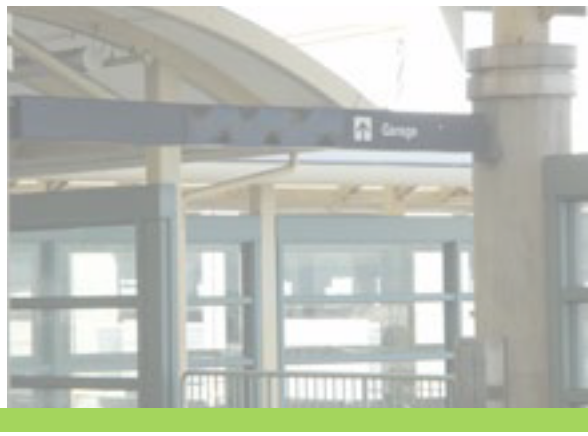

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Project number:
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Millbrae Station

FINAL Access & Circulation Plan

July 2016

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EXECUTIVE SUMMARY

The Millbrae Station Access & Circulation Plan (Plan) assesses multi-modal access and circulation for the proposed Transit-Oriented Development (TOD) on BART property at the Millbrae Bay Area Rapid Transit (BART)/Caltrain Station (Millbrae Station) and presents recommended improvements for pedestrian, bicycle, transit, and vehicle access and circulation. **Figure 1** shows the existing station area, and **Figure 2** shows the proposed TOD project.

The access improvements included in this Plan are consistent with BART's adopted *Station Access Guidelines (2003)* and the general goals BART has identified for its Millbrae TOD Project:[1]

- Increase transit ridership;
- Increase district revenue;
- Implement high-quality TOD projects;
- Support design excellence;
- Improve land use mix;
- Increase density near stations;
- Partner with communities; and
- Achieve positive mode shift (to reduce vehicle miles traveled).

Beginning in 2013, BART developed this Plan and the proposed TOD site plan in close consultation with other agencies that currently (and in the future will) provide transportation services to the Millbrae Station and other interested parties to support the proposed TOD on the existing BART surface parking lots. Plan partners include the City of Millbrae, Caltrans, Caltrain, SamTrans, California High Speed Rail Authority, SFO, Silicon Valley Bicycle Coalition, San Francisco Bay Trail, C/CAG, Commute.org, and Republic Urban developers.

This Plan builds on the circulation and parking analysis and recommendations of the recently adopted Millbrae Station Area Specific Plan (MSASP) and its Environmental Impact Report (EIR). Both efforts required a significant amount of data collection and analysis on which this Plan has relied. The current TOD site plan is consistent with the EIR, and required transportation mitigation measures have been incorporated into the

[1] BART Board presentation on April 14, 2016

site plan and this Access Plan. The information included in the MSASP EIR is supplemented by additional data collected in 2016, as well as the recently released results of the 2015 BART Station Profile Study.

Figure 1: Millbrae Station

Source: Google Earth, 2016

Figure 2: Proposed TOD Project

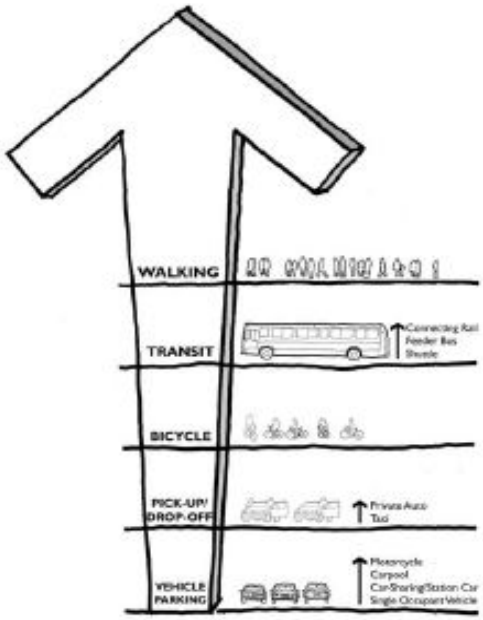
Source: HMH & Republic Millbrae LLC

PLAN GOALS AND OBJECTIVES

The primary goal of the Millbrae Station Access & Circulation Plan is to improve multi-modal station access in order to facilitate continued BART ridership growth. To that end, the Plan has the following objectives:

- Provide a review of the currently proposed TOD project in terms of station access opportunities and identify specific recommendations to be implemented in conjunction with the TOD project (identified as Tier One improvements in the Plan);
- Develop strategies to increase access to Millbrae Station for non-auto modes that will continue to grow BART ridership with reduced station parking; and
- Develop strategies that can be implemented with the proposed TOD project to increase access to Millbrae Station for all modes, to decrease vehicle trip generation, and to manage parking.

The Station Access & Circulation Plan for the proposed TOD project at Millbrae Station focuses on safety and comfort for four primary user groups in the following prioritized order: people who walk, people who ride transit, people who bicycle, and people who arrive in private vehicles for pick-up/drop-off and those who drive and park.

