted in total here but under Supplemental Work on sheet 7 of 11).

074021	Water Pollution Control Maintenance Work*	LS	0	x	25,500	=	$	-
066596	Additional Water Pollution Control**	LS		x		=	$	-
066597	Storm Water Sampling and Analysis***	LS		x		=	$	-
XXXXXX	Some Item							

Subtotal NPDES (Without Supplemental Work) $ -

*Applies to all SWPPPs and those WPCPs with sediment control or soil stabilization BMPs.

**Applies to both SWPPPs and WPCP projects.

*** Applies only to project with SWPPPs.

TOTAL ENVIRONMENTAL $ -

SECTION 6: TRAFFIC ITEMS

6A - Traffic Electrical

Item code		Unit	Quantity		Unit Price ($)			Cost
150760	Remove Sign Structure	EA		x		=	$	-
151581	Reconstruct Sign Structure	EA		x		=	$	-
152641	Modify Sign Structure	EA		x		=	$	-
5602XX	Furnish Sign Structure	LB		x		=	$	-
5602XX	Install Sign Structure	LB		x		=	$	-
56XXXX	XXX" CIDHC Pile (Sign Foundation)	LF		x		=	$	-
56XXXX	Install Overhead Sign (Two Post)	EA	0	x	400,000	=	$	-
56XXXX	Install Overhead Sign (One Post)	EA	0	x	160,000	=	$	-
860090	Maintain Existing Traffic Management System	LS	0	x	900,000	=	$	-
860810	Inductive Loop Detectors	EA		x		=	$	-
86055X	Lighting & Sign Illumination	EA	0	x	4,000	=	$	-
8607XX	Interconnection Facilities	LS		x		=	$	-
8609XX	Traffic Traffic Monitoring Stations	LS	0	x	200,000	=	$	-
860XXX	Signals & Lighting	LS		x		=	$	-
860XXX	ITS Elements	LS		x		=	$	-
861100	Ramp Metering System (Location X)	LS		x		=	$	-
86XXXX	Fiber Optic Conduit System	LS		x		=	$	-
XXXXXX	Ramp Terminal Intersection Improvement	LS	0	x	1,000,000	=	$	-
XXXXXX	Toll Equipment and System Integration (Capital)	LS	0	x	100,000,000	=	$	-
XXXXX	Some Item							

Subtotal Traffic Electrical *$ -*

6B - Traffic Signing and Striping

Item code		Unit	Quantity		Unit Price ($)			Cost
120090	Construction Area Signs	LS	0	x	900,000	=	$	-
150701	Remove Yellow Painted Traffic Stripe	LF	0	x	4	=	$	-
150710	Remove Traffic Stripe	LF	0	x	0.25	=	$	-
150713	Remove Pavement Marking	SQFT		x		=	$	-
150742	Remove Roadside Sign	EA	0	x	120	=	$	-
15075X	Remove Sign Structure	EA	0	x	20,000	=	$	-
15075X	Remove Sign Structure (On Bridge)	EA	0	x	5,000	=	$	-
152320	Reset Roadside Sign	EA		x		=	$	-
152390	Relocate Roadside Sign	EA		x		=	$	-
566011	Roadside Sign (One Post)	EA	0	x	340	=	$	-
566012	Roadside Sign (Two Post)	EA	0	x	1,250	=	$	-
560XXX	Furnish Sign Panels	SQFT		x		=	$	-
560XXX	Install Sign Panels	SQFT		x		=	$	-
82010X	Delineator (Class X)	EA		x		=	$	-
84XXXX	Permanent Pavement Delineation	LS	1	x	10,000	=	$	10,000
840504	Thermoplastic Traffic Strip (4")	LF	5,000	x	0.50	=	$	2,500

Subtotal Traffic Signing and Striping *$ 12,500*

6C - Stage Construction and Traffic Handling

Item code		Unit	Quantity		Unit Price ($)			Cost
120100	Traffic Control System	LS	0	x	4,000,000	=	$	-
120120	Type III Barricade	EA		x		=	$	-
120143	Temporary Pavement Delineation	LF		x		=	$	-
120149	Temporary Pavement Marking (Paint)	LS	0	x	90,000	=	$	-
120159	Temporary Traffic Strip (Paint)	LS	0	x	90,000	=	$	-
12016X	Channelizer	EA		x		=	$	-
128650	Portable Changeable Message Signs	EA	0	x	10,000	=	$	-
129000	Temporary Railing (Type K)	LF	0	x	17	=	$	-
129100	Temp. Crash Cushion Module	EA	0	x	200	=	$	-
129099A	Traffic Plastic Drum	EA		x		=	$	-
839603A	Temporary Crash Cushion (ADIEM)	EA		x		=	$	-
XXXXXX	Misc. Items (Traffic Management Plan)	LS	0	x	180,000	=	$	-
XXXXXX	Some Item	LS		x		=	$	-

Subtotal Stage Construction and Traffic Handling *$ -*

TOTAL TRAFFIC ITEMS $ 12,500

SECTION 7: DETOURS

Include constructing, maintaining, and removal

Item code		Unit	Quantity		Unit Price ($)		Cost
0713XX	Temporary Fence (Type X)	LF		x		=	$ -
07XXXX	Temporary Drainage	LS		x		=	$ -
120143	Temporary Pavement Delineation	LF		x		=	$ -
1286XX	Temporary Signals	EA		x		=	$ -
129000	Temporary Railing (Type K)	LF		x		=	$ -
190101	Roadway Excavation	CY		x		=	$ -
198001	Imported Borrow	CY		x		=	$ -
198050	Embankment	CY		x		=	$ -
250401	Class 4 Aggregate Subbase	CY		x		=	$ -
260201	Class 2 Aggregate Base	CY		x		=	$ -
390132	Hot Mix Asphalt (Type A)	TON		x		=	$ -
XXXXXX	Some Item	LS	0	x	$150,000	=	$ -

TOTAL DETOURS $ -

SUBTOTAL SECTIONS 1-7 $ 458,000

SECTION 8: MINOR ITEMS

8A - Americans with Disabilities Act Items					
ADA Items					$ -
8B - Bike Path Items					
Bike Path Items					$ -
8C - Other Minor Items					
Other Minor Items			5.0%		$ 22,900
Total of Section 1-7	$ 458,000	x	5.0%	=	$ 22,900

TOTAL MINOR ITEMS $ 22,900

SECTIONS 9: MOBILIZATION

Item code						
999990	Total Section 1-8	$ 480,900	x	0%	=	$ -

TOTAL MOBILIZATION $ -

SECTION 10: SUPPLEMENTAL WORK

Item code		Unit	Quantity		Unit Price ($)		Cost
066015	Federal Trainee Program	LS		x		=	$ -
066063	Traffic Management Plan - Public Information	LS		x		=	$ -
066090	Maintain Traffic	LS		x		=	$ -
066094	Value Analysis	LS		x		=	$ -
066204	Remove Rock & Debris	LS		x		=	$ -
066222	Locate Existing Cross-Over	LS		x		=	$ -
066670	Payment Adjustments For Price Index Fluctuations	LS		x		=	$ -
066700	Partnering	LS		x		=	$ -
066866	Operation of Existing Traffic Management System Eler	LS		x		=	$ -
066920	Dispute Review Board	LS		x		=	$ -
066XXX	Some Item	LS		x		=	$ -

Cost of ***NPDES*** *Supplemental Work specified in Section 5C* = $ -

Total Section 1-8	$ 480,900	5%	=	$ 24,045

TOTAL SUPPLEMENTAL WORK $ 24,100

Note: Mobilization item will automatically calculate if working days are 50 or more. For Project less than 50 Working Days Mobilization is not required as a separate contract, however contract item prices should take into consideration mobilization as part of the price. If the building portion of the project is greater than 50% of the total project cost,

If the building portion of the project is greater than 50% of the total project cost, then mobilization is not included.

SECTION 11: STATE FURNISHED MATERIALS AND EXPENSES

Item code		Unit	Quantity		Unit Price ($)		Cost
066063	Public Information	LS	0	x	$100,000	=	$0
066105	RE Office	LS	0	x	$400,000	=	$0
066803	Padlocks	LS		x		=	$0
066838	Reflective Numbers and Edge Sealer	LS		x		=	$0
066901	Water Expenses	LS		x		=	$0
066062A	COZEEP Expenses	LS		x		=	$0
06684X	Ramp Meter Controller Assembly	LS		x		=	$0
XXXXXX	Toll Back Office System	LS	0	x	$1,700,000	=	$0
06684X	TMS Controller Assembly	LS	0	x	$2,000,000	=	$0
06684X	Traffic Signal Controller Assembly	LS		x		=	$0
XXXXXX	Some Item						
	Total Section 1-8	$	480,900		1%	=	$ 4,809

TOTAL STATE FURNISHED	$4,900

SECTION 12: TIME-RELATED OVERHEAD

Estimated Time-Releated Overhead (TRO) Percentage (0% to 10%) = 0%

Item code		Unit	Quantity		Unit Price ($)		Cost	
			Total of All Contract Items Only			$	480,900	(used to calculate TR
070018	Time-Related Overhead	$	480,900	X	0%	=	$0	

TOTAL TIME-RELATED OVERHEAD	$0

SECTION 13: CONTINGENCY

Total Section 1-12	$	509,900	x	20%	=	$101,980

TOTAL CONTINGENCY	$102,000

Note: TRO is a contract item if total project cost is (non-escalated) over $5 million AND 100 or more working days.
If the building portion of the project is greater than 50% of the total project cost, then TRO is not included.
TRO calculated for you as percentage of the sum of all contract items only;
excluding mobilization, supplemental work, state furnished materials and expenses, and contingency.

Engineer Cost Estimate --- Stevens Creek Blvd CrossOver Station Extra
Preliminary Project Study Report

Project ID: XXXXXX

Type of Estimate :	Preliminary Project Study Report (Dec 2019)
Program Code :	04-XXXXX
Project Limits :	From Hwy 101 Interchange in Santa Jose to South of Hwy 101 Interchange in Mt. View
Description:	From PM 0.00 to PM 23.68
Scope :	Construct Extra SR 85 Highway Widening for Crossover Station at Stevens Creek Blvd
Alternative :	Alternative 3-1 or 3-5

	Current Cost		Escalated Cost	
ROADWAY ITEMS	$	914,800		
STRUCTURE ITEMS	$	-	$	-
SUBTOTAL CONSTRUCTION COST	$	914,800		
RIGHT OF WAY	$	-	$	-
TOTAL CAPITAL OUTLAY COST	$	915,000		
PR/ED SUPPORT (3%)	$	28,000		
PS&E SUPPORT (12%)	$	110,000		
RIGHT OF WAY SUPPORT				
CONSTRUCTION SUPPORT (12%)	$	110,000		
AGENCY SUPPORT (8%)	$	74,000		
TOTAL CAPITAL OUTLAY SUPPORT COST*	$	322,000		
TOTAL PROJECT COST	$	1,237,000		

If Project has been programmed enter Programmed Amount

	Month	/	Year
Date of Estimate (Month/Year)	12	/	2019
Estimated Date of Construction Start (Month/Year)	10	/	2023
Number of Working Days	90		Working Days
Estimated Mid-Point of Construction (Month/Year)	12	/	2023
Number of Plant Establishment Days			Days

Estimated Project Schedule

PID Approval
PA/ED Approval
PS&E
RTL
Begin Construction

Approved by Project Manager

Project Manager	Date	Phone

I. ROADWAY ITEMS SUMMARY

	Section		Cost
1	Earthwork	$	25,000
2	Pavement Structural Section	$	293,000
3	Drainage	$	-
4	Specialty Items	$	352,000
5	Environmental	$	-
6	Traffic Items	$	14,800
7	Detours	$	-
8	Minor Items	$	34,300
9	Roadway Mobilization	$	-
10	Supplemental Work	$	36,000
11	State Furnished	$	7,200
12	Contingencies	$	152,500
13	Overhead	$	-

TOTAL ROADWAY ITEMS	$	914,800

Estimate Prepared By :

Name and Title Date Phone

Estimate Reviewed By :

Name and Title Date Phone

SECTION 1: EARTHWORK

Item code		Unit	Quantity		Unit Price ($)		Cost
160101	Clearing & Grubbing	AC	0.6	x	1,725	=	$1,725
170101	Develop Water Supply	LS	1	x	3,000	=	$3,000
190101	Roadway Excavation	CY	150	x	29	=	$4,290
190103	Roadway Excavation (Type Y) ADL	CY		x		=	$0
190105	Roadway Excavation (Type Z-2) ADL	CY		x		=	$0
192037	Structure Excavation (Retaining Wall)	CY		x		=	$0
193013	Structure Backfill (Retaining Wall)	CY		x		=	$0
193031	Pervious Backfill Material (Retaining Wall)	CY		x		=	$0
194001	Ditch Excavation	CY		x		=	$0
198001	Impored Borrow	CY	963	x	17	=	$15,890
198007	Imported Material (Shoulder Backing)	TON		x		=	$0
XXXXXX	Some Item			x		=	$0

TOTAL EARTHWORK SECTION ITEMS $ 25,000

SECTION 2: PAVEMENT STRUCTURAL SECTION

Item code		Unit	Quantity		Unit Price ($)			Cost
150771	Remove Asphalt Concrete Dike	LF		x		=	$	-
150860	Remove Base and Surfacing	CY		x		=	$	-
153103	Cold Plane Asphalt Concrete Pavement	SQYD	0	x	8	=	$	-
150854	Remove Concrete Pavement	CY	0	x	156	=	$	-
260201	Class 4 Aggregate Base	CY	525	x	61	=	$	31,763
250401	Class 4 Aggregate Subbase	CY	175	x	38	=	$	6,650
290201	Asphalt Treated Permeable Base	CY	55	x	160	=	$	8,800
365001	Sand Cover	TON		x		=	$	-
374002	Asphaltic Emulsion (Fog Seal Coat)	TON		x		=	$	-
374492	Asphaltic Emulsion (Polymer Modified)	TON		x		=	$	-
3750XX	Screenings (Type XX)	TON		x		=	$	-
377501	Slurry Seal	TON		x		=	$	-
390095	Replace Asphalt Concrete Surfacing	CY		x		=	$	-
390132	Hot Mix Asphalt (Type A)	TON		x		=	$	-
390136	Minor Hot Mix Asphalt	TON		x		=	$	-
390137	Rubberized Hot Mix Asphalt (Gap Graded)	TON		x		=	$	-
393003	Geosynthetic Pavement Interlayer	SQYD		x		=	$	-
39405X	Shoulder Rumber Strip *(HMA, Type XX Indent*	STA		x		=	$	-
394071	Place Hot Mix Asphalt Dike	LF		x		=	$	-
394090	Place Hot Mix Asphalt (Misc. Area)	SQYD		x		=	$	-
397005	Tack Coat	TON		x		=	$	-
400050	Continuously Reinfored Concrete Pavement	CY	387	x	300	=	$	116,100
401108	Replace Concrete Pavement (Rapid Strength	CY		x		=	$	-
404092	Seal Pavement Joint	LF		x		=	$	-
404094	Seal Longitudinal Isolation Joint	LF		x		=	$	-
413112A	Repair Spalled Joints (Polyester Grout)	SQYD		x		=	$	-
413115	Seal Existing Concrete Pavement Joint	LF		x		=	$	-
420102	Groove Existing Concrete Pavement	SQYD		x		=	$	-
420201	Grind Existing Concrete Pavement	SQYD		x		=	$	-
731502	Minor Concrete (Misc. Const)	CY		x		=	$	-
730010	Minor Concrete (Curb)	LF	2,700	x	48	=	$	129,600
731530	Minor Concrete (Textured Paving)	SQFT		x		=	$	-
XXXXXX	Some Item			x		=	$	-

TOTAL STRUCTURAL SECTION ITEMS $ 293,000

SECTION 3: DRAINAGE

Item code		Unit	Quantity		Unit Price ($)			Cost
150206	Abandon Culvert	LF		x		=	$	-
150805	Remove Culvert	LF		x		=	$	-
150820	Modify Inlet	EA		x		=	$	-
152430	Adjust Inlet	LF		x		=	$	-
155003	Cap Inlet	EA		x		=	$	-
193114	Sand Backfill	CY		x		=	$	-
510502	Minor Concrete (Minor Structure)	CY		x		=	$	-
510512	Minor Concrete (Box Culvert)	CY		x		=	$	-
510XXX	Culvert (Roadway Crossing)	EA		x		=	$	-
62XXXX	XXX" APC Pipe	LF		x		=	$	-
64XXXX	XXX" Plastic Pipe	LF		x		=	$	-
65XXXX	XXX" RCP Pipe	LF		x		=	$	-
66XXXX	XXX" CSP Pipe	LF		x		=	$	-
680905	Underdrain (6" Alternative)	LF	0	x	36	=	$	-
681103	Edge Drain (3" Plastic Pipe)	LF	0	x	21	=	$	-
69XXXX	XXX" Pipe Downdrain	LF		x		=	$	-
70XXXX	XXX" Pipe Inlet	LF		x		=	$	-
70XXXX	XXX" Pipe Riser	LF		x		=	$	-
70XXXX	XXX" Flared End Section	EA		x		=	$	-
703233	Grated Line Drain	LF		x		=	$	-
72XXXX	Rock Slope Protection (Type and Method)	CY		x		=	$	-
721420	Concrete (Ditch Lining)	CY		x		=	$	-
721430	Concrete (Channel Lining)	CY		x		=	$	-
729010	Rock Slope Protection Fabric	SQYD		x		=	$	-
750001	Miscellaneous Iron and Steel	LB		x		=	$	-
XXXXXX	Additional Drainage (Detention Base, etc)	LS		x		=	$	-
XXXXXX	Some Item			x		=	$	-

TOTAL DRAINAGE ITEMS $ -

SECTION 4: SPECIALTY ITEMS

Item code		Unit	Quantity		Unit Price ($)			Cost
070012	Progress Schedule (Critical Path Method)	LS	0	x	30,000	=	$	-
150662	Remove Metal Beam Guard Railing	LF	0	x	15	=	$	-
150668	Remove Terminal Systems	EA		x		=	$	-
1532XX	Remove Concrete Barrier (25, 50 or 50C)	LF	0	x	16	=	$	-
153250	Remove Sound Wall	SQFT	0	x	25	=	$	-
150606	Remove Fence (BW)	LF		x		=	$	-
190110	Lead Compliance Plan	LS	0	x	18,000	=	$	-
49XXXX	CIDH Concrete Piling *(Insert Diameter)*	LF		x		=	$	-
510060	Structural Concrete (Retaining Wall)	CY		x		=	$	-
510133	Class 2 Concrete (Retaining Wall)	CY		x		=	$	-
510XXX	Retaining Wall (MSE)	SQFT	0	x	85	=	$	-
XXXXXX	Sound Wall (On Pile, On Barrier or On Ret. Wall)	SQFT	0	x	40	=	$	-
5110XX	Architectural Treatment *(Insert Type)*	SQFT		x		=	$	-
511048	Apply Anti-Graffiti Coating	SQFT		x		=	$	-
5136XX	Reinforced Concrete Crib Wall *(Insert Type)*	SQFT		x		=	$	-
518002	Sound Wall (Masonry Block)	SQFT		x		=	$	-
520103	Bar Reinf. Steel (Retaining Wall)	LB		x		=	$	-
800007	Fence (BW)	LF		x		=	$	-
832001	Metal Beam Guard Railing	LF	0	x	47	=	$	-
839310	Double Thrie Beam Barrier	LF		x		=	$	-
839521	Cable Railing	LF		x		=	$	-
83954X	Transition Railing *(Insert Type)*	EA		x		=	$	-
8395XX	Terminal System (Type CAT)	EA		x		=	$	-
8395XX	Alternative Flared Terminal System	EA	0	x	1,200	=	$	-
8395XX	End Anchor Assembly (*Insert Type*)	EA		x		=	$	-
839561	Rail Tensioning Assembly	EA		x		=	$	-
839596	Crash Cushion *(G.R.E.A.T)*	EA		x		=	$	-
839701	Concrete Barrier *(50 or 60)*	LF	4,512	x	78	=	$	351,936
833128	Concrete Barrier *(25 Modify)*	LF	0	x	128	=	$	-
XXXXXX	Some Item			x		=	$	-

TOTAL SPECIALTY ITEMS $ 352,000

SECTION 5: ENVIRONMENTAL

5A - ENVIRONMENTAL MITIGATION

Item code		Unit	Quantity		Unit Price ($)			Cost
XXXXXX	Biological Mitigation	LS		x		=	$	-
071325	Temporary Reinforced Silt Fence	LF		x		=	$	-
XXXXXX	Hazardous Material Remediation	LS	0	x	45,000	=	$	-
XXXXXX	Permits	LS	0	x	45,000	=	$	-
071325	Temporary Fence (Type ESA)	LF		x		=	$	-

Subtotal Environmental $ -

5B - LANDSCAPE AND IRRIGATION

Item code		Unit	Quantity		Unit Price ($)			Cost
200001	Highway Planting	ACRE		x		=	$	-
20XXXX	XXX" (*Insert Type*) Conduit *(Use for Irrigation x-*	LF		x		=	$	-
20XXXX	Extend XXX" *(Insert Type)* Conduit	LF		x		=	$	-
201700	Imported Topsoil	CY		x		=	$	-
203015	Erosion Control	ACRE		x		=	$	-
203021	Fiber Rolls	LF		x		=	$	-
203026	Move In/ Move Out (Erosion Control)	EA		x		=	$	-
204099	Plant Establishment Work	LS		x		=	$	-
204101	Extend Plant Establishment (X Years)	LS		x		=	$	-
208000	Irrigation System	LS		x		=	$	-
208304	Water Meter	EA		x		=	$	-
209801	Maintenance Vehicle Pullout	EA		x		=	$	-
XXXXXX	Some Item							

Subtotal Landscape and Irrigation $ -

5C - NPDES

Item code		Unit	Quantity		Unit Price ($)			Cost
074016	Construction Site Management	LS	0	x	450,000	=	$	-
074017	Prepare WPCP	LS	0	x	10,000	=	$	-
074019	Prepare SWPPP	LS	0	x	10,000	=	$	-
074023	Temporary Erosion Control	ACRE	0	x	2,500	=	$	-
074027	Temporary Erosion Control Blanket	SQYD		x		=	$	-
074028	Temporary Fiber Roll	LF		x		=	$	-
074032	Temporary Concrete Washout Facility	EA		x		=	$	-
074033	Temporary Construction Entrance	EA		x		=	$	-
074035	Temporary Check Dam	LF		x		=	$	-
074037	Move In/ Move Out (Temp Erosion Control)	EA		x		=	$	-
074038	Temp. Drainage Inlet Protection	EA	0	x	60	=	$	-
XXXXXX	Site Job Management	LS	0	x	450,000	=	$	-
074042	Temporary Concrete Washout (Portable)	LS		x		=	$	-
XXXXXX	Some Item			x		=	$	-

Supplemental Work for NPDES

(These costs are not accounted in total here but under Supplemental Work on sheet 7 of 11).

074021	Water Pollution Control Maintenance Work*	LS	0	x	25,500	=	$	-
066596	Additional Water Pollution Control**	LS		x		=	$	-
066597	Storm Water Sampling and Analysis***	LS		x		=	$	-
XXXXXX	Some Item							

Subtotal NPDES (Without Supplemental Work) $ -

*Applies to all SWPPPs and those WPCPs with sediment control or soil stabilization BMPs.

**Applies to both SWPPPs and WPCP projects.

*** Applies only to project with SWPPPs.

TOTAL ENVIRONMENTAL $ -

SECTION 6: TRAFFIC ITEMS

6A - Traffic Electrical

Item code		Unit	Quantity		Unit Price ($)			Cost
150760	Remove Sign Structure	EA		x		=	$	-
151581	Reconstruct Sign Structure	EA		x		=	$	-
152641	Modify Sign Structure	EA		x		=	$	-
5602XX	Furnish Sign Structure	LB		x		=	$	-
5602XX	Install Sign Structure	LB		x		=	$	-
56XXXX	XXX" CIDHC Pile (Sign Foundation)	LF		x		=	$	-
56XXXX	Install Overhead Sign (Two Post)	EA	0	x	400,000	=	$	-
56XXXX	Install Overhead Sign (One Post)	EA	0	x	160,000	=	$	-
860090	Maintain Existing Traffic Management System	LS	0	x	900,000	=	$	-
860810	Inductive Loop Detectors	EA		x		=	$	-
86055X	Lighting & Sign Illumination	EA	0	x	4,000	=	$	-
8607XX	Interconnection Facilities	LS		x		=	$	-
8609XX	Traffic Traffic Monitoring Stations	LS	0	x	200,000	=	$	-
860XXX	Signals & Lighting	LS		x		=	$	-
860XXX	ITS Elements	LS		x		=	$	-
861100	Ramp Metering System (Location X)	LS		x		=	$	-
86XXXX	Fiber Optic Conduit System	LS		x		=	$	-
XXXXXX	Ramp Terminal Intersection Improvement	LS	0	x	1,000,000	=	$	-
XXXXXX	Toll Equipment and System Integration (Capital)	LS	0	x	100,000,000	=	$	-
XXXXX	Some Item							

Subtotal Traffic Electrical *$ -*

6B - Traffic Signing and Striping

Item code		Unit	Quantity		Unit Price ($)			Cost
120090	Construction Area Signs	LS	0	x	900,000	=	$	-
150701	Remove Yellow Painted Traffic Stripe	LF	0	x	4	=	$	-
150710	Remove Traffic Stripe	LF	0	x	0.25	=	$	-
150713	Remove Pavement Marking	SQFT		x		=	$	-
150742	Remove Roadside Sign	EA	0	x	120	=	$	-
15075X	Remove Sign Structure	EA	0	x	20,000	=	$	-
15075X	Remove Sign Structure (On Bridge)	EA	0	x	5,000	=	$	-
152320	Reset Roadside Sign	EA		x		=	$	-
152390	Relocate Roadside Sign	EA		x		=	$	-
566011	Roadside Sign (One Post)	EA	0	x	340	=	$	-
566012	Roadside Sign (Two Post)	EA	0	x	1,250	=	$	-
560XXX	Furnish Sign Panels	SQFT		x		=	$	-
560XXX	Install Sign Panels	SQFT		x		=	$	-
82010X	Delineator (Class X)	EA		x		=	$	-
84XXXX	Permanent Pavement Delineation	LS	1	x	10,000	=	$	10,000
840504	Thermoplastic Traffic Strip (4")	LF	9,450	x	0.50	=	$	4,725

Subtotal Traffic Signing and Striping *$ 14,725*

6C - Stage Construction and Traffic Handling

Item code		Unit	Quantity		Unit Price ($)			Cost
120100	Traffic Control System	LS	0	x	4,000,000	=	$	-
120120	Type III Barricade	EA		x		=	$	-
120143	Temporary Pavement Delineation	LF		x		=	$	-
120149	Temporary Pavement Marking (Paint)	LS	0	x	90,000	=	$	-
120159	Temporary Traffic Strip (Paint)	LS	0	x	90,000	=	$	-
12016X	Channelizer	EA		x		=	$	-
128650	Portable Changeable Message Signs	EA	0	x	10,000	=	$	-
129000	Temporary Railing (Type K)	LF	0	x	17	=	$	-
129100	Temp. Crash Cushion Module	EA	0	x	200	=	$	-
129099A	Traffic Plastic Drum	EA		x		=	$	-
839603A	Temporary Crash Cushion (ADIEM)	EA		x		=	$	-
XXXXXX	Misc. Items (Traffic Management Plan)	LS	0	x	180,000	=	$	-
XXXXXX	Some Item	LS		x		=	$	-

Subtotal Stage Construction and Traffic Handling *$ -*

TOTAL TRAFFIC ITEMS $ 14,800

SECTION 7: DETOURS

Include constructing, maintaining, and removal

Item code		Unit	Quantity		Unit Price ($)		Cost
0713XX	Temporary Fence (Type X)	LF		x		=	$ -
07XXXX	Temporary Drainage	LS		x		=	$ -
120143	Temporary Pavement Delineation	LF		x		=	$ -
1286XX	Temporary Signals	EA		x		=	$ -
129000	Temporary Railing (Type K)	LF		x		=	$ -
190101	Roadway Excavation	CY		x		=	$ -
198001	Imported Borrow	CY		x		=	$ -
198050	Embankment	CY		x		=	$ -
250401	Class 4 Aggregate Subbase	CY		x		=	$ -
260201	Class 2 Aggregate Base	CY		x		=	$ -
390132	Hot Mix Asphalt (Type A)	TON		x		=	$ -
XXXXXX	Some Item	LS	0	x	$150,000	=	$ -

TOTAL DETOURS $ -

SUBTOTAL SECTIONS 1-7 $ 684,800

SECTION 8: MINOR ITEMS

8A - Americans with Disabilities Act Items

ADA Items $ -

8B - Bike Path Items

Bike Path Items $ -

8C - Other Minor Items

Other Minor Items 5.0% $ 34,240

Total of Section 1-7 $ 684,800 x 5.0% = $ 34,240

TOTAL MINOR ITEMS $ 34,300

SECTIONS 9: MOBILIZATION

Item code							
999990	Total Section 1-8	$	719,100	x	0%	=	$ -

TOTAL MOBILIZATION $ -

SECTION 10: SUPPLEMENTAL WORK

Item code		Unit	Quantity		Unit Price ($)		Cost
066015	Federal Trainee Program	LS		x		=	$ -
066063	Traffic Management Plan - Public Information	LS		x		=	$ -
066090	Maintain Traffic	LS		x		=	$ -
066094	Value Analysis	LS		x		=	$ -
066204	Remove Rock & Debris	LS		x		=	$ -
066222	Locate Existing Cross-Over	LS		x		=	$ -
066670	Payment Adjustments For Price Index Fluctuations	LS		x		=	$ -
066700	Partnering	LS		x		=	$ -
066866	Operation of Existing Traffic Management System Eler	LS		x		=	$ -
066920	Dispute Review Board	LS		x		=	$ -
066XXX	Some Item	LS		x		=	$ -

*Cost of **NPDES** Supplemental Work specified in Section 5C* = $ -

Total Section 1-8 $ 719,100 5% = $ 35,955

TOTAL SUPPLEMENTAL WORK $ 36,000

Note: Mobilization item will automatically calculate if working days are 50 or more. For Project less than 50 Working Days Mobilization is not required as a separate contract, however contract item prices should take into consideration mobilization as part of the price. If the building portion of the project is greater than 50% of the total project cost,

If the building portion of the project is greater than 50% of the total project cost, then mobilization is not included.

SECTION 11: STATE FURNISHED MATERIALS AND EXPENSES

Item code		Unit	Quantity		Unit Price ($)		Cost
066063	Public Information	LS	0	x	$100,000	=	$0
066105	RE Office	LS	0	x	$400,000	=	$0
066803	Padlocks	LS		x		=	$0
066838	Reflective Numbers and Edge Sealer	LS		x		=	$0
066901	Water Expenses	LS		x		=	$0
066062A	COZEEP Expenses	LS		x		=	$0
06684X	Ramp Meter Controller Assembly	LS		x		=	$0
XXXXXX	Toll Back Office System	LS	0	x	$1,700,000	=	$0
06684X	TMS Controller Assembly	LS	0	x	$2,000,000	=	$0
06684X	Traffic Signal Controller Assembly	LS		x		=	$0
XXXXXX	Some Item						
	Total Section 1-8	$	719,100		1%	=	$ 7,191

TOTAL STATE FURNISHED $7,200

SECTION 12: TIME-RELATED OVERHEAD

Estimated Time-Releated Overhead (TRO) Percentage (0% to 10%) = 0%

Item code		Unit	Quantity		Unit Price ($)		Cost	
			Total of All Contract Items Only				$ 719,100	(used to calculate TR
070018	Time-Related Overhead	$	719,100	X	0%	=	$0	

TOTAL TIME-RELATED OVERHEAD $0

SECTION 13: CONTINGENCY

Total Section 1-12	$	762,300	x	20%	=	$152,460

TOTAL CONTINGENCY $152,500

Note: TRO is a contract item if total project cost is (non-escalated) over $5 million AND 100 or more working days.
If the building portion of the project is greater than 50% of the total project cost, then TRO is not included.
TRO calculated for you as percentage of the sum of all contract items only;
excluding mobilization, supplemental work, state furnished materials and expenses, and contingency.

Engineer Cost Estimate --- El Camino Real Split Station Extra
Preliminary Project Study Report

Project ID: XXXXXX

Type of Estimate : Preliminary Project Study Report (Dec 2019)
Program Code : 04-XXXXX
Project Limits : From Hwy 101 Interchange in Santa Jose to South of Hwy 101 Interchange in Mt. View
Description: From PM 0.00 to PM 23.68

Scope : Construct Extra SR 85 Highway Widening for Split Station at El Camino Real

Alternative : Alternative 3-1 or 3-5

	Current Cost		Escalated Cost	
ROADWAY ITEMS	$	1,149,000		
STRUCTURE ITEMS	$	-	$	-
SUBTOTAL CONSTRUCTION COST	$	1,149,000		
RIGHT OF WAY	$	-	$	-
TOTAL CAPITAL OUTLAY COST	$	1,149,000		
PR/ED SUPPORT (3%)	$	35,000		
PS&E SUPPORT (12%)	$	138,000		
RIGHT OF WAY SUPPORT				
CONSTRUCTION SUPPORT (12%)	$	138,000		
AGENCY SUPPORT (8%)	$	92,000		
TOTAL CAPITAL OUTLAY SUPPORT COST*	$	403,000		

TOTAL PROJECT COST	$	1,552,000

If Project has been programmed enter Programmed Amount

	Month	/	Year
Date of Estimate (Month/Year)	12	/	2019
Estimated Date of Construction Start (Month/Year)	10	/	2023
Number of Working Days	90		Working Days
Estimated Mid-Point of Construction (Month/Year)	12	/	2023
Number of Plant Establishment Days			Days

Estimated Project Schedule
PID Approval
PA/ED Approval
PS&E
RTL
Begin Construction

Approved by Project Manager

Project Manager	**Date**	**Phone**

I. ROADWAY ITEMS SUMMARY

	Section		Cost
1	Earthwork	$	42,600
2	Pavement Structural Section	$	599,000
3	Drainage	$	-
4	Specialty Items	$	206,000
5	Environmental	$	-
6	Traffic Items	$	12,500
7	Detours	$	-
8	Minor Items	$	43,100
9	Roadway Mobilization	$	-
10	Supplemental Work	$	45,200
11	State Furnished	$	9,100
12	Contingencies	$	191,500
13	Overhead	$	-

TOTAL ROADWAY ITEMS	**$**	**1,149,000**

Estimate Prepared By : ______________________
Name and Title Date Phone

Estimate Reviewed By : ______________________
Name and Title Date Phone

SECTION 1: EARTHWORK

Item code		Unit	Quantity		Unit Price ($)		Cost
160101	Clearing & Grubbing	AC	1.1	x	1,725	=	$1,725
170101	Develop Water Supply	LS	1	x	3,000	=	$3,000
190101	Roadway Excavation	CY	300	x	29	=	$8,580
190103	Roadway Excavation (Type Y) ADL	CY		x		=	$0
190105	Roadway Excavation (Type Z-2) ADL	CY		x		=	$0
192037	Structure Excavation (Retaining Wall)	CY		x		=	$0
193013	Structure Backfill (Retaining Wall)	CY		x		=	$0
193031	Pervious Backfill Material (Retaining Wall)	CY		x		=	$0
194001	Ditch Excavation	CY		x		=	$0
198001	Impored Borrow	CY	1,774	x	17	=	$29,271
198007	Imported Material (Shoulder Backing)	TON		x		=	$0
XXXXXX	Some Item			x		=	$0

TOTAL EARTHWORK SECTION ITEMS $ 42,600

SECTION 2: PAVEMENT STRUCTURAL SECTION

Item code		Unit	Quantity		Unit Price ($)			Cost
150771	Remove Asphalt Concrete Dike	LF		x		=	$	-
150860	Remove Base and Surfacing	CY		x		=	$	-
153103	Cold Plane Asphalt Concrete Pavement	SQYD	0	x	8	=	$	-
150854	Remove Concrete Pavement	CY	0	x	156	=	$	-
260201	Class 4 Aggregate Base	CY	1,242	x	61	=	$	75,141
250401	Class 4 Aggregate Subbase	CY	1,419	x	38	=	$	53,922
290201	Asphalt Treated Permeable Base	CY	443	x	160	=	$	70,880
365001	Sand Cover	TON		x		=	$	-
374002	Asphaltic Emulsion (Fog Seal Coat)	TON		x		=	$	-
374492	Asphaltic Emulsion (Polymer Modified)	TON		x		=	$	-
3750XX	Screenings (Type XX)	TON		x		=	$	-
377501	Slurry Seal	TON		x		=	$	-
390095	Replace Asphalt Concrete Surfacing	CY		x		=	$	-
390132	Hot Mix Asphalt (Type A)	TON		x		=	$	-
390136	Minor Hot Mix Asphalt	TON		x		=	$	-
390137	Rubberized Hot Mix Asphalt (Gap Graded)	TON		x		=	$	-
393003	Geosynthetic Pavement Interlayer	SQYD		x		=	$	-
39405X	Shoulder Rumber Strip *(HMA, Type XX Inden*	STA		x		=	$	-
394071	Place Hot Mix Asphalt Dike	LF		x		=	$	-
394090	Place Hot Mix Asphalt (Misc. Area)	SQYD		x		=	$	-
397005	Tack Coat	TON		x		=	$	-
400050	Continuously Reinfored Concrete Pavement	CY	1,330	x	300	=	$	399,000
401108	Replace Concrete Pavement (Rapid Strength	CY		x		=	$	-
404092	Seal Pavement Joint	LF		x		=	$	-
404094	Seal Longitudinal Isolation Joint	LF		x		=	$	-
413112A	Repair Spalled Joints (Polyester Grout)	SQYD		x		=	$	-
413115	Seal Existing Concrete Pavement Joint	LF		x		=	$	-
420102	Groove Existing Concrete Pavement	SQYD		x		=	$	-
420201	Grind Existing Concrete Pavement	SQYD		x		=	$	-
731502	Minor Concrete (Misc. Const)	CY		x		=	$	-
731530	Minor Concrete (Textured Paving)	SQFT		x		=	$	-
XXXXXX	Some Item			x		=	$	-