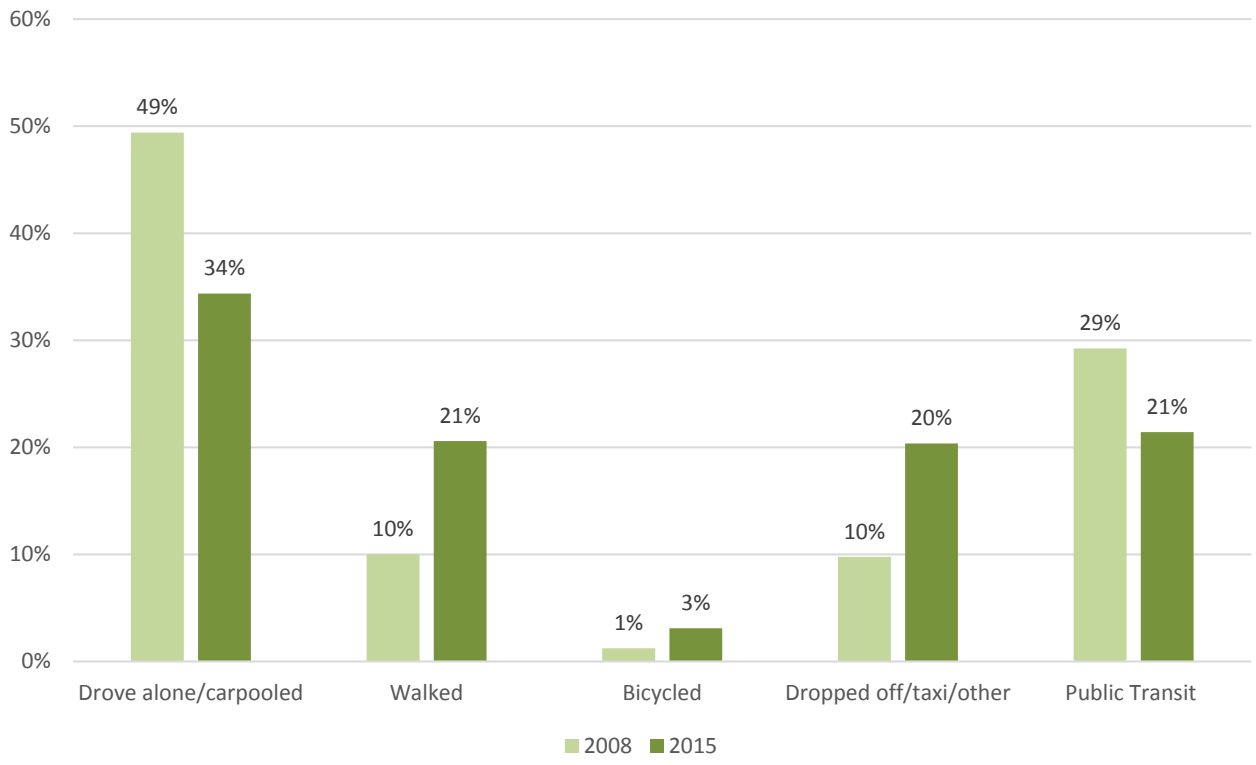


Source: BART Station Access Guidelines (2003)

CURRENT STATION ACCESS CHARACTERISTICS

A greater proportion of BART riders are using access modes *other* than driving to and parking at the Millbrae Station than ever before. Currently, about two-thirds of BART passengers entering the station are walking, biking, being dropped off, or using public transit to access the BART station, as shown in **Figure 3**. This is a significant change from 2008, when nearly half of BART riders boarding at Millbrae Station drove to the station.

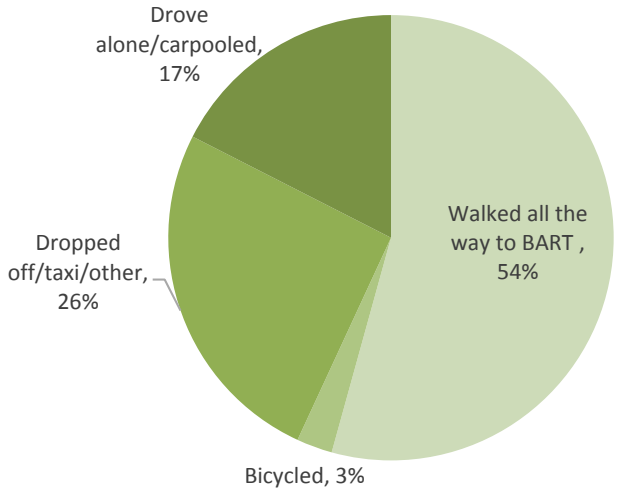
Figure 3: Modes of Access to BART Millbrae Station, 2008 and 2015 Station Profile Surveys



Source: 2008 and 2015 BART Station Profile Study (home- and non-home origins combined)

For those who currently drive and park, most are coming from home locations outside the City of Millbrae. Only 17 percent of Millbrae residents surveyed in BART's 2015 Station Profile Survey reported that they drove alone or carpooled to the station, and over half of Millbrae residents riding BART reported walking to the station, as shown in **Figure 4**.

Figure 4: Access Modes for BART Riders Living in Millbrae



Source: 2015 BART Station Profile Survey

In conjunction with the shift in modes used to access the station, the number of people using the station has also grown substantially. Nearly 20,000 people (station entries and exits) are passing through Millbrae Station to access BART and Caltrain on an average weekday. As shown in **Table 1**, the number of BART riders using Millbrae Station grew 47 percent between 2010 and 2015, with an annual average growth rate of 8%. There are now over 14,000 BART riders entering and exiting the station on an average weekday, as detailed in **Table 2**.

TABLE 1: BART STATIONS WITH HIGHEST RIDERSHIP GROWTH, 2010-2015

Station	Ridership Growth 2010-2015	Average Annual Growth 2010-2015
1. San Bruno	52%	9%
2. North Concord/Martinez	48%	8%
3. Millbrae	47%	8%
4. Ashby	42%	7%
5. West Oakland	41%	7%
BART Systemwide	26%	5%

Source: BART Station Exit Data 2009-2016

TABLE 2: MILLBRAE STATION AVERAGE WEEKDAY BART ENTRIES (BOARDINGS)/EXITS (ALIGHTINGS), JANUARY-MARCH 2016

	Number of Riders
Entries (Boardings)	7,364
Exits (Alightings)	6,957
Total Ridership	*14,321*

Source: BART Entry/Exit Data January, February, and March 2016

Caltrain ridership at Millbrae Station has also increased, growing seven percent between 2014 and 2015 to an average weekday ridership of 3,536 passengers in 2015. **Table 3** presents a summary of the change in growth in ridership at the five busiest Caltrain stations, as well as overall ridership growth for the system from 2014 to 2015.

TABLE 3: CALTRAIN AVERAGE WEEKDAY RIDERSHIP (AWR), 2014-2015

	2014		2015		
Station	**Rank**	**AWR**	**Rank**	**AWR**	**% Change**
San Francisco	1	12,160	1	13,571	11.6%
Palo Alto	2	6,156	2	7,197	16.9%
Mountain View	3	4,274	3	4,570	6.9%
San Jose Diridon	4	3,714	4	4,160	12.0%
Millbrae	5	3,291	5	3,536	7.4%
Systemwide		52,611		58,245	10.7%

Source: Caltrain 2015 Annual Passenger Count, Key Findings

TRANSFERS BETWEEN BART AND CALTRAIN

In 2013, Fehr & Peers conducted an intercept survey of Caltrain riders that asked questions about trip origin, destination, and mode of access. Through analysis of these responses, Fehr & Peers estimated that approximately 1,600 riders transfer between BART and Caltrain daily. Each passenger would make two (2) transfers per day: one (1) transfer during the initial trip and one (1) transfer in the opposite direction for the return trip. BART, who estimated a similar number of daily transferring riders, validated this estimate.

Using the 2013 boarding data from BART and Caltrain, about 25 percent of passengers boarding BART at Millbrae transferred from Caltrain, and about 49 percent of Caltrian passengers boarding at Millbrae transferred from BART. Subtracting transfer trips, approximately 4,830 daily BART boardings and approximately 1,655 daily Caltrain boardings had an origin or destination at the Millbrae Station in 2013 (and did not transfer from either BART or Caltrain).[2] **Table 4** summarizes this information.

TABLE 4: MILLBRAE STATION DAILY BOARDINGS AND TRANSFERS, 2013

	Non-Transfer	Transfer	Total
BART	4,830	1,600	6,430
Caltrain	1,655	1,600	3,255

Source: MSASP DEIR, p. 4.13-25

STATION ACCESS IMPROVEMENTS

The proposed TOD project and other planned development in the area would further increase the number of people walking, bicycling, taking transit/shuttles, and driving to and through the area east of Millbrae Station. BART ridership at the Millbrae Station has grown significantly since the station's opening in 2003, with an average of over 7,000 weekday boardings in early 2016. In conjunction with this ridership growth, there has been a major shift in how passengers access the station, with a significant increase in walking and drop-off/taxi access and a corresponding decrease in the percentage of riders who drive and park. Given the changes in land use and circulation patterns in and around the station area as well as in the greater Bay Area, it is likely that this trend will continue into the future, with an even greater share of riders relying on walking, biking, transit, shuttles, and drop-off/pick-up.

With this increase in activity and change in access modes that further reduces the park-and-ride demand at the station, it is important that the on-site and external transportation facilities providing direct access to the site are designed to accommodate the projected volumes and to be safe, convenient, and easily navigable, especially by foot and bicycle. Furthermore, the *BART Station Access Guidelines* designate walking, transit, and bicycling as primary modes of access, and they deemphasize the role of automobile access and parking.

This Plan fulfills the requirements of Millbrae Station Area Specific Plan (MSASP) Circulation and Parking Policy P-CP 31, which requires project applicants within the TOD zones identified by the MSASP to "…submit

[2] Millbrae Station Area Specific Plan and Transit-Oriented Development #1 and #2 Draft EIR, p. 4.13-25.

a plan of how multi-modal access and circulation to the transit station will be accomplished." As mandated by MSASP Circulation and Parking Policy P-CP 31, a separate, more comprehensive plan addressing multi-modal station access improvements for both the east and west sides, and for both the near and far terms, will be prepared in the future. This policy also states "In the event the access plan is not complete at the time of application for projects within the TOD zone, applicants shall submit a plan of how multi-modal access and circulation to the transit station will be accomplished." Given that a comprehensive, multi-agency, multi-modal access plan has not yet been completed, this Plan fulfills the requirements of P-CP 31 by providing an access plan for the proposed TOD project on the BART property located on the east side of the station.

While the access improvements described in this Plan are near-term improvements (to be implemented in conjunction with the proposed TOD project) that address eastside station access, this Plan also summarizes the broader, longer-term improvements identified in the recently adopted MSASP. Although these longer-term improvements are beyond the scope of this Plan, they are included for the following reasons:

- To explain how the near-term improvements will integrate with future, more comprehensive station access improvements;
- To identify the future conditions under which these longer-term improvements are likely to be needed and how circulation and access conditions on the TOD site may change; and
- To identify the key public and private partners needed to plan, design, fund, and eventually construct these longer-term improvements.