TOTAL STRUCTURAL SECTION ITEMS $ 599,000

SECTION 3: DRAINAGE

Item code		Unit	Quantity		Unit Price ($)			Cost
150206	Abandon Culvert	LF		x		=	$	-
150805	Remove Culvert	LF		x		=	$	-
150820	Modify Inlet	EA		x		=	$	-
152430	Adjust Inlet	LF		x		=	$	-
155003	Cap Inlet	EA		x		=	$	-
193114	Sand Backfill	CY		x		=	$	-
510502	Minor Concrete (Minor Structure)	CY		x		=	$	-
510512	Minor Concrete (Box Culvert)	CY		x		=	$	-
510XXX	Culvert (Roadway Crossing)	EA		x		=	$	-
62XXXX	XXX" APC Pipe	LF		x		=	$	-
64XXXX	XXX" Plastic Pipe	LF		x		=	$	-
65XXXX	XXX" RCP Pipe	LF		x		=	$	-
66XXXX	XXX" CSP Pipe	LF		x		=	$	-
680905	Underdrain (6" Alternative)	LF	0	x	36	=	$	-
681103	Edge Drain (3" Plastic Pipe)	LF	0	x	21	=	$	-
69XXXX	XXX" Pipe Downdrain	LF		x		=	$	-
70XXXX	XXX" Pipe Inlet	LF		x		=	$	-
70XXXX	XXX" Pipe Riser	LF		x		=	$	-
70XXXX	XXX" Flared End Section	EA		x		=	$	-
703233	Grated Line Drain	LF		x		=	$	-
72XXXX	Rock Slope Protection (Type and Method)	CY		x		=	$	-
721420	Concrete (Ditch Lining)	CY		x		=	$	-
721430	Concrete (Channel Lining)	CY		x		=	$	-
729010	Rock Slope Protection Fabric	SQYD		x		=	$	-
750001	Miscellaneous Iron and Steel	LB		x		=	$	-
XXXXXX	Additional Drainage (Detention Base, etc)	LS		x		=	$	-
XXXXXX	Some Item			x		=	$	-

TOTAL DRAINAGE ITEMS $ -

SECTION 4: SPECIALTY ITEMS

Item code		Unit	Quantity		Unit Price ($)			Cost
070012	Progress Schedule (Critical Path Method)	LS	0	x	30,000	=	$	-
150662	Remove Metal Beam Guard Railing	LF	0	x	15	=	$	-
150668	Remove Terminal Systems	EA		x		=	$	-
1532XX	Remove Concrete Barrier (25, 50 or 50C)	LF	0	x	16	=	$	-
153250	Remove Sound Wall	SQFT	0	x	25	=	$	-
150606	Remove Fence (BW)	LF		x		=	$	-
190110	Lead Compliance Plan	LS	0	x	18,000	=	$	-
49XXXX	CIDH Concrete Piling *(Insert Diameter)*	LF		x		=	$	-
510060	Structural Concrete (Retaining Wall)	CY		x		=	$	-
510133	Class 2 Concrete (Retaining Wall)	CY		x		=	$	-
510XXX	Retaining Wall (MSE)	SQFT	0	x	85	=	$	-
XXXXXX	Sound Wall (On Pile, On Barrier or On Ret. Wall)	SQFT	0	x	40	=	$	-
5110XX	Architectural Treatment *(Insert Type)*	SQFT		x		=	$	-
511048	Apply Anti-Graffiti Coating	SQFT		x		=	$	-
5136XX	Reinforced Concrete Crib Wall *(Insert Type)*	SQFT		x		=	$	-
518002	Sound Wall (Masonry Block)	SQFT		x		=	$	-
520103	Bar Reinf. Steel (Retaining Wall)	LB		x		=	$	-
800007	Fence (BW)	LF		x		=	$	-
832001	Metal Beam Guard Railing	LF	0	x	47	=	$	-
839310	Double Thrie Beam Barrier	LF		x		=	$	-
839521	Cable Railing	LF		x		=	$	-
83954X	Transition Railing *(Insert Type)*	EA		x		=	$	-
8395XX	Terminal System (Type CAT)	EA		x		=	$	-
8395XX	Alternative Flared Terminal System	EA	0	x	1,200	=	$	-
8395XX	End Anchor Assembly (*Insert Type*)	EA		x		=	$	-
839561	Rail Tensioning Assembly	EA		x		=	$	-
839596	Crash Cushion *(G.R.E.A.T)*	EA		x		=	$	-
839701	Concrete Barrier *(50 or 60)*	LF	2,640	x	78	=	$	205,920
833128	Concrete Barrier *(25 Modify)*	LF	0	x	128	=	$	-
XXXXXX	Some Item			x		=	$	-

TOTAL SPECIALTY ITEMS $ 206,000

SECTION 5: ENVIRONMENTAL

5A - ENVIRONMENTAL MITIGATION

Item code		*Unit*	*Quantity*		*Unit Price ($)*		*Cost*	
XXXXXX	Biological Mitigation	LS		x		=	$	-
071325	Temporary Reinforced Silt Fence	LF		x		=	$	-
XXXXXX	Hazardous Material Remediation	LS	0	x	45,000	=	$	-
XXXXXX	Permits	LS	0	x	45,000	=	$	-
071325	Temporary Fence (Type ESA)	LF		x		=	$	-

Subtotal Environmental $ -

5B - LANDSCAPE AND IRRIGATION

Item code		*Unit*	*Quantity*		*Unit Price ($)*		*Cost*	
200001	Highway Planting	ACRE		x		=	$	-
20XXXX	XXX" (*Insert Type*) Conduit *(Use for Irrigation x-*	LF		x		=	$	-
20XXXX	Extend XXX" *(Insert Type)* Conduit	LF		x		=	$	-
201700	Imported Topsoil	CY		x		=	$	-
203015	Erosion Control	ACRE		x		=	$	-
203021	Fiber Rolls	LF		x		=	$	-
203026	Move In/ Move Out (Erosion Control)	EA		x		=	$	-
204099	Plant Establishment Work	LS		x		=	$	-
204101	Extend Plant Establishment (X Years)	LS		x		=	$	-
208000	Irrigation System	LS		x		=	$	-
208304	Water Meter	EA		x		=	$	-
209801	Maintenance Vehicle Pullout	EA		x		=	$	-
XXXXXX	Some Item							

Subtotal Landscape and Irrigation $ -

5C - NPDES

Item code		*Unit*	*Quantity*		*Unit Price ($)*		*Cost*	
074016	Construction Site Management	LS	0	x	450,000	=	$	-
074017	Prepare WPCP	LS	0	x	10,000	=	$	-
074019	Prepare SWPPP	LS	0	x	10,000	=	$	-
074023	Temporary Erosion Control	ACRE	0	x	2,500	=	$	-
074027	Temporary Erosion Control Blanket	SQYD		x		=	$	-
074028	Temporary Fiber Roll	LF		x		=	$	-
074032	Temporary Concrete Washout Facility	EA		x		=	$	-
074033	Temporary Construction Entrance	EA		x		=	$	-
074035	Temporary Check Dam	LF		x		=	$	-
074037	Move In/ Move Out (Temp Erosion Control)	EA		x		=	$	-
074038	Temp. Drainage Inlet Protection	EA	0	x	60	=	$	-
XXXXXX	Site Job Management	LS	0	x	450,000	=	$	-
074042	Temporary Concrete Washout (Portable)	LS		x		=	$	-
XXXXXX	Some Item			x		=	$	-

Supplemental Work for NPDES

(These costs are not accounted in total here but under Supplemental Work on sheet 7 of 11).

074021	Water Pollution Control Maintenance Work*	LS	0	x	25,500	=	$	-
066596	Additional Water Pollution Control**	LS		x		=	$	-
066597	Storm Water Sampling and Analysis***	LS		x		=	$	-
XXXXXX	Some Item							

Subtotal NPDES (Without Supplemental Work) $ -

*Applies to all SWPPPs and those WPCPs with sediment control or soil stabilization BMPs.

**Applies to both SWPPPs and WPCP projects.

*** Applies only to project with SWPPPs.

TOTAL ENVIRONMENTAL $ -

SECTION 6: TRAFFIC ITEMS

6A - Traffic Electrical

Item code		Unit	Quantity		Unit Price ($)			Cost
150760	Remove Sign Structure	EA		x		=	$	-
151581	Reconstruct Sign Structure	EA		x		=	$	-
152641	Modify Sign Structure	EA		x		=	$	-
5602XX	Furnish Sign Structure	LB		x		=	$	-
5602XX	Install Sign Structure	LB		x		=	$	-
56XXXX	XXX" CIDHC Pile (Sign Foundation)	LF		x		=	$	-
56XXXX	Install Overhead Sign (Two Post)	EA	0	x	400,000	=	$	-
56XXXX	Install Overhead Sign (One Post)	EA	0	x	160,000	=	$	-
860090	Maintain Existing Traffic Management System	LS	0	x	900,000	=	$	-
860810	Inductive Loop Detectors	EA		x		=	$	-
86055X	Lighting & Sign Illumination	EA	0	x	4,000	=	$	-
8607XX	Interconnection Facilities	LS		x		=	$	-
8609XX	Traffic Traffic Monitoring Stations	LS	0	x	200,000	=	$	-
860XXX	Signals & Lighting	LS		x		=	$	-
860XXX	ITS Elements	LS		x		=	$	-
861100	Ramp Metering System (Location X)	LS		x		=	$	-
86XXXX	Fiber Optic Conduit System	LS		x		=	$	-
XXXXXX	Ramp Terminal Intersection Improvement	LS	0	x	1,000,000	=	$	-
XXXXXX	Toll Equipment and System Integration (Capital)	LS	0	x	100,000,000	=	$	-
XXXXX	Some Item							

Subtotal Traffic Electrical *$ -*

6B - Traffic Signing and Striping

Item code		Unit	Quantity		Unit Price ($)			Cost
120090	Construction Area Signs	LS	0	x	900,000	=	$	-
150701	Remove Yellow Painted Traffic Stripe	LF	0	x	4	=	$	-
150710	Remove Traffic Stripe	LF	0	x	0.25	=	$	-
150713	Remove Pavement Marking	SQFT		x		=	$	-
150742	Remove Roadside Sign	EA	0	x	120	=	$	-
15075X	Remove Sign Structure	EA	0	x	20,000	=	$	-
15075X	Remove Sign Structure (On Bridge)	EA	0	x	5,000	=	$	-
152320	Reset Roadside Sign	EA		x		=	$	-
152390	Relocate Roadside Sign	EA		x		=	$	-
566011	Roadside Sign (One Post)	EA	0	x	340	=	$	-
566012	Roadside Sign (Two Post)	EA	0	x	1,250	=	$	-
560XXX	Furnish Sign Panels	SQFT		x		=	$	-
560XXX	Install Sign Panels	SQFT		x		=	$	-
82010X	Delineator (Class X)	EA		x		=	$	-
84XXXX	Permanent Pavement Delineation	LS	1	x	10,000	=	$	10,000
840504	Thermoplastic Traffic Strip (4")	LF	5,000	x	0.50	=	$	2,500

Subtotal Traffic Signing and Striping *$ 12,500*

6C - Stage Construction and Traffic Handling

Item code		Unit	Quantity		Unit Price ($)			Cost
120100	Traffic Control System	LS	0	x	4,000,000	=	$	-
120120	Type III Barricade	EA		x		=	$	-
120143	Temporary Pavement Delineation	LF		x		=	$	-
120149	Temporary Pavement Marking (Paint)	LS	0	x	90,000	=	$	-
120159	Temporary Traffic Strip (Paint)	LS	0	x	90,000	=	$	-
12016X	Channelizer	EA		x		=	$	-
128650	Portable Changeable Message Signs	EA	0	x	10,000	=	$	-
129000	Temporary Railing (Type K)	LF	0	x	17	=	$	-
129100	Temp. Crash Cushion Module	EA	0	x	200	=	$	-
129099A	Traffic Plastic Drum	EA		x		=	$	-
839603A	Temporary Crash Cushion (ADIEM)	EA		x		=	$	-
XXXXXX	Misc. Items (Traffic Management Plan)	LS	0	x	180,000	=	$	-
XXXXXX	Some Item	LS		x		=	$	-

Subtotal Stage Construction and Traffic Handling *$ -*

TOTAL TRAFFIC ITEMS $ 12,500

SECTION 7: DETOURS

Include constructing, maintaining, and removal

Item code		Unit	Quantity		Unit Price ($)		Cost
0713XX	Temporary Fence (Type X)	LF		x		=	$ -
07XXXX	Temporary Drainage	LS		x		=	$ -
120143	Temporary Pavement Delineation	LF		x		=	$ -
1286XX	Temporary Signals	EA		x		=	$ -
129000	Temporary Railing (Type K)	LF		x		=	$ -
190101	Roadway Excavation	CY		x		=	$ -
198001	Imported Borrow	CY		x		=	$ -
198050	Embankment	CY		x		=	$ -
250401	Class 4 Aggregate Subbase	CY		x		=	$ -
260201	Class 2 Aggregate Base	CY		x		=	$ -
390132	Hot Mix Asphalt (Type A)	TON		x		=	$ -
XXXXXX	Some Item	LS	0	x	$150,000	=	$ -

TOTAL DETOURS $ -

SUBTOTAL SECTIONS 1-7 $ 860,100

SECTION 8: MINOR ITEMS

8A - Americans with Disabilities Act Items							
	ADA Items						$ -
8B - Bike Path Items							
	Bike Path Items						$ -
8C - Other Minor Items							
	Other Minor Items				5.0%		$ 43,005
	Total of Section 1-7	$	860,100	x	5.0%	=	$ 43,005

TOTAL MINOR ITEMS $ 43,100

SECTIONS 9: MOBILIZATION

Item code							
999990	Total Section 1-8	$	903,200	x	0%	=	$ -

TOTAL MOBILIZATION $ -

SECTION 10: SUPPLEMENTAL WORK

Item code		Unit	Quantity		Unit Price ($)		Cost
066015	Federal Trainee Program	LS		x		=	$ -
066063	Traffic Management Plan - Public Information	LS		x		=	$ -
066090	Maintain Traffic	LS		x		=	$ -
066094	Value Analysis	LS		x		=	$ -
066204	Remove Rock & Debris	LS		x		=	$ -
066222	Locate Existing Cross-Over	LS		x		=	$ -
066670	Payment Adjustments For Price Index Fluctuations	LS		x		=	$ -
066700	Partnering	LS		x		=	$ -
066866	Operation of Existing Traffic Management System Eler	LS		x		=	$ -
066920	Dispute Review Board	LS		x		=	$ -
066XXX	Some Item	LS		x		=	$ -
	*Cost of **NPDES** Supplemental Work specified in Section 5C*					=	$ -
	Total Section 1-8	$	903,200		5%	=	$ 45,160

TOTAL SUPPLEMENTAL WORK $ 45,200

Note: Mobilization item will automatically calculate if working days are 50 or more. For Project less than 50 Working Days Mobilization is not required as a separate contract, however contract item prices should take into consideration mobilization as part of the price. If the building portion of the project is greater than 50% of the total project cost,
If the building portion of the project is greater than 50% of the total project cost, then mobilization is not included.

SECTION 11: STATE FURNISHED MATERIALS AND EXPENSES

Item code		Unit	Quantity		Unit Price ($)			Cost
066063	Public Information	LS	0	x	$100,000	=		$0
066105	RE Office	LS	0	x	$400,000	=		$0
066803	Padlocks	LS		x		=		$0
066838	Reflective Numbers and Edge Sealer	LS		x		=		$0
066901	Water Expenses	LS		x		=		$0
066062A	COZEEP Expenses	LS		x		=		$0
06684X	Ramp Meter Controller Assembly	LS		x		=		$0
XXXXXX	Toll Back Office System	LS	0	x	$1,700,000	=		$0
06684X	TMS Controller Assembly	LS	0	x	$2,000,000	=		$0
06684X	Traffic Signal Controller Assembly	LS		x		=		$0
XXXXXX	Some Item							
	Total Section 1-8	$	903,200		1%	=	$	9,032

TOTAL STATE FURNISHED **$9,100**

SECTION 12: TIME-RELATED OVERHEAD

Estimated Time-Releated Overhead (TRO) Percentage (0% to 10%) = 0%

Item code		Unit	Quantity		Unit Price ($)			Cost	
			Total of All Contract Items Only				$	903,200	(used to calculate TR
070018	Time-Related Overhead	$	903,200	X	0%	=		$0	

TOTAL TIME-RELATED OVERHEAD **$0**

SECTION 13: CONTINGENCY

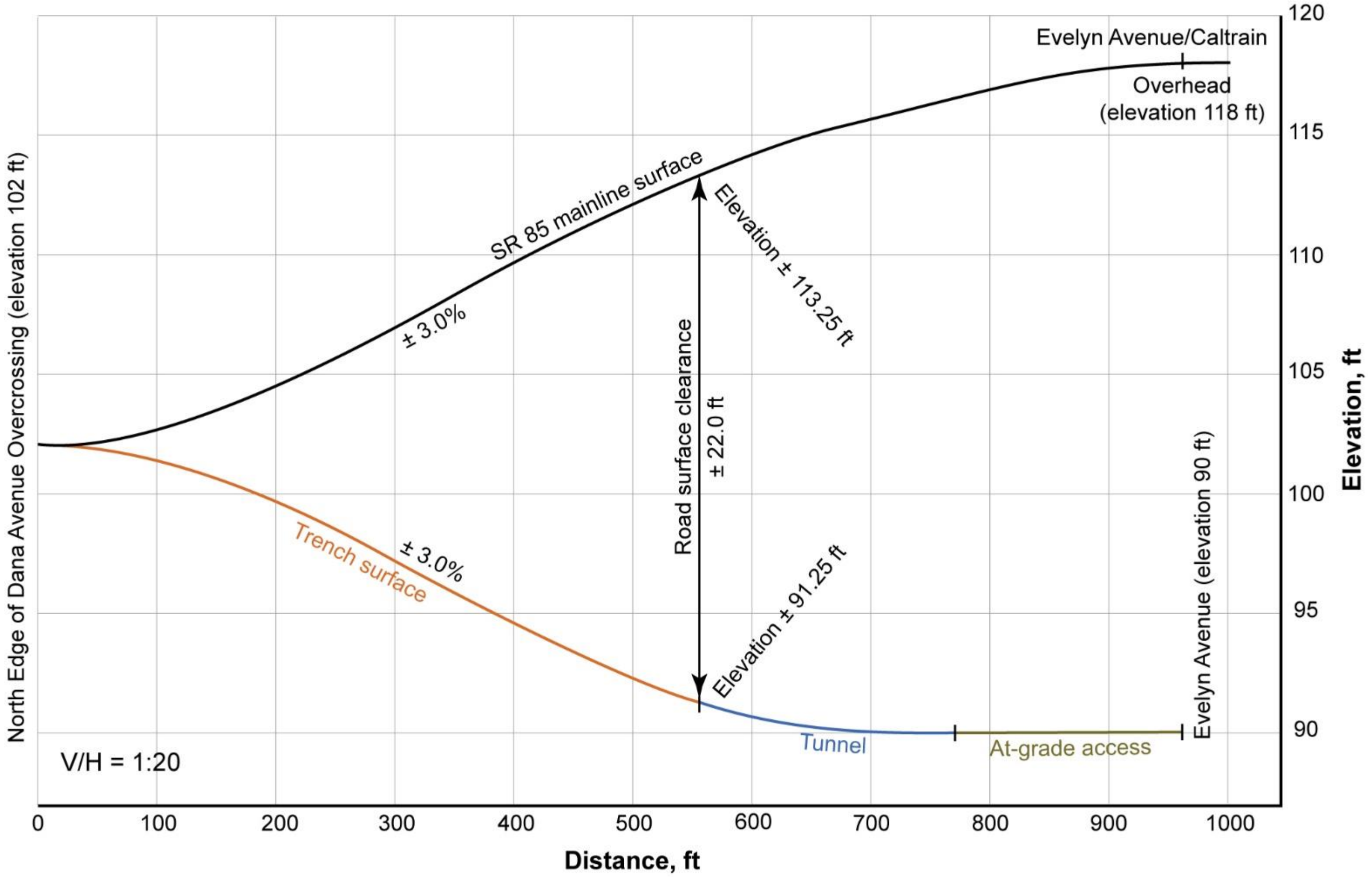
Total Section 1-12	$	957,500	x	20%	=	$191,500

TOTAL CONTINGENCY **$191,500**

Note: TRO is a contract item if total project cost is (non-escalated) over $5 million AND 100 or more working days.
If the building portion of the project is greater than 50% of the total project cost, then TRO is not included.
TRO calculated for you as percentage of the sum of all contract items only;
excluding mobilization, supplemental work, state furnished materials and expenses, and contingency.