SUMMARY OF ACCESS CONSTRAINTS AND ISSUES

The Millbrae Station is a highly constrained site, bordered by major roadways to the west, south and east, and the Highline Canal to the north. The at-grade BART and Caltrain tracks also present a significant constraint in terms of station access and circulation. Further exacerbating these conditions is the fact that development on the eastern portion of the site (approximately three acres) is restricted by a PG&E utility easement and its proximity to runways at SFO.

Currently, station access and design is oriented toward vehicle and shuttle access, with most if not all of the station area occupied by multi-lane roadways, surface and structured parking, bus bays, and taxi and other passenger drop-off areas. Both BART and the City of Millbrae have adopted goals of transforming the Millbrae Station area into a multi-modal, mixed-use neighborhood. The introduction to the Circulation and Parking chapter of the MSASP framed the issue best:

> *Rather than treating the Millbrae Station as a single purpose transportation facility oriented to park-and-ride and shuttle access, the Specific Plan sets a strong vision for the redevelopment of adjacent*

sites in a manner that will better integrate the Millbrae Station into the surrounding residential and commercial activity. (MSASP, p. 7.1)

Although there is consensus on the future vision for the Millbrae Station, articulating that vision has been much more challenging. There will continue to be significant vehicle, shuttle, and transit access and circulation needs within and around the station area. Millbrae Station is also a planned High-Speed Rail Station, which will bring additional access and circulation needs to the site. These facts, combined with the significant constraints present on the site, have made accommodating both future development and access needs a challenge requiring both significant data collection and analysis as well as compromise to overcome.

ORGANIZATION OF ACCESS IMPROVEMENTS

This Plan focuses on identifying access and circulation changes related to the proposed TOD project on BART property. A broad range of stakeholders worked with BART to develop the approach for the TOD project and to consider how broader land use and infrastructure changes within and around the station area affect the TOD project site plan and vice versa. However, the relatively short timeline for this TOD project requires that some of these issues, such as the future High Speed Rail alignment or Caltrain electrification project, be resolved as part of a future, comprehensive, multi-modal station access planning effort. As identified in the MSASP (P-CP 31), the City of Millbrae will lead this comprehensive, multi-modal access planning effort to address both longer term and broader access issues related to Millbrae Station.

Consequently, the following sections describe the access improvements that will be implemented in conjunction with the proposed TOD project and explain how these improvements address the access challenges and issues that have arisen throughout the process. In some cases, particular access issues and challenges will need to be addressed as part of the future comprehensive, multi-agency, multi-modal access plan because they are outside the scope of this Plan and the TOD project. To the extent that improvements identified in the MSASP address these broader issues, they are included and discussed with the near-term access improvements that are the focus of this Plan.

The access improvements are organized by tiers that reflect their priority and readiness for implementation. Following is an overview of the tier structure. Chapter 5 provides a description of both Tier One and Tier Two improvements and illustrative site plans for each set of modal access improvements.

Tier One improvements are to be made in conjunction with the TOD project development and are the focus of this Plan. They provide for the access needs of BART and Caltrain through 2040. The Tier One improvements were developed based on the data and analysis from the Millbrae Station Area Specific Plan (MSASP) EIR, and they are consistent with the findings and transportation mitigations determined in the

EIR. They are to be implemented within the next three to five years and would be completed in conjunction with the development of BART property on the east side of the station.

Tier Two improvements provide further access enhancements, but are not critical to providing adequate station access for BART and Caltrain through 2040. BART will provide necessary staff time and consideration of matching funds for the development and implementation of BART-related Tier 2 improvements. BART will maintain a proactive role in continuing to work with the City and other partners in advancing Tier 2 improvements. Further developing and defining the scope and implementation strategy for Tier Two improvements should be a focus of the future comprehensive, multi-agency, multi-modal access plan to be led by the City of Millbrae. Many of these improvements are included as concepts in the MSASP, and relevant figures from the MSASP are included in Chapter 5 of this Plan, which provides a description of the Tier 2 improvements.

PEDESTRIAN ACCESS IMPROVEMENTS

The site plan for the proposed TOD project includes multiple pedestrian circulation improvements, which are fully described in Chapter 5. Garden Lane Paseo provides a focus for the new residential and office uses planned for the site. It creates a pedestrian promenade that connects the station entrance to Rollins Road and Aviador Avenue and features a public gathering space or plaza near the station entrance. The site plan includes continuous wide sidewalks throughout much of the plan area with pedestrian crossings at many of the intersections.

A new Class I multi-use path would be constructed from the intersection of Aviador Avenue and Garden Lane East to a planned City of Millbrae Pedestrian/Bicycle overcrossing of US-101 connecting to the Bay Trail that runs along the shoreline south of Millbrae Avenue. A two-way bicycle/pedestrian path along the north side of Garden Lane East behind the planned bus stop will connect the new pathway and eventual US-101 overcrossing to the Garden Lane Paseo and station entrance.

The TOD project will maintain all existing pedestrian connections from the east side of the station to other locations within the City of Millbrae. Currently, pedestrians can travel via existing sidewalks to locations north, south, east and west of the station area via Millbrae Avenue, Rollins Road, South Station Road, and Aviador Avenue.

Tier One improvements are described below and shown in **Figure 5**.

Tier One Pedestrian Access Improvements

1. Add wayfinding signage to direct pedestrians through the station to connect the east side with the west side.

2. Add a crosswalk across Rollins Road connecting the hotel site with the sidewalk and shuttle bus transit stops on the south side of the existing BART parking garage.

3. Install an intersection treatment at Rollins Road and Garden Lane East that balances the need to provide safe, comfortable and direct pedestrian and bicycle access across Rollins Road at Garden Lane East with the need to prevent excessive vehicle queueing on Rollins Road and Millbrae Avenue.

   The final intersection treatment will be based on the results of an updated microsimulation analysis that will be conducted by the TOD project developer as part of the signal redesign for the intersection of Millbrae Avenue and Rollins Road. The output of the microsimulation will inform the signal design and crossing treatments used at both Rollins Road and Garden Lane, as well as at the intersection of Millbrae Avenue and Rollins Road in order to ensure safe conditions for all users. BART and the developer will work closely with the City on designing and implementing an intersection control that creates a safe, inviting crossing for pedestrians and bicyclists, and ensures motorist safety by preventing the potential for excessive queueing.

4. Add enhanced pedestrian crossing treatments to on-site intersections to include continental or ladder crosswalk striping, signage, advance stop bars, shark teeth, and other treatments to improve pedestrian visibility and comfort.

5. Install a Class 1 multi-use path along the east side of Aviador Avenue to provide a Bay Trail segment (minimum pathway width is 2.4 meters with 0.6 meter clearance on either side per the California *Highway Design Manual*).

6. Construct a two-way bicycle/pedestrian path along the north side of Garden Lane East behind the planned bus stop.

7. Add wayfinding signage to provide direction from the development to El Camino Real, Downtown Millbrae, and other local destinations per the direction and policies in the MSASP.

Figure 5: Pedestrian Access Improvements

Source: HMH & Republic Millbrae LLC

BICYCLE ACCESS IMPROVEMENTS

The site plan for the proposed TOD project includes several improvements to bicycle circulation. As discussed under the Pedestrian Access Improvements, a new Class I multi-use path would be constructed from the intersection of Aviador Avenue and Garden Lane East to a planned City of Millbrae Pedestrian/Bicycle overcrossing of US-101 connecting to the Bay Trail that runs along the shoreline south of Millbrae Avenue. This facility will become part of the Bay Trail. A new Class I multi-use pathway will be constructed adjacent to Aviador Avenue to complete the Bay Trail route by connecting to a planned Bay Trail extension north of the project site that will continue past the airport.

Bicycles through the TOD site would travel along a new two-way bicycle/pedestrian path along the north (westbound) side of Garden Lane East. In addition, sharrows will be installed on Garden Lane (eastbound), Rollins Road (both directions) and Garden Lane Paseo (both directions). The Garden Lane Paseo (west of the cul de sac) would serve as a shared bicycle and pedestrian facility providing direct access to the Millbrae Station eastside entrance.

Bicycle racks and bicycle storage facilities will be provided as a project design feature for all land uses within the project site. Retrofitted bicycle parking will be installed in the current station parking structure; staple style bicycle racks would be installed at the western terminus of the Garden Lane Paseo; secure bicycle parking (likely a bike room or bike cages) would be located in the Site 5A and Site 5B parking garages; BART bike lockers would be placed at the station plaza; and bike lockers would be placed in the Site 5B parking garage.

Tier One Bicycle Access Improvements

The bicycle access improvements that will be incorporated in to the TOD project and the eastside station entrance are detailed below and shown in **Figure 6**.

1. Add wayfinding signage to direct bicyclists through the station to connect the west side with the east side.
2. Install a Class 1 multi-use path along east side of Aviador Avenue to provide a Bay Trail segment.
3. Provide treatments to facilitate bicycle transitions to and from the proposed Class I multi-use path at the intersection of Aviador Avenue and Garden Lane East, including wide curb ramps, pavement markings, and clear signage.
4. Construct a two-way bicycle/pedestrian path along the north side of Garden Lane East behind the planned bus stop.

5. Add Class 3 bike route striping (sharrows) and signage on the eastbound direction of Garden Lane East, and on Garden Lane Paseo and Rollins Road (north of Millbrae Avenue) in both directions.

6. Install an intersection treatment at Rollins Road and Garden Lane East that balances the need to provide safe, comfortable and direct pedestrian and bicycle access across Rollins Road at Garden Lane East with the need to prevent excessive vehicle queueing on Rollins Road and Millbrae Avenue.

   The final intersection treatment will be based on the results of an updated microsimulation analysis that will be conducted by the TOD project developer as part of the signal redesign for the intersection of Millbrae Avenue and Rollins Road. The output of the microsimulation will inform the signal design and crossing treatments used at both Rollins Road and Garden Lane, as well as at the intersection of Millbrae Avenue and Rollins Road in order to ensure safe conditions for all users. BART and the developer will work closely with the City on designing and implementing an intersection control that creates a safe, inviting crossing for pedestrians and bicyclists, and ensures motorist safety by preventing the potential for excessive queueing.