Optional Item

- Alternatives 3-1 and 3-5: Median direct-connector ramp from Dana Street to Evelyn Avenue
- Trench = 550 feet long × 28 feet wide
- Tunnel = 190 feet long × 28 feet high
- Surface ramp = 258 feet × 28 feet wide
- Retaining wall for surface ramp = 145 feet long × 15 feet (average) high



Note: See Figure 3 (Part 1—Proposed Engineering Features) for Conceptual Alignment Plan

SR85 Drop Ramp & Tunnel
Estimate of Probable Construction Cost

SUMMARY REPORT
SHOWING UNIT PRICE

Estimate Date: **12/12/19** ; *Rev. No.* **01**
Client:
Estimator **C. Gidlof**
Checked By: **B Scales**
Doc Scope Date: **12/01/19**

LEVEL DESCRIPTION	QTY	U/M	UNIT PRICE	TOTAL COST
1 SR85 Drop Ramp & Box Tunnel	**1**	**L.S.**	**$8,470,580.29**	**8,470,580**
A Construction	***1***	***L.S.***	*$6,274,503.89*	***6,274,504***
01 Indirect Cost	**4**	**Mo**	$222,691.14	**890,765**
00100 Mobilization & Initial Expense	1	L.S.	$64,673.42	64,673
0001 Contract Mobilization	1	L.S.	$15,073.42	15,073
0002 Permits	1	L.S.	$20,026.67	20,027
0003 Insurance & Bonds	1	L.S.	$29,573.33	29,573
01 Bonds	1	L.S.	$19,520.00	19,520
02 Insurance	1	L.S.	$10,053.33	10,053
00105 Contract Job Cost	4	Mo	$196,522.78	786,091
0001 Project Home Office	4	MO.	$26,724.00	106,896
0002 Contract Vehicles	4	Mo	$9,000.00	36,000
0003 Site Supervisory & Emergency	4	M0	$74,205.60	296,822
0004 Field Office	4	Mo	$5,133.33	20,533
0005 Construction Equipment (General Use)	4	Mo	$45,228.33	180,913
01 Construction Vehicles	4	Mo	$2,550.00	10,200
02 Temporary Storage	4	Mo	$150.00	600
03 Temporary Roads & Parking	1	L.S.	$7,140.00	7,140
04 Project Site Cleaning	4	Mo	$3,310.00	13,240
05 Other	4	Mo	$5,000.00	20,000
06 Equipment Schedule less Crew Eqpt	1	LS	$129,733.33	129,733
0006 Site Operating (Facility Eqmt.)	4	Mo	$10,191.11	40,764
01 Trailers	4	Mo	$3,844.45	15,378
02 Office Equipment	1	L.S.	$18,080.00	18,080
03 Mail & Couriers	4	Mo	$650.00	2,600
04 Communication	1	L.S.	$4,706.67	4,707
0007 Temporary Facilities @ Constr. Site	4	Mo	$2,675.00	10,700
01 Water	4	Mo	$875.00	3,500
02 Toilets & Sanitary Sewers	4	Mo	$1,050.00	4,200
03 Electric	4	Mo	$750.00	3,000
0008 Personnel Health & Safety	4	Mo	$7,484.33	29,937
0009 Contract Environmental Control & Cleanup	4	Mo	$8,681.07	34,724
0010 Miscellaneous contract Activities	4	Mo	$7,200.00	28,800
00120 Demoblization	1	L.S.	$40,000.00	40,000
0001 Demobilization	1	L.S.	$40,000.00	40,000
02 Direct Cost	**1**	**L.S.**	$5,383,739.33	**5,383,739**
01 Trench	15,400	SF	$199.46	3,071,645
001 Site Preparation	1,711	SY	$85.25	145,863
01 Site Clearing	1,711	SY	$11.00	18,821
02 Site Grading & Earthwork	1,711	SY	$66.00	112,926
03 Site Cleanup	1,711	SY	$8.25	14,116
002 Excavation	6,274	B.C.Y	$33.66	211,213
01 Bulk Excavation	6,274	B.C.Y	$8.76	54,942
02 Haul Off Site	6,274	B.C.Y.	$24.91	156,272
003 Trench Construction	1,711	SY	$1,403.97	2,402,190
01 Sheet Pile Shoring	12,100	SF	$67.62	818,193
02 Concrete	1,752	CY	$554.31	971,147
001 Base Slab 18"	15,400	S.F.	$15.55	239,474
002 Wall 22' Tall	896	CY	$816.60	731,673
03 Rebar 250 lb/CY	438,000	LB	$1.32	578,160
04 Concrete Pump	1,752	C.Y.	$19.80	34,690
004 Site Civil/Mechanical Utilities	1,711	SY	$117.26	200,624
01 Water Supply and Distribution Systems	1	LS	$74,993.37	74,993

SR85 Drop Ramp & Tunnel
Estimate of Probable Construction Cost

SUMMARY REPORT
SHOWING UNIT PRICE

Estimate Date: **12/12/19** ; *Rev. No.* ***01***
Client:
Estimator **C. Gidlof**
Checked By: **B Scales**
Doc Scope Date: **12/01/19**

LEVEL DESCRIPTION	QTY	U/M	UNIT PRICE	TOTAL COST
001 Water	**550**	**L.F.**	$136.35	74,993
01 Water Supply Distribution	**550**	**L.F.**	$93.84	51,613
02 Fire Hydrants	**10**	**EA**	$2,338.04	23,380
02 Oil/Water Separators	**550**	**LF**	$62.11	34,163
001 New Oil/Water Separator	**1**	**EA**	$34,162.52	34,163
03 Storm Drainage	**550**	**LF**	$166.30	91,468
001 Structures/Inlets	**10**	**EA**	$4,061.87	40,619
002 24" Storm Drain	**550**	**L.F.**	$65.30	35,913
003 12" Storm Drain	**550**	**L.F.**	$27.16	14,936
005 Site Electrical Utilities	**15,400**	**S.F.**	$7.26	111,755
01 Elec / Tel Service Entrance	**1**	**L.S.**	$91,668.30	91,668
001 Electrical Service Entrance Conduits	**1**	**L.S.**	$63,604.64	63,605
002 Duct Banks	**161**	**LF**	$174.31	28,064
02 Exterior Lighting	**1**	**L.S.**	$15,137.14	15,137
001 Exterior Lighting Fixtures and Controls	**1**	**L.S.**	$13,097.74	13,098
002 Special Security Lighting Systems	**1**	**L.S.**	$2,039.40	2,039
03 Exterior Communications and Alarm Systems	**1**	**L.S.**	$4,950.00	4,950
02 Box Tunnel	**5,600**	**SF**	$303.09	1,697,283
001 Box Installation	**1**	**Mo**	$214,792.75	214,793
002 Excavation	**4,563**	**B.C.Y**	$33.66	153,613
01 Bulk Excavation	**4,563**	**B.C.Y**	$8.76	39,958
02 Haul Off Site	**4,563**	**B.C.Y.**	$24.91	113,654
003 Precast Concrete Box	**1,274**	**CY**	$1,043.07	1,328,877
01 Concrete	**1,274**	**CY**	$693.27	883,232
001 Wall 22' Tall	**652**	**CY**	$1,020.75	665,528
002 Base Slab 18"	**5,600**	**S.F.**	$19.44	108,852
003 Roof 18"	**5,600**	**S.F.**	$19.44	108,852
02 Rebar	**318,500**	**LB**	$1.32	420,420
03 Concrete Pump	**1,274**	**C.Y.**	$19.80	25,225
03 Drop Ramp	**809**	**SY**	$759.96	614,812
001 Site Preparation	**809**	**SY**	$85.25	68,967
01 Site Clearing	**809**	**SY**	$11.00	8,899
02 Site Grading & Earthwork	**809**	**SY**	$66.00	53,394
03 Site Cleanup	**809**	**SY**	$8.25	6,674
002 Excavation	**4,044**	**B.C.Y**	$33.66	136,141
01 Bulk Excavation	**4,044**	**BCY**	$8.76	35,414
02 Haul Off Site	**4,044**	**B.C.Y.**	$24.91	100,727
003 Retaining Wall	**2,175**	**SF**	$110.69	240,752
01 Sheet Pile Shoring	**2,175**	**SF**	$45.80	99,617
02 Wall 15' Tall (Avg)	**121**	**CY**	$816.60	98,809
03 Rebar	**30,250**	**LB**	$1.32	39,930
04 Concrete Pump	**121**	**C.Y.**	$19.80	2,396
004 Site Civil/Mechanical Utilities	**809**	**SY**	$54.82	44,347
01 Storm Drainage	**260**	**LF**	$170.57	44,347
001 Structures/Inlets	**5**	**EA**	$4,061.87	20,309
002 24" Storm Drain	**260**	**L.F.**	$65.30	16,977
003 12" Storm Drain	**260**	**L.F.**	$27.16	7,061
005 Site Electrical Utilities	**7,280**	**S.F.**	$2.08	15,137
01 Exterior Lighting	**1**	**L.S.**	$15,137.14	15,137
001 Exterior Lighting Fixtures and Controls	**1**	**L.S.**	$13,097.74	13,098
002 Special Security Lighting Systems	**1**	**L.S.**	$2,039.40	2,039
006 Paving	**809**	**SY**	$95.33	77,124
007 Landscaping	**7,280**	**S.F.**	$4.44	32,344
B PR/ED Support 3%	***1***	***LS***	*$188,235.12*	***188,235***
C PS&E Support 12%	***1***	***LS***	*$752,940.48*	***752,940***

SR85 Drop Ramp & Tunnel
Estimate of Probable Construction Cost

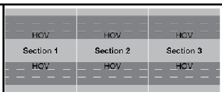
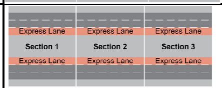
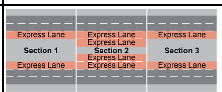
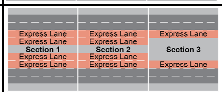
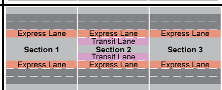
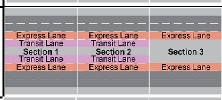
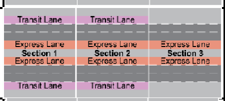
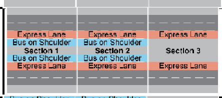
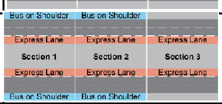
PARSONS

SUMMARY REPORT
SHOWING UNIT PRICE

Estimate Date: **12/12/19** ; *Rev. No.* ***01***
Client:
Estimator **C. Gidlof**
Checked By: **B Scales**
Doc Scope Date: **12/01/19**

LEVEL DESCRIPTION	QTY	U/M	UNIT PRICE	TOTAL COST
D Construction Support 12%	***1***	***LS***	*$752,940.48*	***752,940***
E Agency Support 8%	***1***	***LS***	*$501,960.32*	***501,960***

SR 85 Transit Study Construction Cost Matrix (cost in millions of 2020 dollars)

Alternative				Option	Express Lane Conversion			EL Camino Real Interchange	Right Shoulder			Median			Stations					Sub Total	Contin gency (20%)	Total Construction Cost	Support Costs (35%)	Total Project Cost
					Section 1	Section 2	Section 3		Section 1	Section 2	Section 3	Secton 1	Section 2	Section 3	Mountain View	El Camino Real	Stevens Creek	Saratoga	Bascom					
Existing	1-1		No Change	1																				
				2				$16.7												$16.7	$3.3	$20.0	$7.0	**$27.0**
Express Lanes	2-1		HOV To Express Lane		$15.8	$47.3	$19.3													$82.3	$16.5	$98.7	$34.5	**$133.2**
	2-2		Short Dual Express Lane		$15.8	$47.3	$19.3						$40.0							$122.3	$24.5	$146.7	$51.3	**$198.0**
	2-3		Long Dual Express Lane		$15.8	$47.3	$19.3	$16.7				$27.0	$40.0							$166.0	$33.2	$199.1	$69.7	**$268.8**
Transit Lanes	3-1		Short Median Transit Lane	1	$15.8	$47.3	$19.3						$40.0				$10.0	$12.0	$10.0	$154.3	$30.9	$185.1	$64.8	**$249.9**
				2	$15.8	$47.3	$19.3						$40.0				$10.0	$12.0	$10.0	$154.3	$30.9	$185.1	$64.8	**$249.9**
	3-2		Long Median Transit Lane	1	$15.8	$47.3	$19.3	$16.7				$27.0	$40.0		$7.0	$12.5	$10.0	$12.0	$10.0	$217.5	$43.5	$260.9	$91.3	**$352.3**
				2	$15.8	$47.3	$19.3	$16.7				$27.0	$40.0		$7.0	$12.5	$10.0	$12.0	$10.0	$217.5	$43.5	$260.9	$91.3	**$352.3**
	3-3		Right Side Transit Lane	1	$15.8	$47.3	$19.3	$16.7	$35.0	$55.0						$7.5	$7.5	$7.5	$7.5	$219.0	$43.8	$262.7	$92.0	**$354.7**
				2	$15.8	$47.3	$19.3	$16.7	$35.0	$55.0										$189.0	$37.8	$226.7	$79.4	**$306.1**
Bus On Shoulder	4-1		Median Bus On Shoulder	1	$15.8	$47.3	$19.3	$16.7				$22.4	$33.2		$7.0	$12.5	$10.0	$12.0	$10.0	$206.1	$41.2	$247.3	$86.5	**$333.8**
				2	$15.8	$47.3	$19.3	$16.7				$22.4	$33.2		$7.0	$12.5	$10.0	$12.0	$10.0	$206.1	$41.2	$247.3	$86.5	**$333.8**
	4-2		Right Side Bus On Shoulder	1	$15.8	$47.3	$19.3	$16.7	$22.4	$35.2						$7.5	$7.5	$7.5	$7.5	$186.6	$37.3	$223.9	$78.4	**$302.2**
				2	$15.8	$47.3	$19.3	$16.7	$22.4	$35.2										$156.6	$31.3	$187.9	$65.8	**$253.6**

APPENDIX D

PRELIMINARY ENVIRONMENTAL REVIEW

Appendix D -

Preliminary Environmental Review

The recommendation of a previous SR 85 Study (State Route 85 Express Lanes Project) was to convert the HOV lane in sections 1, 2 and 3 to an express lane and to add a second express lane in section 2, adjacent to the one running the length of the corridor. This corresponds to Alternative 2-2 of this study. The Environmental Impact Statement for the previous SR 85 project was completed April 2015 with a finding of no significant impact. In November 2016, Santa Clara County voters approved Measure B, a 30-year, half-cent countywide sales tax to enhance transit, highways, expressways and active transportation (bicycles, pedestrians and complete streets). State Route 85 Corridor Transit Study was identified in a list of eligible funding categories and projects. Up to $350 million dollars will be available for transit, congestion relief and noise abatement projects throughout the corridor over the 30-year life of the funding measure. A lawsuit was filed in 2017 challenging the validity of Measure B. As the lawsuit made its way through the courts, funds collected from Measure B were held in escrow. With all litigation settled, VTA began dispersing funding January 30, 2019.

Given that all the proposed alternatives of this study stay within the existing SR 85 right-of-way, the findings of the previous environmental work can be used in a preliminary review of environmental impacts.

Environmental Impact Categories

The following is a brief discussion of the environmental impacts of the previous study in the context of a preliminary review of the impacts associated with the existing set of alternatives.

Land Use/Growth

It was concluded that the previous project if constructed would not change or conflict with the land use in the corridor and that projected growth and development in the corridor would occur with or without construction of the project. Given that the project connects existing and established transit centers, and all new stations would be located within SR 85 right of way and any off corridor stops or stations would be existing facilities located in already developed areas, any of the build alternatives is not anticipated to contribute to any additional growth or land use changes.

Farmlands/Timberlands

No farmland/timberland impacts associated with construction.

Community Impacts

No community impacts are associated with the build alternatives. There would be no acquisition of residences, businesses or other land uses. No barriers to movement would be associated with the project. All off corridor stops and stations would be existing facilities and all new stations would be within SR 85 right of way.

Environmental Justice

No environmental justice impacts would result from the project. There would be on disproportionate or adverse impacts to any minority or low-income populations. None of the build alternatives would impact existing residences or businesses.

Utility/Emergency Services

No utility relocations are anticipated, and emergency services access would be maintained during the construction under any of the build alternatives.