7. Add bicycle facilities within the existing right-of-way of South Station Road within the project site to facilitate connection to a future bicycle facility on South Station Road south of Millbrae Avenue. This could include either Class 3 bike route striping (sharrows) and signage or a Class 2 bicycle lane in the southbound direction and a contra-flow Class 2 bicycle lane in the northbound direction.

The following Tier One improvements occur outside of the TOD project boundaries within the City of Millbrae's public right-of-way. Consequently, the City will be responsible for designing and restriping the roadway in order to implement these improvements.

8. Add Class 3 bike route striping (sharrows) and signage on Rollins Road between Millbrae Avenue and Adrian Road in both directions.

9. Add bike lanes on southbound Rollins Road between Adrian Road and Broderick Road. This bike lane will connect with the southbound bike lane already installed on the portion of Rollins Road south of Broderick Road located within the City of Burlingame.

Figure 6: Bicycle Access Improvements

Source: HMH & Republic Millbrae LLC

TRANSIT ACCESS IMPROVEMENTS

The TOD site will accommodate both current and future levels of public and private shuttle service by providing up to eight bus bays on the east side of the station. The MSASP EIR analyzed current and future ridership and access needs for both BART and Caltrain through 2040. The EIR analyzed access needs for both the east and west sides of the station and determined that a total of seven bus bays were recommended for a redesigned transit center on the east side of the station to accommodate current and future shuttle activity.[3]

Shuttles would enter the site on Rollins Road and stop at one of two locations: smaller shuttles and buses (up to 40 feet in length) would stage at one of four bus bays on East Station Road adjacent to the BART parking garage. Shuttles accessing East Station Road would pick up and drop off passengers along the roadway and turn around at the western end of the roadway near the station entrance to exit via the same entry point at Rollins Road.

Larger shuttle and transit vehicles (vehicles longer than 40 feet) would drop off and pick up passengers on southbound Rollins Road between East Station Road and Garden Lane Paseo (two bus bays) and at the bus transfer facility on Garden Lane East (two bus bays). Shuttles stopping on southbound Rollins Road would enter the eastside station area via northbound Rollins Road and turn around at the north end of Rollins Road (at the northern edge of the station area) to access the stops on the southbound side of the roadway. Shuttles stopping on Garden Lane East would enter the eastside station area via northbound Rollins Road, turn right at the end of Rollins Road and circle clockwise around the parking lot to Aviador Avenue to Garden Lane East.

Six of the eight shuttle and transit stop locations are located west of Rollins Road, and the majority of boarding and alighting areas are located immediately adjacent to the eastside station entrance along East Station Road. These stop locations maximize shuttle and transit passenger direct access to the station entrance and minimize the number of pedestrians crossing Rollins Road at Garden Lane East.

To maximize available curb space for passenger boarding and alighting, shuttle and transit vehicles would not be allowed to layover in any of the staging areas along East Station Road, Rollins Road, or Garden Lane East. All transit and shuttle layovers would occur along southbound Aviador Avenue north of Garden Lane East. **Table 5** summarizes the shuttle and transit vehicle capacity that will be provided within the TOD project site.

[3] Millbrae Station Area Specific Plan Update and Transit-Oriented Development #1 and #2 Draft EIR, p. 4.13-71.

TABLE 5: SUMMARY OF SHUTTLE/TRANSIT CAPACITY WITH TOD PROJECT

Shuttle/Transit Stop Location	Number of Bus Bays	Average Estimated Dwell Time	Vehicle Capacity per 15 minutes
East Station Road (vehicles up to 40')	4	5 minutes	12
Southbound Rollins Road (vehicles greater than 40')	2	5 minutes	6
Garden Lane East (vehicles greater than 40')	2	5 minutes	6
Aviador Avenue Layover Area	Up to 4, depending on size	Not Applicable	Not Applicable

Shuttle and Transit Vehicle Capacity

The proposed site plan provides eight bus bays, which is enough to accommodate both existing and projected future shuttle activity for both BART and Caltrain access. The MSASP EIR analyzed current and future ridership and access needs for both BART and Caltrain through 2040. The EIR analyzed access needs for both the east and west sides of the station and determined that a total of seven bus bays were needed for a redesigned transit center on the east side of the station to accommodate current and future shuttle activity.[4]

Currently, nine shuttles use seven of the 11 available bus bays during the peak 30-minute period with an average dwell time of approximately three minutes. On average, shuttles accessing the eastside of the station are significantly less than capacity, carrying an average passenger load of only eight passengers per vehicle during the morning peak period from 6:30-9:30 AM. The observations conducted by Pirzadeh & Associates in February 2016 found that the greatest number of shuttle vehicles accessing the eastside station area during any 30-minute period was nine vehicles with an average dwell time of approximately three minutes. These nine vehicles used seven of the 11 available bus bays. As shown in **Table 21**, there were 425 shuttle passengers boarding on the east side of the station during the morning peak period. Fifty-six shuttle/transit vehicles transported these passengers, yielding an average passenger load of eight passengers per vehicle.

Arrivals and departures of shuttle vehicles was generally staggered with little if any overlap. As shown in **Table 5**, the TOD site plan would provide capacity for up to 24 smaller transit vehicles (up to 40 feet in length) and up to 12 larger transit vehicles (greater than 40 feet in length) within a 30-minute period. Over

[4] Millbrae Station Area Specific Plan Update and Transit-Oriented Development #1 and #2 Draft EIR, p. 4.13-71.

the entire morning peak period from 6:30-9:30 AM, a total of 144 smaller transit vehicles and 72 larger transit vehicles could be accommodated on the east side of the station.