Traffic and Transportation/Pedestrian and Bicycle Facilities

There would be no impact to pedestrian and bicycle facilities under any of the build alternatives as there are none present on SR 85. The previous environmental documentation projected impaired traffic flow is in some segments of SR 85, including the HOV lane under the no build alternative in both 2015 and 2035. It can be assumed that any of the build alternatives would improve travel times as compared with the No Build in 2015 and 2035. It is anticipated express lane segments would operate at or close to free-flow conditions.

Visual/Aesthetics

The project under any of the proposed alternatives would not change the visual appearance or aesthetics of the corridor and all new infrastructure would be consistent with the freeway setting that exists.

Cultural Resources

The area of potential effects contains at least 20 cultural resources sites. Subsurface geoarchaeological explorations were conducted as part of the previously completed environmental analysis to identify obscured or buried archeological resources that could be affected by project construction. None were found during testing. It was determined the project would not affect a Section 4(f) historic resource. Mitigation measures can be implemented if cultural materials are unearthed during construction. Construction would be halted, and a qualified archaeologist would assess the find and procedures described in state law would be implemented.

Hydrology and Floodplain

Parts of the corridor are in the 100-year floodplain. None of the build alternatives would increase the amount of area in the floodplain and would not significantly increase impervious surfaces or runoff quality. Measures could be implemented during construction to avoid or minimize impacts to water quality and storm water runoff.

Water Quality and Storm Water Runoff

Project construction could have temporary impacts to water quality and storm water runoff from erosion. Construction always includes the risk of spills and fluid leaks from construction vehicles, equipment, or materials. The temporary impacts to water quality and storm water runoff increase as the area of disturbed soil and impervious surface increases. The project area is susceptible to hydromodification. Temporary and permanent erosion control best management practices can be implemented to address water quality and storm water runoff issues and to maintain or restore the area to preconstruction conditions.

Geology/Soils/Seismicity/Topography

The project area could be exposed to strong earthquake shaking. Untreated soil in the area of foundations for overhead signs and widened SR 85 bridge decks could be subject to liquefaction. These issues can be mitigated by following seismic design requirements. Build alternatives with more station construction would have an increased need for seismic design elements.

Paleontology

With any construction project there is the potential to encounter unexpected subsurface paleontological resources. A Paleontological Mitigation Plan will include monitoring during active construction to allow for collection and curation of any fossils found. The potential for encountering paleontological resources increase with the size of the construction area.

Hazardous Waste/Materials

Five potential hazardous materials sites are outside but located within one mile of the corridor. Encountering contaminated ground water during construction from these sites has been deemed a medium to high risk in the previous environmental document. Asbestos or pesticides from previous agricultural land uses in the project corridor may be present in the soil adjacent to the corridor. Soils in the immediate vicinity of SR 85 may have contaminated surface soils from break wear, oil, grease and exhaust from vehicular traffic and contain aerially deposited lead (ADL) and other heavy metals. Further investigation of hazardous materials sites prior to construction are needed to avoid contaminated groundwater. Soils and groundwater will be tested prior to final project design to determine management options and any special handling requirements. If contaminated soils, ground water or other hazardous materials are encountered, they will be disposed of per regulations.

Air Quality

The project would not violate standards for particulate matter. Minor increases in mobile source air toxics in the project opening year and horizon year would be offset by emissions improvements from national control programs. Additional improvement in air quality could be achieved using an electric BRT fleet. Alternatives that reduce the number of vehicle trips and result in a shift from single occupant vehicles to carpools or transit would improve air quality.

Natural Communities

As noted in the previous environmental document, the corridor is built out with pavement and other types of urban development. All alternatives stay within the existing right-of-way. Potential impacts to natural communities would be during construction and those can be mitigated through proper survey prior to construction and identification of measures to protect adjacent natural communities during construction. Station construction would increase the area of potential impact. Alternatives that include more stations would involve more planning to protect natural communities prior to construction.

Wetlands and Other Waters

It is assumed that none of the build alternatives will impact wetlands or other waters. Temporary indirect impacts could be associated with construction related discharges. These could be mitigated.

Plant Species

The area within the corridor has been disturbed by roadway development. Any impacts would be negligible. All areas where stations and stops would be developed have been disturbed by existing development.

Animal Species

Under the previous alternative evaluated, project construction could result in temporary effects to .57 acres of potential upland habitat for the western pond turtle. It has been noted that there would be no permeant impacts to special status birds or bats. Project construction noise could temporarily disturb migratory birds, nesting raptors, and special status bats. Construction could be timed to mitigate these impacts. The larger the construction footprint with additional lane miles or stations, the more potential temporary construction impacts.

Threatened and Endangered Species

Potential construction related impacts could result in temporary effects to upland habitat for the California red-legged frog and the California tiger salamander and temporary and permanent impacts to the DRLF habitat associated with bridge widening at Saratoga Creek. There is very low potential for construction impacts to the bay checkerspot butterfly and the canyon jewel flower. Impacts can be avoided and minimized by preconstruction surveys and precautions during construction.

Invasive Species

Project construction has the potential to spread invasive species. In the SR 85 corridor English ivy and sweet fennel are known invasive species. Preconstruction surveys and precautions during construction can eliminate or minimize potential impacts.

Cumulative Impacts

No cumulative impacts were identified during the previous environmental work.

Noise

Traffic Noise levels would vary by alternative. All alternatives will increase the volume of buses along SR 85 and thus increase traffic related noise, but not perhaps a perceptible increase. The alternative evaluated in the previous environmental work was determined to have no effect on existing noise levels, or no more than a 3-decible increase. Alternatives such as Alternative 3-3 that involves a right side transit lane implemented by reducing the right side shoulder as well as Alternative 3-3, right side bus on shoulder have potential to increase traffic noise levels, but most likely not a perceptible increase in noise. Some segments of the corridor have existing noise barriers. These may need to be relocated in some cases.

Growth

The documentation in the done previously indicates that alternative evaluated does not have any impact on growth. It is stated that the growth projected in the corridor will occur with or without project construction. None of the build alternatives would involve providing new access to undeveloped areas. The build alternatives would locate stations within the existing SR 85 right of way or use existing transit stations or stops.

Duration of Construction

Duration of Construction will vary by alternative. It is assumed that alternatives such as those that involve more construction in more sections and additional stations will require longer construction periods. Construction can have a variety of impacts to the natural environment as well as noise, aesthetics and congestion. It can also result in additional costs associated with mitigation.

Utilities and Drainage

The larger the footprint of the alternative associated with widening, the greater potential for impacts on drainage. An increase in impervious surface area creates the need to address drainage and may impact the existing roadway drainage structures requiring them to be rebuilt. Thus, alternatives that require widening of the roadway have the potential for additional drainage impacts.

Utilities are sometimes an area of concern. Often there is utility infrastructure in roadway expansion areas that must be moved. No utility impacts were identified in the previous environmental documentation.

Summary of Impacts

The following table summarizes impacts by alternative.

Summary of Preliminary Environmental Impacts

Alternative			Land Use	Growth	Farmlands/Timberlands	Community Impacts
	1-1	**No Change**	None	None	None	None
Express Lanes	2-1	**HOV To Express Lane**	None. Project stays within existing ROW.	None. No new stops or stations.	None. Project contained within the existing ROW.	None. Project contained within the existing ROW.
Express Lanes	2-2	**Short Dual Express Lane**	None. Project stays within existing ROW.	None. No new stops or stations.	None. Project contained within the existing ROW.	None. Project contained within the existing ROW.
Express Lanes	2-3	**Long Dual Express Lane**	None. Project stays within existing ROW.	None. No new stops or stations.	None. Project contained within the existing ROW.	None. Project contained within the existing ROW.
Transit Lanes	3-1	**Short Median Transit Lane**	None. Project stays within existing ROW.	None. New stops and stations would be in previously developed areas.	None. Project contained within the existing ROW.	None. Project contained within the existing ROW.
Transit Lanes	3-2	**Long Median Transit Lane**	None. Project stays within existing ROW.	None. New stops and stations would be in previously developed areas.	None. Project contained within the existing ROW.	None. Project contained within the existing ROW.
Transit Lanes	3-3	**Right Side Transit Lane**	None. Project stays within existing ROW.	None. New stops and stations would be in previously developed areas.	None. Project contained within the existing ROW.	None. Project contained within the existing ROW.
Bus On Shoulder	4-1	**Median Bus On Shoulder**	None. Project stays within existing ROW.	None. New stops and stations would be in previously developed areas.	None. Project contained within the existing ROW.	None. Project contained within the existing ROW.
Bus On Shoulder	4-2	**Right Side Bus On Shoulder**	None. Project stays within existing ROW.	None. New stops and stations would be in previously developed areas.	None. Project contained within the existing ROW.	None Project contained within the existing ROW.

Summary of Preliminary Environmental Impacts (continued)

Alternative			Hazardous Waste/Materials	Air Quality	Noise	Natural Communities
	1-1	No Change	None	None	None	None
Express Lanes	2-1	HOV To Express Lane	None	None	None	None
Express Lanes	2-2	Short Dual Express Lane	Risk of encounter contaminated groundwater during construction in Section 2.	Potential for temporary construction impacts. butt would not exceed state thresholds.	No perceptible increase in noise. Addition of center express lane could move traffic in Section 2 away from receptors.	Potential tree removal and impact to vegetation in Section 2.
Express Lanes	2-3	Long Dual Express Lane	Risk of encounter contaminated groundwater during construction in Sections 1 and 2.	Potential for temporary construction impacts. butt would not exceed state thresholds.	No perceptible increase in noise. Addition of center express lane could move traffic in Sections 1 and 2 away from receptors.	Potential tree removal and impact to vegetation in Sections 1 and 2.
Transit Lanes	3-1	Short Median Transit Lane	Risk of encounter contaminated groundwater during construction in Section 2.	Potential for temporary construction impacts. butt would not exceed state thresholds.	No perceptible increase in noise. Addition of center transit lane could move traffic in Section 2 away from receptors.	Potential tree removal and impact to vegetation in Section 2.
Transit Lanes	3-2	Long Median Transit Lane	Risk of encounter contaminated groundwater during construction in Sections and 2.	Potential for temporary construction impacts. butt would not exceed state thresholds.	No perceptible increase in noise. Addition of center transit lanes could move traffic in Sections 1 and 2 away from receptors.	Potential tree removal and impact to vegetation in Sections 1 and 2.
Transit Lanes	3-3	Right Side Transit Lane	Risk of encounter contaminated groundwater during construction in Sections and 2.	Potential for temporary construction impacts. butt would not exceed state thresholds.	No perceptible increase in noise. Addition of right side transit lanes could move traffic in Sections 1 and 2 closer to receptors.	Potential tree removal and impact to vegetation in Sections 1 and 2.
Bus On Shoulder	4-1	Median Bus On Shoulder	Risk of encounter contaminated groundwater during construction in Sections and 2.	Potential for temporary construction impacts. butt would not exceed state thresholds.	No perceptible increase in noise. Addition of center median bus on shoulder could move buss traffic in Sections 1 and 2 away from receptors.	Potential tree removal and impact to vegetation in Sections 1 and 2.
Bus On Shoulder	4-2	Right Side Bus On Shoulder	Risk of encounter contaminated groundwater during construction in Sections 1 and 2.	Potential for temporary construction impacts. butt would not exceed state thresholds.	No perceptible increase in noise. Addition of right side bus on shoulder could move bus traffic in Sections 1 and 2 closer to receptors.	Potential tree removal and impact to vegetation in Sections 1 and 2.

Summary of Preliminary Environmental Impacts (continued)

Alternative			Wetlands and Other Waters	Plant Species	Animal Species	Threatened and Endangered Species
	1-1	No Change	None	None	None	None
Express Lanes	2-1	HOV To Express Lane	None	None	None	None
Express Lanes	2-2	Short Dual Express Lane	Potential for temporary impacts associated with construction related discharges in Section 2.	None or negligible.	Potential temporary construction impacts in Section 2.	Potential for temporary construction impacts in Section 2.
Express Lanes	2-3	Long Dual Express Lane	Potential for temporary impacts associated with construction related discharges in Sections 1 and 2.	None or negligible.	Potential temporary construction impacts in Sections 1 and 2.	Potential for temporary construction impacts in Sections 1 and 2.
Transit Lanes	3-1	Short Median Transit Lane	Potential for temporary impacts associated with construction related discharges in Section 2.	None or negligible.	Potential temporary construction impacts in Sections 1 and 2.	Potential for temporary construction impacts in Sections 1 and 2.
Transit Lanes	3-2	Long Median Transit Lane	Potential for temporary impacts associated with construction related discharges in Sections 1 and 2.	None or negligible.	Potential temporary construction impacts in Sections 1 and 2.	Potential for temporary construction impacts in Sections 1 and 2.
Transit Lanes	3-3	Right Side Transit Lane	Potential for temporary impacts associated with construction related discharges in Sections 1 and 2.	None or negligible.	Potential temporary construction impacts in Sections 1 and 2.	Potential for temporary construction impacts in Sections 1 and 2.
Bus On Shoulder	4-1	Median Bus On Shoulder	Potential for temporary impacts associated with construction related discharges in Sections 1 and 2.	None or negligible.	Potential temporary construction impacts in Sections 1 and 2.	Potential for temporary construction impacts in Sections 1 and 2.
Bus On Shoulder	4-2	Right Side Bus On Shoulder	Potential for temporary impacts associated with construction related discharges in Sections 1 and 2.	None or negligible.	Potential temporary construction impacts in Sections 1 and 2.	Potential for temporary construction impacts in Sections 1 and 2.

Summary of Preliminary Environmental Impacts (continued)

Alternative			Environmental Justice	Utility/Emergency Services	Traffic and Transportation/pedestrian and bicycle Facilities	Visual/Aesthetics
	1-1	**No Change**	None	None	Previous environmental documentation noted impaired traffic flow in both build and future years. No impact on pedestrian and bicycle facilities. No impact to pedestrian and bicycle facilities.	None
Express Lanes	2-1	**HOV To Express Lane**	Project has the potential to improve traffic flow.	None	Positive impacts on traffic flow. No impacts to bicycle and pedestrian facilities.	Project would be visually and aesthetically compatible with existing freeway setting
Express Lanes	2-2	**Short Dual Express Lane**	Positive impact. Project would improve traffic flow with additional benefits in Section 2.	Potential for some traffic related construction impacts in Section 2.	Positive impacts on traffic flow. No impacts to bicycle and pedestrian facilities.	Project would be visually and aesthetically compatible with existing freeway setting
Express Lanes	2-3	**Long Dual Express Lane**	Positive impact. Project would improve traffic flow with additional benefits in Sections 1 and 2.	Potential for some traffic related construction impacts in Sections 1 and 2.	Positive impacts on traffic flow. No impacts to bicycle and pedestrian facilities.	Project would be visually and aesthetically compatible with existing freeway setting
Transit Lanes	3-1	**Short Median Transit Lane**	Positive impact. Project would improve traffic flow with additional benefits in Sections 1 and provide a transit option.	Potential for some traffic related construction impacts in section 2.	Positive impacts on traffic flow. No impacts to bicycle and pedestrian facilities.	Project would be visually and aesthetically compatible with existing freeway setting
Transit Lanes	3-2	**Long Median Transit Lane**	Positive impact. Project would improve traffic flow with additional benefits in Sections 1 and 2 and provide a transit option.	Potential for some construction related impacts in Sections 1 and 2.	Positive impacts on traffic flow. No impacts to bicycle and pedestrian facilities.	Project would be visually and aesthetically compatible with existing freeway setting
Transit Lanes	3-3	**Right Side Transit Lane**	Positive impact. Project would improve traffic flow with additional benefits in Sections 1 and 2 and provide a transit option.	Potential for some construction related impacts in Sections 1 and 2.	Positive impacts on traffic flow. No impacts to bicycle and pedestrian facilities.	Project would be visually and aesthetically compatible with existing freeway setting
Bus On Shoulder	4-1	**Median Bus On Shoulder**	Positive impact. Project would improve traffic flow with additional benefits in Sections 1 and 2 and provide a transit option.	Potential for some construction related impacts in Sections 1 and 2.	Positive impacts on traffic flow. No impacts to bicycle and pedestrian facilities.	Project would be visually and aesthetically compatible with existing freeway setting
Bus On Shoulder	4-2	**Right Side Bus On Shoulder**	Positive impact. Project would improve traffic flow with additional benefits in Sections 1 and 2 and provide a transit option.	Potential for some construction related impacts in Sections 1 and 2.	Positive impacts on traffic flow. No impacts to bicycle and pedestrian facilities.	Project would be visually and aesthetically compatible with existing freeway setting

Summary of Preliminary Environmental Impacts (continued)

Alternative			Hydrology and Floodplain	Water Quality and Storm Water Runoff	Geology/Soils/Seismicity/ Topography	Paleontology
	1-1	No Change	None	None	None	None
Express Lanes	2-1	HOV To Express Lane	None	None	None	None
Express Lanes	2-2	Short Dual Express Lane	None	Potential temporary impacts during construction in Section 2.	None	Potential for encountering unexposed subsurface paleontological resources in Section 2.
Express Lanes	2-3	Long Dual Express Lane	None	Potential temporary impacts during construction in Sections 1 and 2. Mitigation possible.	None	Potential for encountering unexposed subsurface paleontological resources in Sections 1 and 2.
Transit Lanes	3-1	Short Median Transit Lane	None	Potential temporary impacts during construction in Section 2. Mitigation possible.	Need to construct stations/stops and any widened bridge decks to seismic standards.	Potential for encountering unexposed subsurface paleontological resources in Sections 1 and 2.
Transit Lanes	3-2	Long Median Transit Lane	None	Potential temporary impacts during construction in Sections 1 and 2. Mitigation possible.	Potential for encountering unexposed subsurface paleontological resources in Sections 1 and 2.	Potential for encountering unexposed subsurface paleontological resources in Sections 1 and 2.
Transit Lanes	3-3	Right Side Transit Lane	None	Potential temporary impacts during construction in Sections 1 and 2. Mitigation possible.	Need to construct stations/stops and any widened bridge decks to seismic standards.	Potential for encountering unexposed subsurface paleontological resources in Sections 1 and 2.
Bus On Shoulder	4-1	Median Bus On Shoulder	None	Potential temporary impacts during construction in Sections 1 and 2. Mitigation possible.	Need to construct stations/stops and any widened bridge decks to seismic standards.	Potential for encountering unexposed subsurface paleontological resources in Sections 1 and 2.
Bus On Shoulder	4-2	Right Side Bus On Shoulder	None	Potential for encountering unexposed subsurface paleontological resources in Sections 1 and 2.	Need to construct stations/stops and any widened bridge decks to seismic standards.	Potential for encountering unexposed subsurface paleontological resources in Sections 1 and 2.

Summary of Preliminary Environmental Impacts (continued)

Alternative			Invasive Species	Cumulative Impacts
	1-1	**No Change**	None	None
Express Lanes	**2-1**	**HOV To Express Lane**	None	None
Express Lanes	**2-2**	**Short Dual Express Lane**	Potential for the inadvertent spread of invasive species during construction in Section 2, but can be mitigated.	None
Express Lanes	**2-3**	**Long Dual Express Lane**	Potential for the inadvertent spread of invasive species during construction in Sections 1 and 2, but can be mitigated.	None
Transit Lanes	**3-1**	**Short Median Transit Lane**	Potential for the inadvertent spread of invasive species during construction in Section 2, but can be mitigated.	None
Transit Lanes	**3-2**	**Long Median Transit Lane**	Potential for the inadvertent spread of invasive species during construction in Sections 1 and 2, but can be mitigated.	None
Transit Lanes	**3-3**	**Right Side Transit Lane**	Potential for the inadvertent spread of invasive species during construction in Sections 1 and 2, but can be mitigated.	None
Bus On Shoulder	**4-1**	**Median Bus On Shoulder**	Potential for the inadvertent spread of invasive species during construction in Sections 1 and 2, but can be mitigated.	None
Bus On Shoulder	**4-2**	**Right Side Bus On Shoulder**	Potential for the inadvertent spread of invasive species during construction in Sections 1 and 2, but can be mitigated.	None

APPENDIX E

TRANSIT OPERATIONS

SR 85 Transit Guideway Study: Transit Operating Concepts

Draft Report

Prepared for:

Santa Clara Valley Transportation Authority

Prepared by:

CHS Consulting Group
220 Montgomery Street, Suite 346
San Francisco, California 94104

December 18, 2019

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Tables and Figures

As part of Task 2 of the transit opportunities study for State Route 85 (SR 85) in Santa Clara County, CHS Consulting Group (CHS) is responsible for examining expanded Santa Clara Valley Transportation Authority (VTA) bus operations on that roadway. Specifically, we are to suggest alternative network concepts for the corridor, as well as evaluate the operating implications of various lane configurations that could facilitate the flow of buses on the freeway. This technical memorandum summarizes our findings in these tasks.

1.0 Travel in the Study Area

Travel characteristics of the study area, summarized in Chapters 3 and 4, serve as a guide for designing transit service in the SR 85 corridor. Among them are the following key findings:

- SR 85 does not directly connect any major activity centers [although a few, like De Anza College, are located nearby].
- The greatest concentrations of population are in the southeast and southern portions of the corridor, while the greatest concentrations of employment are in the northwest and northern portions. Certain adjacent areas like Palo Alto, Mountain View, and the Stevens Creek corridor have relatively high concentrations of both population and employment.
- For the most part, origin-destination pairs in the study area are dispersed, and their travel direction does not necessarily parallel that of the corridor. Many of these trips may not be using SR 85 at all.
- There are some areas along the corridor where the propensity to use transit is higher than average for Santa Clara County. These include the interchanges with US-101 (at the northwest end of the corridor), El Camino Real, Stevens Creek Boulevard, SR-17, Almaden Expressway, SR-87, and US-101 (at the southeast end of the corridor).

Some of these findings do not bode well for transit, which is best suited to areas with relatively high densities of population and employment, and with trip patterns concentrated along corridors. However, the research did suggest that the best opportunities for transit may be in serving relatively short trips, as opposed to the longer trips that begin or end outside of the SR 85 corridor.

2.0 Current Transit Service

Chapter 3 detailed the VTA transit services using the SR 85 freeway. Since that information was compiled, VTA has initiated several service changes. An updated summary of current VTA service using the freeway as of December 28, 2019 is provided below:

- 27-Good Samaritan Hospital-Kaiser San Jose [30- to 45-minute weekday service; 60-minute weekend service]
- 102-South San Jose-Palo Alto [7 one-way trips during each weekday peak period]
- 168- Gilroy Transit Center-San Jose Diridon Transit Center [7 one-way trips during each weekday peak period]
- 185-Gilroy Transit Center-Mountain View [3 one-way trips during each weekday peak period]

- 901-Blue Line (Baypointe-Santa Teresa) light rail [15-minute service weekdays and weekends]

Most of these five routes serve relatively short segments of the freeway southeast of San Jose. Those serving the longest segments of the corridor (Routes 102 and 185) operate few trips, and those trips are restricted to the peak direction of travel during the peak travel period. Thus, there are gaps in service along the corridor during mid-days, evenings, and weekends, as well as in the contra-peak direction of travel during peak hours. Additionally, with the exception of the Blue Line light rail service, these routes do not make stops along the freeway and bypass trip attractors like De Anza College, West Valley College, and Good Samaritan Hospital. As a result, they not only skirt potential destinations desired by Santa Clara County travelers, but they also miss transfer opportunities with connecting bus services at these locations (as well as at the freeway's interchange with El Camino Real).

Whether demand is sufficient to justify all-day, bi-directional operation in the SR 85 corridor will be determined by travel demand estimates yet to be conducted. For the time being, efforts have focused on developing alternative service patterns that could fill the apparent gaps identified in the corridor to date. For the purposes of this memorandum, these service alternatives are referred to as bus rapid transit (BRT). While there are many versions of BRT, the term is used here to denote bus service that is generally characterized by:

- Freedom from delay enabled by priority in traffic (through such measures as reserved lanes and traffic signal priority) and off-board fare collection
- Frequent, two-way operation throughout the day
- Upscale passenger amenities at stations and on the buses, with unique branding to position the service as an improvement over ordinary local bus service.

The intent is not just to speed up buses, but to create a travel experience that can attract the more demanding segments of the market that are reluctant to use public transportation today. Whether or not all of these attributes can be provided, the term BRT is a useful way to describe the premium bus service being examined for the SR 85 freeway corridor.

3.0 Nature of the Service

Many of the characteristics of BRT previously mentioned were recommended in Chapter 4, which stated that effective transit in the SR 85 corridor should serve bi-directional travel demands throughout the day. It further suggested that this service connect with nearby existing local and regional transit lines, link to activity centers in the northwest part of the corridor, and focus on trips that are 3 to 15 miles in length. These criteria have been used as guidelines in developing hypothetical BRT services for consideration in the SR 85 corridor. Each element of these services-- alignment, terminals, stopping points, and schedules is discussed below.

3.1 Alignment

SR 85 would form the major part of the alignment of a BRT service in this corridor, with arterial streets providing access to stations in certain areas. As described in the Basis of Design Report for this project, a number of different lane configurations have been proposed to offer a pathway for buses that would allow them to avoid traffic congestion on the freeway. These configurations include exclusive transit lanes or express lanes. The express lanes would be located along the left (median) side of each direction of travel. In contrast, the transit lanes could be either on the left or right sides, either as new lanes added to the freeway or as conversions of existing shoulders. Bus station designs have been developed for each of these lane configurations. The various arrangements have implications on how buses would access the lanes and serve stations, as discussed later in this memorandum.

3.2 Terminal Points

Numerous locations could serve as the termini of an SR 85 BRT service. Two criteria were used to limit these to a small number for consideration:

- Presence of an activity center, either a major generator of trips or a transfer point for several transit routes
- Proximity to SR 85, desirably no farther than one mile

Using these criteria, the Mountain View Transit Center (at Evelyn Avenue and Castro Street) emerged as the most suitable northwestern terminal for SR 85 BRT. The Transit Center consists of a light rail terminal and a Caltrain station. It is served additionally by two VTA bus routes, as well as public and private shuttles to employment areas. It is also directly adjacent to Downtown Mountain View. The Transit Center is located about a half-mile west of SR 85.

A second possible northwestern terminal was identified in the North Bayshore area of Mountain View (approximately at the intersection of San Antonio Road and Casey Avenue). This location contravenes the one-mile distance criterion (it's approximately 3 ½ miles from SR 85). However, it penetrates an important employment area which is slated for even more workplace development. Buses serving it could stop at the Mountain View Transit Center as a way station. Such a service would provide a one-seat ride to many jobs for those traveling to or from the BRT stations farther south. On the other hand, little demand for travel to this employment area would be expected midday and on weekends. Including this terminal for further study allows its merits and drawbacks to be made explicit.

For the southeastern terminal, two locations were also considered: Santa Teresa Station and Ohlone/Chynoweth Station. Both are existing light rail terminals that are served by VTA buses. Of these, Santa Teresa Station is less promising, as it would entail almost five miles of travel along a section of SR 85 already served by Blue Line light rail service. Because it avoids this duplication, Ohlone/Chynoweth Station makes the most sense. If Santa Teresa were chosen as the terminal, then BRT should serve Ohlone/Chynoweth as a way station (exiting and re-entering the freeway to do so).

In summary, the most cost-effective terminals for SR 85 BRT appear to be Mountain View Transit Center in the northwest end of the corridor and Ohlone/Chynoweth Station in the southeast. However, in order to consider and test a reasonable number of routings, alternatives with terminals at North Bayshore and Santa Teresa have also been included.

3.3 Way Stations

Chapter 4 identified 12 locations that potentially could be served by an SR 85 BRT line. Of these, five were selected for further consideration (in addition to the four mentioned above as terminal stations). These five are located at colleges, hospitals, and transit centers. The transit centers are particularly important because they can extend the range of SR 85 buses by permitting transfers to and from transit lines serving other areas of Santa Clara County.

The following locations were considered reasonable candidates as way stations along the SR 85 corridor:

- El Camino Real: While there is little within walking distance of the interchange of SR 85 and El Camino Real, a BRT stop here would allow passenger transfers to and from two important bus lines in the VTA network, local 22 and rapid 522. The configuration of roadways at this interchange could pose challenges for pedestrians because of the ramps and high-speed traffic, a factor that must be dealt with in the design of the BRT station.
- Stevens Creek Boulevard: This stop would serve De Anza College, with an enrollment of 24,000 students. Classrooms vary from 0.2 to 0.4 miles walking distance from the SR 85 interchange. A transit center at the eastern edge of campus is about 0.6 miles from the freeway and is currently served by five VTA bus routes; only one of these routes passes through the SR 85/Stevens Creek interchange. Due to these distances, some first-mile/last-mile issues are likely.
- Saratoga Avenue: Like El Camino Real, this location has little around it within walking distance. However, Saratoga Avenue is an access route to West Valley College, with an enrollment of 12,000 students. A transit center near the entrance of the college serves three VTA bus routes (only one of which passes through the SR 85/Saratoga interchange). However, West Valley College is about a mile away from the SR 85 interchange with Saratoga Avenue, making convenient first-mile/last-mile connections a must.
- Winchester Boulevard: Should the light rail Green Line be extended south from Winchester Station to Los Gatos, its proposed terminal at Vasona Junction would be close to SR 85 and an ideal place for passengers to transfer to and from the SR 85 BRT line. However, the future of the Vasona Extension is currently uncertain. For this reason, it is primarily included here as a placeholder in case the project again becomes active. The next best station location in this area would be slightly (0.75 miles) farther east at Bascom Avenue.
- Bascom Avenue: The interchange of SR 85 with Bascom Avenue/Los Gatos Boulevard would provide access to Good Samaritan Hospital. In addition to the medical facilities there, connections could be made to two VTA bus lines that serve the hospital complex (only one of which also passes through the SR 85/Bascom Avenue interchange). The distance between the station and the hospital complex is from 0.2 to 0.5 miles, which could create first-mile/last-mile concerns for some transit riders. Should the Vasona LRT Extension be constructed in the future, the Bascom Avenue station should no longer be considered, as a station on the Vasona extension would provide transfers to both light rail and other VTA bus lines.

Thus, of the five way station locations identified, four were selected for further study for SR 85 BRT service: El Camino Real, Stevens Creek Boulevard, Saratoga Avenue, and Bascom Avenue.

The Basis of Design Report examined on-line station alternatives for the median of the freeway as well as along the right side (in each direction of travel). In addition, station locations at the tops of ramps from both the median and right sides of the freeway were considered. From the point of view of overall operations, these various designs will yield similar results in terms of travel time, operating costs, and patronage.

However, an alternative approach for stations is to route buses off SR 85 so that they can travel directly to a destination too distant for comfortable walking from the freeway. This approach would be useful to address the first-mile/last-mile concerns previously mentioned at Stevens Creek Boulevard (for reaching both De Anza College and its adjacent transit center), Saratoga Avenue (for reaching West Valley College), and Bascom Avenue (for reaching Good Samaritan Hospital). As noted in Chapter 4, a transit service that operates strictly along SR 85 will have difficulty attracting riders if it does not provide linkages to these activity centers. The advantage of the off-line approach described here is that BRT would directly penetrate each activity center. The disadvantages are that these diversions will add travel time to the service, raise operating costs, increase the probability of delays and unreliability, and annoy through riders. To help overcome these drawbacks, on-street priority measures for BRT would be necessary.

3.4 Schedules

The discussion thus far has focused on the spatial elements of transit service: alignment, terminals, and way stations. The final elements are temporal: the schedules on which the BRT buses operate, and the span of service each day during which operation is provided. For the purposes of the operating analyses performed in this study, a constant headway of 15 minutes has been assumed. This provides regular and reliable service that could, in reality, be increased during peak travel periods after some operating experience has been gained. Likewise, it may be appropriate to decrease service to every half hour on weekends or late in the evening in order to cost-effectively serve low numbers of riders during these periods. Nonetheless, the 15-minute frequency allows for a consistent basis of comparison among all hypothetical alternatives while maintaining a standard of good service in the corridor.

Another reason for considering 15-minute frequencies on the SR 85 BRT line is that it has the potential of creating a shortcut for riders on many of VTA's light rail lines. Those at the western end of the Orange Line near Mountain View, the southwest end of the Green Line (if extended to Vasona), or the south end of the Blue Line near Ohlone/Chynoweth may find it less time consuming to transfer to the circumferential BRT line on SR 85 to travel to the end of one of the other lines than to travel in the opposite direction and pass through downtown San Jose in order to reach their destination. Since the light rail lines use 15 minutes as a base level of service, the SR 85 BRT line should do the same. Even if timed transfers cannot be guaranteed at the light rail terminals, transferring passengers will not have to endure long waiting times, which would defeat the purpose of the shortcut.

The span of service is assumed to be:

- Monday-Friday 5:00 am – 10:00 pm
- Saturday 6:00 am – 7:00 pm
- Sunday 7:00 am – 7:00 pm

Actual operating experience could reveal that service on Saturdays and/or Sundays is not warranted, but the above spans are appropriate for comparing the alternatives at this point in time.

4.0 Hypothetical Routing Plans

In order to develop estimates of operating needs and costs, four hypothetical routing alternatives were developed. These incorporate the terminals, way stations, and schedules previously described, as well as the concepts of on-line versus off-line stations.

- Alternative 1. Mountain View-Ohlone/Chynoweth with Freeway Stations: This could be considered the base case. Either on-line or ramp stations would be located along SR 85 at El Camino Real, Stevens Creek Boulevard, Saratoga Avenue, and Bascom Avenue.
- Alternative 2. Mountain View-Ohlone/Chynoweth with Off-line Stations: Either on-line or ramp stations would be located along SR 85 at El Camino Real, with off-line stations at De Anza College, West Valley College, and Good Samaritan Hospital.
- Alternative 3. North Bayshore-Ohlone/Chynoweth with Freeway Stations: On-street stops would be located at six locations in the North Bayshore area, as well as the Mountain View Transit Center, with either on-line or ramp stations along SR 85 at El Camino Real, Stevens Creek Boulevard, Saratoga Avenue, and Bascom Avenue.
- Alternative 4. Mountain View-Santa Teresa Station with Freeway Stations: Either on-line or ramp stations would be located along SR 85 at El Camino Real, Stevens Creek Boulevard, Saratoga Avenue, and Bascom Avenue, with an off-line station at Ohlone/Chynoweth.

A composite map of all four alternatives is provided in **Figure 1**, with the separate alternatives depicted diagrammatically in **Figure 2**.

These alternatives represent a range of approaches for providing premium bus service in the SR 85 corridor and utilizing restricted lanes to keep buses moving during congested periods. In reality, several routing patterns could be operated on the freeway simultaneously. For example, in addition to the base case Mountain View-Ohlone/Chynoweth buses, other buses could be operated between Mountain View and the current Winchester light rail terminal. Another variant is for peak-hour express buses to supplement base service along SR 85 by connecting residential areas at the south end of the corridor with employment areas in the north, such as North Bayshore. However, to simplify the process of developing estimates of patronage and operating parameters at this early stage of the project, only Alternatives 1-4 were examined in depth. If it is eventually decided to invest in BRT on SR 85 and equip that facility with transit lanes and stations, more detailed analyses can be undertaken on a wider variety of service patterns.

5.0 Comparative Operating Statistics

REMIX software was utilized to test the alternatives. This program uses a graphical interface and allows the results of different route alignments to be displayed instantly. In running the REMIX model, average running speeds of 31 mph were assumed on the freeway and 18 mph on arterial streets (which are derived from the current operating statistics of Route 102). To this was added an average dwell time of 40 seconds at each station. Layover time at the end of each run was input as 17% of round-trip running time, VTA's current average. Fully-allocated operating costs (as opposed to marginal costs) were calculated at $179 per hour, VTA's current level.

Analyzing the four hypothetical alternatives with REMIX resulted in the comparative operating statistics summarized in **Table 1**. The length of the alternatives ranges from 18.5 to 23.4 miles, with Alternative 1 being the shortest and Alternative 4 the longest. Largely for this reason, Alternative 1 serves a somewhat smaller catchment area of both population and employment than most of the other alternatives. Alternative 4 has the greatest population base. The greatest employment base is encompassed within the catchment area of Alternative 3, influenced mainly by its direct service to the North Bayshore employment area. Running times among the alternatives vary from 40.5 to 58.2 minutes (including station dwell time). They correlate generally with the length of each alternative but are affected further by the amount of arterial street running; again, Alternative 1 is the lowest. With its relatively short running time, Alternative 1 would require only seven buses to operate a 15-minute service. The other alternatives require nine or ten buses to run the same frequency.

The robust 15-minute all-day service hypothesized for the alternatives results in 0.86 to 1.08 million service miles per year and 36,652 to 52,490 annual service hours. These result in annual operating costs of $6.56 million to $9.40 million. In each instance, Alternative 1 is the lowest in the range. Alternative 3 is the highest for service hours and cost, while Alternative 4 is highest for service miles.

6.0 Bus Use of Priority Lanes on the Freeway

Many lane and station configurations for SR 85 were presented in the Basis of Design Report. An important consideration is the ability of BRT buses to access these lanes and stations, especially if difficult maneuvers are required. Comments on each type of design alternative are summarized below:

- Design alternatives with median priority lanes (either express lanes or exclusive transit lanes) but no on-line stations would be impractical for SR 85 BRT service. Since way stations would be an integral part of bus rapid transit in this corridor, BRT buses would have to use on- and off-ramps at the right side of each travel direction to access the stations (whether those stations were on the freeway ramps or were off-line, such as at West Valley College). During periods of heavy traffic flow, buses weaving into and out of the median lanes would entail slower maneuvering speeds and could result in a somewhat more accident-prone operation. One way around this problem would be to construct drop ramps directly to and from the median lanes, but this solution would add considerable cost to each alternative. In this scenario, stations for operating alternatives 1, 3, and 4 could be located at the top of these drop ramps. Stations for operating alternative 2 would be off-line, but the drop ramps would allow BRT buses to access them without weaving to the general traffic ramps at the right-side of the freeway.