An analysis conducted as part of the MSASP projected that the number of passengers using a transit or shuttle vehicle to access the east side of the station on an average weekday would grow to 1,901 by 2040 assuming full buildout of the development planned in the MSASP (see Appendix D). It is assumed that the great majority of shuttle/transit boardings take place in the morning peak period, as is currently the case. If 90 percent of shuttle/transit boardings occur in the morning peak period, then an esitmated 1,711 passengers will access shuttles on the east side of the station during this period. Assuming an average passenger load of 25 passengers per vehicle, approximately 68 vehicles would be needed to transport these passengers. This is 12 more vehicles than the 56 vehicles currently accessing the east side of the station during the morning peak period from 6:30-9:30 AM.

BART is currently developing a shuttle access policy and potential permitting system. This will better enable BART to regulate and control the use of curb space at its stations and ensure that shuttles using the stations are providing first/last mile connections to and from the stations for rail riders (and not using them as park-and-ride facilities). It will also enable BART to gather information about which shuttles are using the stations and how many rail passengers are using shuttles to access the station.

Tier One transit access improvements are described below and shown in **Figure 7**.

Tier One Transit Access Improvements

1. Construct East Station Road for smaller shuttle bus (vehicles up to 40 feet long) pick-up/drop-off activities. Provide shelter/weather protection, benches, lighting, schedule information, and other amenities for waiting passengers.
2. Construct a bus bay on the west side (southbound direction) of Rollins Road between East Station Road and Garden Lane Paseo for longer (greater than 40 feet in length) buses. Provide shelter/weather protection, lighting, schedule information, and other amenities for waiting passengers.
3. Construct a bus bay on the west side (southbound direction) of Rollins Road south of Garden Lane Paseo for larger vehicles (greater than 40 feet in length). Provide shelter/weather protection and other amenities for waiting passengers.
4. Construct Garden Lane East with bus bays for longer buses and as bus/shuttle layover space along Aviador Avenue. Provide shelter/weather protection and other amenities for waiting passengers.
5. Add signage to prohibit passenger vehicle pick-up and drop-off activities in bus and shuttle areas.

6. Install adaptive, electronic signage identifying in-coming buses/shuttles and where they will be berthing on-site to facilitate operations and passenger wayfinding.

7. In addition to providing transit subsidies to TOD residents and workers, pedestrian and wayfinding improvements that facilitate access to bus service on El Camino Real should be implemented in conjunction with TOD development. For residents and workers of the future TOD planned for the eastside of the station, direct pedestrian access to fast, frequent bus service on El Camino Real will be critical in facilitating a reduction in vehicle trips.

Figure 7: Transit Access Improvements

Source: HMH & Republic Millbrae LLC

VEHICLE ACCESS IMPROVEMENTS

Automobile access to and from the TOD site would be from Millbrae Avenue via Rollins Road and South Station Road. The proposed TOD project would narrow Rollins Road from six lanes to four lanes of traffic and construct its northern terminus as a single-lane turnaround. It would accommodate north-south travel through the site and provide direct access to the BART parking garage, Garden Lane East and Garden Lane Paseo (for driveway entrance), and East Station Road. All intersections on Rollins Road would be stop-controlled at the intersecting side streets. Garden Lane Paseo, a narrow bi-directional, two-lane roadway, would terminate on its western end at a small, mid-block cul-de-sac at the pedestrian and bicycle paseo and on its eastern end its intersection with Aviador Avenue. South Station Road, a minor roadway located adjacent to the east side of the tracks, would continue to operate one-way southbound, serving vehicles exiting the BART parking garage and Site 5B parking garage.

The TOD project would include two new parking garages within the office and residential buildings and two reconfigured surface parking lots. The Site 5A parking garage would have two vehicle access points on East Station Road. The Site 5B parking garage would have one vehicle access point on the cul-de-sac on Garden Lane Paseo and another on South Station Road. The Site 6A surface parking lot would have vehicle access on both Rollins Road and Garden Lane East. The Residential Site 6B surface parking lot would have vehicle access on Garden Lane East. Additional on-street parking would be provided along Aviador Avenue, a bi-directional, two-lane roadway that would not provide vehicle connections north of the TOD site.

Kiss-and-ride and other passenger pick-up/drop-off (from transportation network company providers such as Uber and Lyft) would be accommodated within the BART parking garage on Level 2. Preliminary designs indicate that approximately 62 revenue-producing parking spaces would be eliminated from the BART parking garage in order to create a safe and convenient pick-up/drop-off location near the station entrance.

A key area of concern throughout the course of the TOD site plan development has been the intersection of Garden Lane and Rollins Road. At this intersection, the need to provide safe, comfortable and direct pedestrian and bicycle access across Rollins Road at Garden Lane East must be balanced with the need to prevent excessive vehicle queueing on Rollins Road and Millbrae Avenue, particularly during the morning peak period. To determine the appropriate treatment for this intersection, the TOD project developer will conduct an updated microsimulation analysis and will use the results to inform the signal design and crossing treatments used at both Rollins Road and Garden Lane, as well as at the intersection of Millbrae Avenue and Rollins Road in order to ensure safe conditions for all users. BART and the developer will work closely with the City on designing and implementing an intersection control that creates a safe, inviting crossing for pedestrians and bicyclists, and ensures motorist safety by preventing the potential for excessive queueing.