- Design alternatives that feature transit lanes and stations along the median of the freeway north of SR 87 would be amenable to operating alternatives 1, 3, and 4. Operating Alternative 2 would require median drop ramps to access off-line stations.
- Design alternatives that offer transit lanes and stations along the right side of the freeway would be useable by all of the BRT operating alternatives (though on-line stations would be unnecessary for operating alternative 2). Any right-side design alternative that would accommodate buses only during peak periods would not be practical for all-day transit use unless buses were permitted to stop at the on-line stations off-peak. Alternatively, buses could use ramp or off-line stops all day, and no stops would be required along the freeway's transit lanes.
- Design alternatives that require buses to transition between median- and side-running priority lanes will necessitate weaving maneuvers for buses. Depending on the magnitude of traffic volumes, the difficulty of those maneuvers could make such alternatives impractical.
- At the north end of the project, the drop ramp suggested for Evelyn Avenue would appear to be essential for those design alternatives with priority lanes in the median in that segment of the freeway. This ramp would avoid the need for weaving maneuvers between the median lanes where buses would operate and the right-side entrance and exit ramps. Likewise, at the south end of the project near Ohlone-Chynoweth Station, some sort of direct connector ramp arrangement would be needed to avoid the weaving that would be required in the alternatives with median priority lanes in that segment of the freeway.

7.0 Ridership

An analysis of the projected ridership that would be generated by each of the hypothetical operating alternatives will be conducted later in this study. Until such time as ridership can be assessed, it would be premature to judge which operating alternative would be better or worse, overall, than the others.

8.0 Conclusions

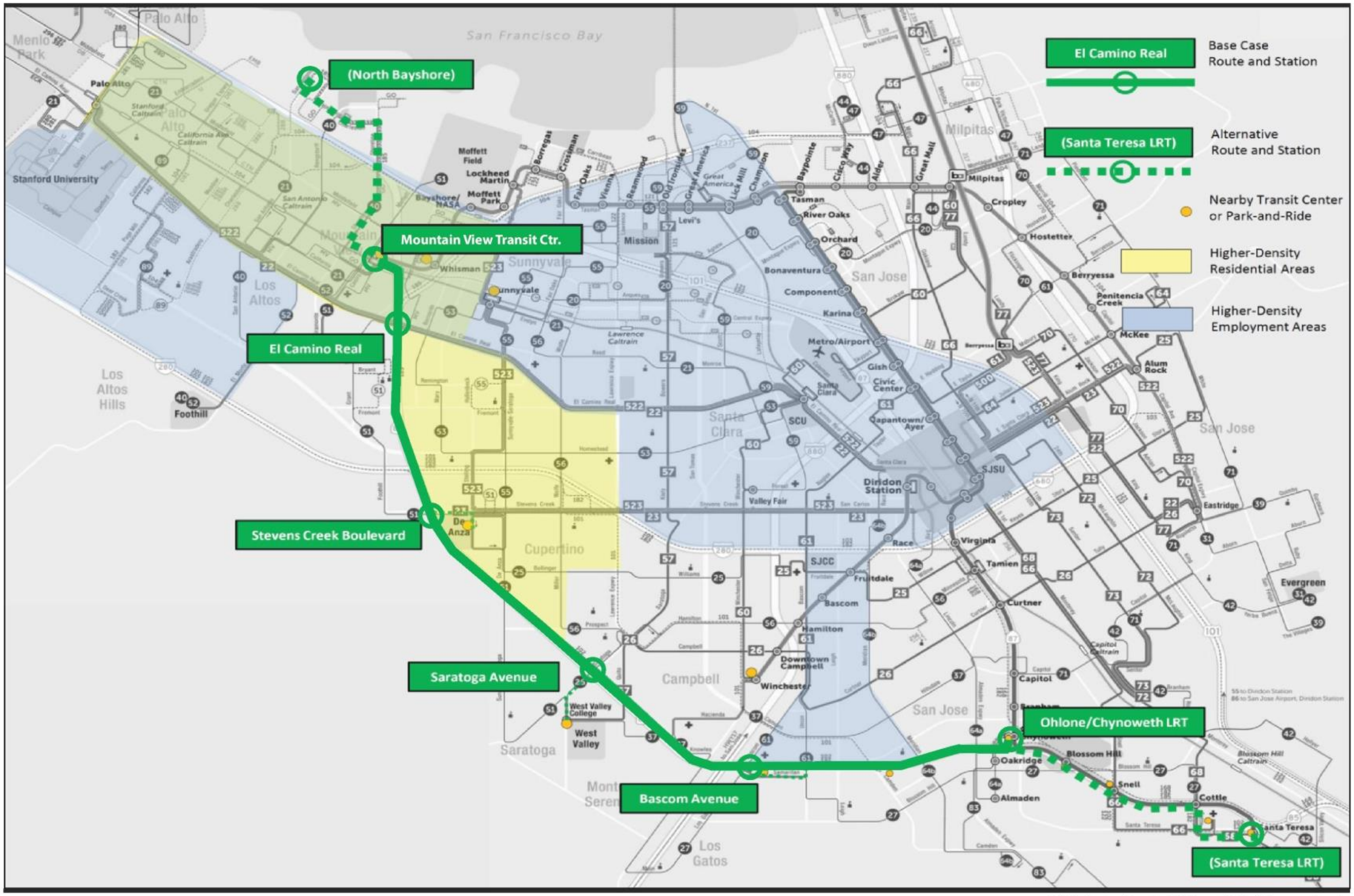
The provision of bus rapid transit in the SR 85 corridor appears to be feasible for several of the design configurations that give buses priority on the freeway and that provide intermediate stations to access activity centers. VTA must assess whether the costs (both capital and operating) of this service are warranted for the ridership that would be expected. Nonetheless, there is no apparent fatal flaw from an operating standpoint for providing premium service in this corridor. The keys for success will be to provide connectivity with destinations and other VTA transit services located along the corridor while maintaining relatively high travel speeds.

Table 1. Results of REMIX Analysis of SR 85 BRT Alternatives

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Terminals	Mountain View	Mountain View	North Bayshore	Mountain View
	Ohlone/Chynoweth	Ohlone/Chynoweth	Ohlone/Chynoweth	Santa Teresa
Station Type	Freeway	Off-line	Freeway	Freeway
Population Served	8,235	8,141	9,691	10,146
Number of Jobs Served	5,024	5,603	9,525	6,094
Number of Stations (one-way)	6	6	13	7
Length of Route (one-way, miles)	18.5	22.2	22.4	23.4
Running Time (one-way, minutes)	40.5	53	58.2	52.7
Running Time (two-way, minutes)	94.8	124	136.2	123.3
Number of Peak Buses Required	7	9	10	9
Annual Service Miles (million miles)	0.86	1.03	1.04	1.08
Annual Service Hours	36,652	47,965	52,490	47,512
Annual Operating Cost (millions)	$6.56	$8.59	$9.40	$8.50

Notes:

1. Running speeds are assumed to be 31 mph on freeways and 18 mph on local streets.
2. One-way running times include driving time between stations and dwell time at stations (assuming 40 seconds per station).
3. Two-way running times also include 17% layover time.
4. Service is provided at 15-minute headways from 5 am to 10 pm on weekdays, 6 am to 7 pm on Saturdays, and 7am to 7 pm on Sundays.
5. Peak buses do not include spares.



VTA State Route 85 Transit Guideway Study

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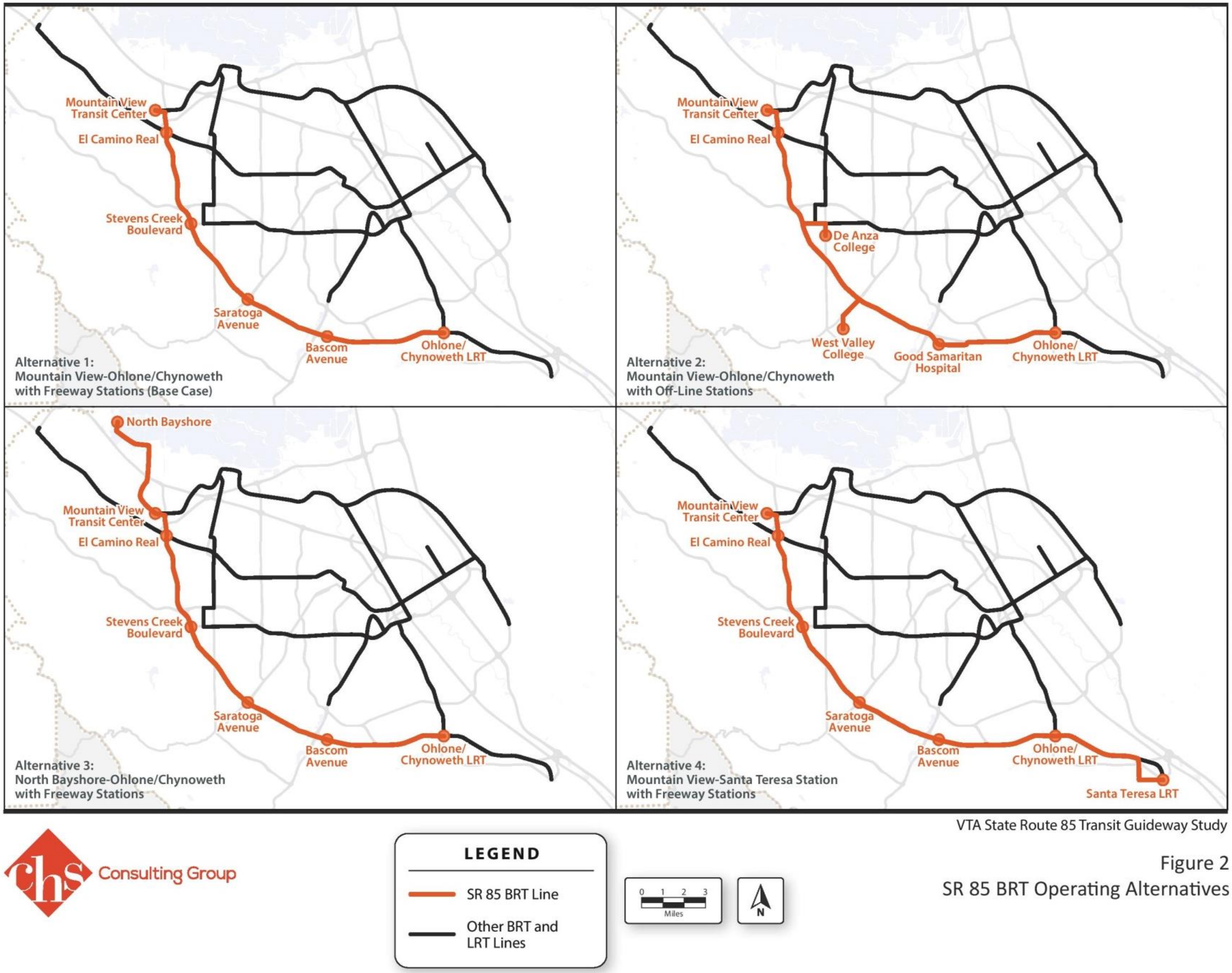
Figure 1
Composite Map of BRT Route Alternatives
Studied for SR 85



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VTA State Route 85 Transit Guideway Study

Figure 2
SR 85 BRT Operating Alternatives

Consulting Group

220 Montgomery Street, Suite 346
San Francisco, CA 94104
(415) 392-9688

211 Tenth Street, Suite 368
Oakland, CA 94607
(510) 272-9597

2150 Trade Zone Boulevard, Suite 105A
San Jose, CA 95131
(408) 777-4444

801 South Grand Avenue, 11th Floor
Los Angeles, CA 90017
(213) 260-1247

www.chsconsulting.net

SR 85 Transit Guideway Study: Bus Travel Time Estimates

Final Report

Prepared for:

CDM Smith

Prepared by:

CHS Consulting Group
220 Montgomery Street, Suite 346
San Francisco, California 94104

May 8, 2020

This technical memorandum discusses the methodology and assumptions for estimating bus travel times for each alternative in the SR 85 Transit Guideway Study. Bus travel time consists of two parts: running time between stations, and delay associated with way stations. Specific components of this delay include deceleration, acceleration, dwell time, traffic signal delay, re-entry delay, and offline station access delay. They vary based on station configurations, bus types, traffic conditions, and estimated ridership.

As described in project alternative analysis reports, there are three transit lane alternatives (short median, long median, and right side) and two bus-on-shoulder alternatives (median and right side). For each alternative, two routing options have been analyzed: (1) an in-route option with on-line or ramp stations, and (2) a deviation route option with off-line stations. On-line stations are located on the freeway mainline in the median of the roadway or along its right side. Ramp stations are located at the top of the freeway's on- or off-ramps. Off-line stations are located outside the freeway right-of-way at locations where there are activity centers or transfer stations that could generate ridership on the BRT line. Bus travel times are estimated for each alternative, each routing option, and both AM and PM peak periods (6 am to 10 am and 3 pm to 7 pm, respectively) in both directions. Ranges presented by minimum, maximum, and average travel time are included in the estimation.

1.0 Data

1.1 Freeway Speed and Volume Data

Freeway speed and volume data provided by CDM Smith include the speed on the general purpose lanes and the managed lanes (HOV lane/express lane) for each freeway segment. The whole corridor is divided into over 50 segments, with each segment located between two sets of ramps; within each peak period, travel times were tabulated by 15-minute time periods. General purpose and managed lane volumes are also given for each segment in both the AM and PM peak hour.

1.2 Ridership Estimates

Preliminary ridership estimates have been provided by CDM Smith for each station and each routing option. Low or high ridership stations were identified, based on whether the average peak period boardings are expected to be below or over 15 passengers.

2.0 Assumptions for Bus Running Time

2.1 Transit Lane Alternatives

Buses are assumed to run at the speed limit of SR-85, which is 65 mph on a dedicated transit lane.

2.2 Bus-on-Shoulder Alternatives

For the "median bus-on-shoulder" alternative, buses would use the express lane and, when traffic drops below 35 mph, they would exit onto the shoulder to bypass the congestion and run as fast as 35 mph or 10 mph over the express lane speed, whichever is slower. For the "right side bus-on-shoulder" alternative, buses would use the right-most general purpose lane and, when traffic drops below 35 mph, they would exit onto the shoulder to bypass the congestion and run as fast as 35 mph or 10 mph over the adjacent general purpose lane speed, whichever is slower.

2.3 Travel Time between Terminal Stations and SR-85

For all alternatives, buses would run on local streets between Ohlone-Chynoweth terminal and the Santa Teresa Boulevard ramps, and between Mountain View Transit Center terminal and the Evelyn Avenue ramps. The travel times for these segments have been estimated using Google Maps during peak hours. **Table 1** below shows the results.

Table 1. Travel Time between Terminal Stations and SR-85

Direction	AM Travel Time (min)		PM Travel Time (min)	
	Range	Mean	Range	Mean
Between Mountain View Transit Center and Evelyn Avenue ramps				
NB	3-6	4	3	3
SB	3-4	3.5	3-6	4
Between Ohlone-Chynoweth Station and Almaden Expressway ramps*				
NB	4-6	4.5	4	4
SB	3	3	3-4	3.5

*Because of the location limits of freeway speed data, the travel time of segments between Ohlone-Chynoweth Station and Almaden Expressway ramps have been estimated using Google Maps

3.0 Assumptions for Station Area Delay

3.1 On-line and Ramp Stations

Buses would decelerate while approaching an on-line station, stop and dwell at the station to alight and board passengers, and then accelerate and re-enter the travel lane. For ramp stations, buses would decelerate to approach the ramp intersection, wait for the green signal indication, stop at the far-side bus station, wait for passengers to alight and board, and then accelerate and merge back to the mainline travel lane. Assumptions are summarized in **Table 2,** below.

Table 2. Assumption Summary

Factor	Assumption
Deceleration	4 ft/s²
Acceleration	2.1 to 3.4 ft/s² for an articulated hybrid bus, depending on speed
Dwell time	30 or 60 seconds, depending on ridership level
Traffic signal delay	Based on local intersection operation
Re-entry delay	0 to 18 seconds, depending on configuration and traffic lane volumes

Reference sources include *Transit Capacity and Quality of Service Manual, 3rd Edition* (*TCQSM*), TRB's *Transit Cooperative Research Program Synthesis 75* (*TCRP*), and AASHTO's *A Policy on Geometric Design of Highways and Streets, 5th Edition* ("*Green Book*"). Details on assumptions for each delay component are summarized below.

3.1.1 Deceleration

The same deceleration rate is assumed for buses moving from the prevailing freeway speed to the stopping condition at bus stations (for on-line stations) and traffic signals (for ramp stations). It's possible that a bus driver will use heavier braking force on a station at the freeway grade than one on a ramp, but the difference in time were considered negligible for the purposes of this analysis. The same assumption applies to the acceleration rate (below).

According to *TCQSM*, the comfortable deceleration rate on average for a bus is 4 ft/s². According to the *Green Book,* this value is lower than a passenger car's deceleration rate of 6-8 ft/s² but higher than that of truck at 3 ft/s². Deceleration delay and distance will be calculated based on the prevailing speeds for both AM and PM peak hours.

3.1.2 Acceleration

Similarly, the same acceleration rate is assumed from the stopped condition at a bus station to the prevailing freeway speed for both on-line and ramp station alternatives.

Unlike deceleration, however, the acceleration rates depend on both the ultimate speed reached and on the bus type/propulsion system (*TCQSM*). They are lower when accelerating to higher speeds (50 mph) and higher when accelerating to lower speeds (20 mph) **(see Table 3).** For the purposes of this analysis, a 60-foot articulated bus is the most likely to be used for BRT service, based on common practice throughout the country. Moreover, federal regulations have led transit operators away from diesel buses and towards electric propulsion. Given the lack of information currently available for an all-electric bus, this analysis assumes a hybrid articulated bus for BRT service in the SR 85 corridor. Acceleration delay and distance will be calculated based on the prevailing speeds for both AM and PM peak hours.

Table 3. Bus Acceleration Characteristics

Bus Type	Average Time to Reach Speed (s)			Average Acceleration to Speed (ft/s^2)	
	10 mi/h	20 mi/h	50 mi/h	20 mi/h	50 mi/h
40-ft standard diesel	5.0	8.7	33.2	3.4	2.2
45-ft motor coach diesel	4.0	7.4	27.1	4.0	2.7
60-ft articulated diesel	4.0–4.7	9.1	42.3–43.6	3.2	1.7
Double deck diesel	6.2	10.4	43.6	2.8	1.7
60-ft articulated hybrid	3.8	8.6	35.2	3.4	2.1

3.1.3 Dwell Time

The most efficient boarding situation – all-door, pre-paid, and level boarding – is assumed for stations under all alternatives. These attributes are commonly shared by BRT systems operating elsewhere. According to *TCQSM*, the average per-passenger service time is 1.75 seconds (see **Table 4).** For the purposes of assuming a dwell time, corridor stations were categorized in two groups, based on the ridership analysis being performed by CDM Smith: Stations exhibiting the potential for 60 or more boardings per hour are classified as "high ridership" and the dwell time assumed as 60 seconds; stations with lower than 60 boardings per hour are assumed to have a dwell time of 30 seconds. A dwell time of 60 seconds is assumed for both terminal stations.

Table 4. Per-Passenger Service Time

Situation	Average Passenger Service Time (s/p)	
	Observed Range	Suggested Default
BOARDING		
No fare payment	1.75–2.5	1.75
Visual inspection (paper transfer/flash pass/mobile phone)	1.6–2.6	2.0
Single ticket or token into farebox	2.9–5.1	3.0
Exact change into farebox	3.1–8.4	4.5
Mechanical ticket validator	3.5–4.0	4.0
Magnetic stripe card	3.7–6.5	5.0
Smart card	2.5–3.2	2.75
ALIGHTING		
Front door	1.4–3.6	2.5
Rear door	1.2–2.2	1.75
Rear door with smart card check-out	3.4–4.0	3.5

3.1.4 Traffic Signal Delay

Traffic signal delay is the time waiting at a ramp intersection to get a green indication when buses approach a ramp station. This delay depends on cycle length, split, traffic volume, etc. For this study, half the signal cycle length is assumed to be the average waiting time at an intersection. Further, transit signal priority (TSP) treatments can minimize signal delay by extending the green indication or terminating a red indication early when a bus is approaching to allow the bus to make it through the intersection. Research shows that TSP can reduce bus delay at a signalized intersection by 5 to 15 seconds[1]. On average, 10 seconds of reduction is assumed for this study with the implementation of TSP. **Table 5** below shows signal cycle lengths and traffic signal delay at stations where ramp stations have been considered. Note that TSP treatments will add cost to ramp station alternatives.

Table 5. Traffic Signal Delay at Stations

Station	Cycle Length (s)		Signal Delay (s)	
	AM	PM	AM	PM
Bascom Avenue	116	120	48	50
Saratoga Avenue	120	120	50	50
Stevens Creek Boulevard	124	140	52	60

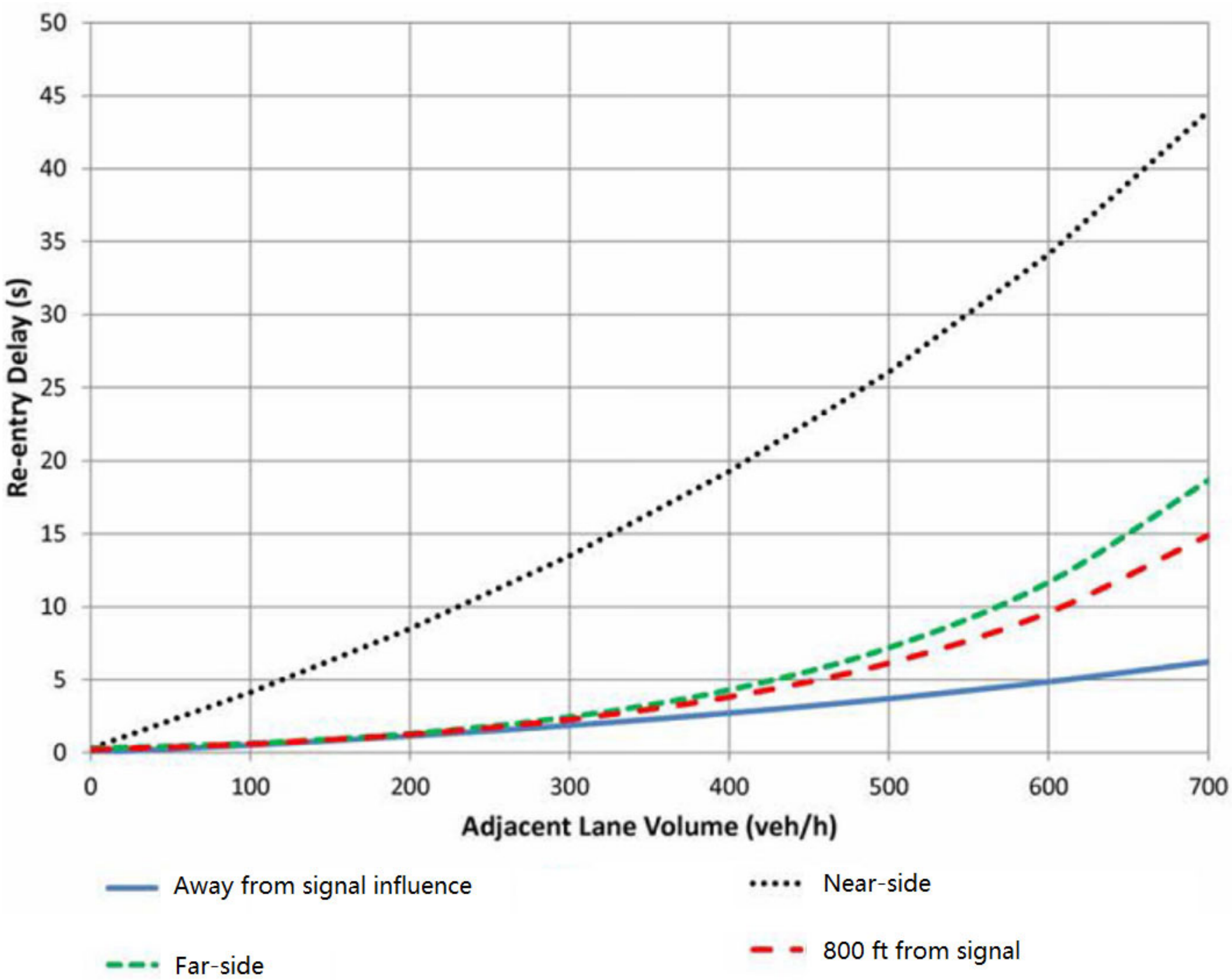
Source: Apple Park Project Draft Environmental Impact Report, Cupertino General Plan Draft Environmental Impact Report, Samaritan Medical Center Master Plan Project Environmental Impact Report

3.1.5 Re-entry Delay

Re-entry delay occurs where bus stations are out of the traffic lane and bus drivers must wait for a gap in traffic to pull back into the lane and continue on their route (*TCQSM*). Re-entry delay typically ranges from 0 to 10 seconds and can be significantly longer at near-side stations at traffic signals, when the bus has to wait for a long queue of vehicles to clear. The delay is determined by traffic conditions and bus station configurations; **Figure 1**, below, presents the results. For this project, far-side stations are preferred, so the re-entry delay will be calculated based on traffic volumes in the adjacent lane.

[1] https://nacto.org/docs/usdg/bus_signal_priority_chada.pdf

Figure 1. Illustrative Re-entry Delay by Station Configuration



3.2 Off-line Stations

The analysis includes three offline stations, located at De Anza College, West Valley College, and Good Samaritan Hospital. Delays for these stations have been estimated using Google Maps. After the bus leaves the off-ramp, it would merge with local street traffic, drop off/pick up passengers at the off-line station, and then use local streets to access the freeway on-ramp. **Table 6** below compares the travel times of running on the freeway without any stops versus diverting to local streets (using either existing ramps or potential direct bus ramps) and the difference between these two (delay). Dwell time would be calculated in the same manner as described in Section 3.1 above.

Table 6. Off-line Station Travel Time Delays

Direction	Scenario	AM Travel Time (min)		PM Travel Time (min)	
		Range	Mean	Range	Mean
De Anza College					
NB	Freeway no stop	6-14	10	1	1
	Use Stevens Creek ramps	9-22	16	8-16	12
	Use Stevens Creek and McClellan ramps	8-20	14	6-13	10
	Delay – Stevens Creek ramps	3-8	6	7-15	11
	Delay – Stevens Creek and McClellan ramps	2-6	4	5-12	9
SB	Freeway no stop	1	1	6-11	9
	Use Stevens Creek ramps	10-15	13	15-22	18
	Use Stevens Creek and McClellan ramps	6-10	8	10-16	13
	Delay – Stevens Creek ramps	9-14	12	9-11	9
	Delay – Stevens Creek and McClellan ramps	5-9	7	4-5	4
West Valley College					
NB	Freeway no stop	2-6	4	2	2
	Use Saratoga and Quito ramps	6-22	14	7-12	10
	Delay – Saratoga and Quito ramps	4-16	10	5-10	8
SB	Freeway no stop	2	2	2-7	5
	Use Saratoga and Quito ramps	6-12	9	6-13	10
	Delay – Saratoga and Quito ramps	4-10	7	4-6	5
Good Samaritan Hospital					
NB	Freeway no stop	6-14	10	3	3
	Use Bascom and Union Ramps	8-18	13	5-10	8
	Delay – Bascom and Union Ramps	2-4	3	2-7	5
SB	Freeway no stop	3	3	8-15	12
	Use Bascom and Union Ramps	5-7	6	10-18	14
	Delay – Bascom and Union Ramps	2-4	3	2-3	2

4.0 Results

The travel time results are shown in **Table 7** below.

Table 7. Travel Time Results (min)

Alternative			3-1 Short Median Transit Lane	3-2 Long Median Transit Lane	3-3 Right Side Transit Lane	4-1 Median Bus-On-Shoulder	4-2 Right Side Bus-On-Shoulder
Option 1 – In Route							
NB	AM	Max	33.4	32.2	33.9	35.2	46.9
		Min	27.7	28.2	28.9	28.4	32.8
		Avg	29.7	29.7	30.4	32.1	40.6
	PM	Max	28.6	30.2	29.9	30.2	35.0
		Min	28.6	30.2	29.9	30.2	33.9
		Avg	28.6	30.2	29.9	30.2	34.5
SB	AM	Max	27.6	28.2	28.3	27.9	32.8
		Min	26.6	27.2	27.3	26.9	31.2
		Avg	27.1	27.7	27.8	27.4	32.0
	PM	Max	31.7	29.7	31.3	32.1	48.2
		Min	26.8	26.7	27.3	27.4	41.9
		Avg	28.9	28.2	28.8	30.0	45.0
Option 2 – Deviation Route							
NB	AM	Max	59.9	58.7	62.8	61.6	71.3
		Min	35.1	35.6	37.6	35.9	37.7
		Avg	46.8	46.7	49.8	49.0	55.8
	PM	Max	57.1	61.7	54.7	58.7	62.9
		Min	40.0	43.6	39.6	41.6	43.8
		Avg	50.1	53.6	48.6	51.6	54.4
SB	AM	Max	49.5	50.1	55.6	49.8	56.1
		Min	36.5	37.1	41.5	36.8	41.5
		Avg	43.0	43.6	49.1	43.3	49.4
	PM	Max	53.5	51.5	59.5	53.7	68.6
		Min	44.6	44.5	50.5	45.1	57.2
		Avg	48.7	48.0	54.5	49.7	62.8

Table 7 arrays all of the results of the travel time analysis, including the minimum, maximum, and average time for each alternative in each direction of travel during each peak period. Unfortunately, the 120 cells in the table make comparing the alternatives difficult. For example, the shortest travel time of 26.6 minutes occurs in Alternative 3-1, Option 1 (southbound in the AM peak), while the longest time of

71.3 minutes occurs in Alternative 4-2, Option 2 (northbound in the AM peak). In order to avoid "apples and oranges" comparisons and simplify the results, **Table 8**, below, was developed. It uses only the average travel times from **Table 7**. Moreover, it homes in on the predominant directions of travel by aggregating northbound AM peak bus travel time with that of the southbound PM peak. Though that aggregate would not be experienced by BRT buses in regular service, it does represent a way of comparing the alternatives during the times most important to commuters.

Table 8. Aggregated Average Roundtrip Travel Time (min)

3-1 Short Median Transit Lane	3-2 Long Median Transit Lane	3-3 Right Side Transit Lane	4-1 Median Bus on Shoulder	4-2 Right Side Bus on Shoulder
Option 1 – In Route (AM from Ohlone to Mountain View, PM back to Ohlone)				
58.6	57.9	59.2	62.1	84.6
Option 2 – Deviation Route (AM from Ohlone to Mountain View, PM back to Ohlone)				
95.5	94.7	104.3	108.4	118.6

Table 8 makes it clear that, as would be expected, Option 2 with off-line stations requiring route deviations entails considerably longer travel time than Option 1 with on-line or ramp stations. For most of the alternatives, Option 2 requires from 62% to 76% more travel time; Alternative 4-2 exhibits a smaller differential, with 39% more travel time. Whether the longer travel times of Option 2 is a fatal flaw will depend on the results of the patronage forecast being developed as a separate component of this study.

Within each option, Alternative 3-2 results in the lowest travel time and Alternative 4-2 the highest. Other than Alternative 4-2, the other alternatives on Option 1 are within about 4 minutes of each other; the spread in Option 2 is greater, with a difference of up to almost 14 minutes. Travel time, of course, is only one aspect of the alternatives that must be considered. The capital cost of each alternative (covered in other reports in this study) must be taken into account, along with the patronage estimates mentioned above.

Consulting Group

220 Montgomery Street, Suite 346
San Francisco, CA 94104
(415) 392-9688

211 Tenth Street, Suite 368
Oakland, CA 94607
(510) 272-9597

2150 Trade Zone Boulevard, Suite 105A
San Jose, CA 95131
(408) 777-4444

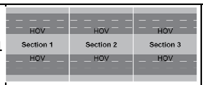
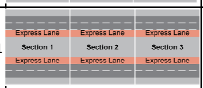
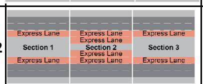
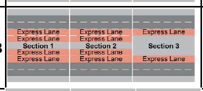
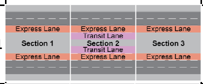
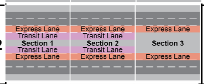
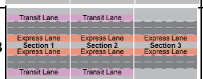
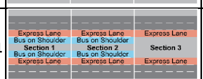
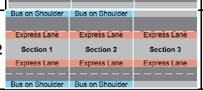
801 South Grand Avenue, 11th Floor
Los Angeles, CA 90017
(602) 885-7481

www.chsconsulting.net

APPENDIX F

SUMMARY EVALUATION MATRIX

SR 85 Transit Study Evaluation Matrix

Alternative				Option	Range of New Riders (Passengers /day)	Total Project Costs (2020) (millions)	Incremental Cost per New Rider	Subsidy per New Boarding (Rider)	Change in Traffic Operations NB & SB Peak Hour: *Vehicle Miles of Travel* AM		*PM*		*Vehicle Hours of Delay* AM		*PM*		*Miles of Congestion* AM		*PM*		Improvement in Transit Realiability (qualitative)	Additional Transit Operating Costs (2020) (millions)	Benefit to Shuttle Passengers	Right of Way Required (acres)	Impacts on Local Streets (qualitative)	Environmental Impacts (qualitative): Growth	Land Use	Noise
Existing	1-1		No Change																									
Express Lanes	2-1		HOV To Express Lane		Minimal increase in existing service	$135.0			580	0.4%	226	0.2%	-730	-45.8%	-852	-37.3%	-2.9	-38.7%	-2.5	-29.1%	None		Increased Speed in Express Lane	0	None	None	None	None
	2-2		Short Dual Express Lane		Minimal increase in existing service	$200.0			20,545	15.2%	24,793	16.5%	-1,218	-76.4%	-1,457	-63.8%	-6.1	-81.3%	-4.6	-53.5%	Minimal in Section 2 only		Increased Speed in Express Lanes	0	None	None	None	Low
	2-3		Long Dual Express Lane		Minimal increase in existing service	$270.0			28,993	21.4%	34,176	22.7%	-1,471	-92.2%	-1,695	-74.2%	-7.1	-94.7%	-6.8	-79.1%	Minimal in Sections 2 & 3 only		Increased Speed in Express Lanes	*El Camino Real Only*	*El Camino Real Only*	None	None	Low
Transit Lanes	3-1		Short Median Transit Lane	1	310	$250.0	$374.7	$74.5	203	0.1%	-87	-0.1%	-752	-47.2%	-906	-39.7%	-2.9	-38.7%	-3.4	-39.5%	Improved only for Section2	$6.6	Increased Speed in Express or Transit Lane	0	None	None	None	Low
				2	270		$458.7	$85.6	205	0.2%	-106	-0.1%	-753	-47.2%	-910	-39.9%	-2.9	-38.7%	-3.4	-39.5%		$8.6			At all new ramp intersections	None	None	Low
	3-2		Long Median Transit Lane	1	570	$350.0	$267.5	$40.5	119	0.1%	-228	-0.2%	-755	-47.3%	-925	-40.5%	-2.9	-38.7%	-3.4	-39.5%	Improved for Sections 1 & 2	$6.6	Increased Speed in Express or Transit Lane	*El Camino Real Only*	*El Camino Real Only*	None	None	Low
				2	530		$302.2	$43.6	111	0.1%	-206	-0.1%	-754	-47.3%	-907	-39.7%	-2.9	-38.7%	-3.4	-39.5%		$8.6		*El Camino Real Only*	At all new ramp intersections	None	None	Low
	3-3		Right Side Transit Lane	1	560	$355.0	$275.5	$41.3	125	0.1%	-228	-0.2%	-754	-47.3%	-925	-40.5%	-2.9	-38.7%	-3.4	-39.5%	Improved for Sections 1 & 2	$6.6	Increased Speed in Express or Transit Lane	*El Camino Real Only*	*El Camino Real Only*	None	None	Low
				2	510	$310.0	$285.5	$45.3	131	0.1%	-196	-0.1%	-754	-47.3%	-907	-39.7%	-2.9	-38.7%	-3.4	-39.5%		$8.6		*El Camino Real Only*	*El Camino Real Only*	None	None	Low
Bus On Shoulder	4-1		Median Bus On Shoulder	1	570	$334.0	$257.3	$40.5	122	0.1%	-204	-0.1%	-754	-47.3%	-924	-40.5%	-2.9	-38.7%	-3.4	-39.5%	Improved for Sections 1 & 2	$6.6	Increased Speed in Express or Transit Lane	*El Camino Real Only*	*El Camino Real Only*	None	None	Low
				2	530		$291.2	$43.6	111	0.1%	-206	-0.1%	-754	-47.3%	-907	-39.7%	-2.9	-38.7%	-3.4	-39.5%		$8.6		*El Camino Real Only*	At all new ramp intersections	None	None	Low
	4-2		Right Side Bus On Shoulder	1	500	$300.0	$268.6	$46.2	154	0.1%	-160	-0.1%	-751	-47.1%	-908	-39.8%	-2.9	-38.7%	-3.4	-39.5%	Improved for Sections 1 & 2	$6.6	Increased Speed in Express or Transit Lane	*El Camino Real Only*	*El Camino Real Only*	None	None	Low
				2	480	$255.0	$261.8	$48.1	155	0.1%	-196	-0.1%	-752	-47.2%	-907	-39.7%	-2.9	-38.7%	-3.4	-39.5%		$8.6		*El Camino Real Only*	*El Camino Real Only*	None	None	Low