Tier One vehicle access improvements are described below and shown in **Figure 8**.

Tier One Vehicle Access Improvements

1. Redesign Level 2 in parking garage to accommodate passenger vehicle pick-up and drop-off activities, including taxi and transportation network company (TNC) vehicles such as Uber and Lyft. This will include safety and comfort amenities such as lighting, benches, security cameras, emergency call-box, real-time arrivals, and benches. The facility will be designed such that vehicles will exit the garage via South Station Road.
2. Add signage to direct passenger vehicle pick-up and drop-off activities to the parking structure and discourage/prevent pick-up and drop-off activities in all transit/shuttle staging areas and along Garden Lane Paseo and East Station Road.
3. Maintain access to motorcycle/motorized scooter parking on South Station Road underneath the Millbrae Ave overpass and install signage directing motorcyclists to this area. Alternatively, consider relocating motorcycle/motorized scooter parking inside the BART parking garage or to the surface parking area west of Aviador Avenue.
4. If needed, add signage within the garage to direct a greater share of garage traffic to exit via South Station Road in order to reduce the volume of vehicle traffic on Rollins Road during peak periods. BART will monitor the operations of the new facility in conjunction with the City and will work with the City to redesign or modify the circulation pattern for vehicles exiting the garage.

Figure 8: Vehicle Access Improvements

Source: HMH & Republic Millbrae LLC

PLAN STRUCTURE

The Station Access & Circulation Plan is organized into six chapters:

- **Chapter 1: Introduction** describes the Plan process, context and background, including the relationship of this Plan to the Millbrae Station Area Specific Plan (MSASP). This chapter also provides an overview of the TOD project and Plan goals and objectives.
- **Chapter 2: Policy and Planning Context** provides a brief summary of relevant BART, Caltrain, City of Millbrae and other agencies' policies and guidelines that inform the Plan's conclusions and recommendations.
- **Chapter 3: Setting and Existing Conditions** describes the existing access, circulation, and operating conditions of the transportation network around Millbrae Station and, in particular, within the TOD project site.
- **Chapter 4: General Access Strategies** provides an overview of general strategies to enhance multi-modal access within and around Millbrae Station.
- **Chapter 5: Station Access Improvements** presents the near-term improvements to address access needs resulting from development of the TOD site. This chapter also references longer-term, more comprehensive access needs identified in the MSASP.
- **Chapter 6: Overview of Key Issues and Their Resolution** provides an overview and summary of the key issues and concerns that have arisen since BART began planning for the proposed TOD project in 2013.

1. INTRODUCTION

The Millbrae Station Access & Circulation Plan (Plan) assesses multi-modal access and circulation for the proposed Transit-Oriented Development (TOD) on BART property at the Millbrae Bay Area Rapid Transit (BART)/Caltrain Station (Millbrae Station) and presents recommended improvements for pedestrian, bicycle, transit, and vehicle access and circulation. These recommendations are consistent with BART's adopted *Station Access Guidelines (2003)* and the general goals BART has identified for its Millbrae TOD Project:[5]

- Increase transit ridership;
- Increase district revenue;
- Implement high-quality TOD projects;
- Support design excellence;
- Improve land use mix;
- Increase density near stations;
- Partner with communities; and
- Achieve positive mode shift (to reduce vehicle miles traveled).

TOD projects present unique opportunities for promoting and developing non-automobile means of travel and access to transit facilities. Historically, BART has found these opportunities have not been given equal consideration with roadway improvements during project review. Thus, BART requires station access and circulation improvement plans to be developed in concert with TOD projects at BART stations.

BART believes that conducting an access and circulation plan in concert with a TOD project can provide the District with sufficient information to improve the various modes of access to the station in general and help shape the TOD project specifically. BART-initiated access studies analyze roadway impacts as well as other modes of access to BART, such as pedestrian, bicycle, pick-up/drop-off (kiss-and-ride), transit (both fixed route and publically/privately operated shuttles), taxis, and high-occupancy vehicles, within a 1/4- to 1/2-mile radius of a station and the greater station catchment area. The access improvements identified as a result of the plan are not static; once an access and circulation plan has been completed, periodic updates are needed to address changing conditions. However, the Plan and its updates will provide a blueprint for access improvements that can be pursued over time as funding becomes available.

[5] BART Board presentation on April 14, 2016

This Plan also fulfills the requirements of Millbrae Station Area Specific Plan (MSASP) Circulation and Parking Policy P-CP 31, which requires project applicants within the TOD zones identified by the MSASP to "…submit a plan of how multi-modal access and circulation to the transit station will be accomplished." It also requires that "All transit operators serving the Millbrae Station, including BART, California High-Speed Rail Authority, Caltrain, and SamTrans, shall have an opportunity to review and provide comments on the developer proposed multi-modal access and circulation plan prior to City entitlement approval."

PLAN PROCESS

Beginning in 2013, BART developed this Plan and the proposed TOD site plan in close consultation with other agencies that currently (and in the future will) provide transportation services to the Millbrae Station and other interested parties to support the proposed TOD on the existing BART surface parking lots. Plan partners include the City of Millbrae, Caltrans, Caltrain, SamTrans, California High Speed Rail Authority, SFO, Silicon Valley Bicycle Coalition, San Francisco Bay Trail, C/CAG, commute.org, and Republic Urban developers.

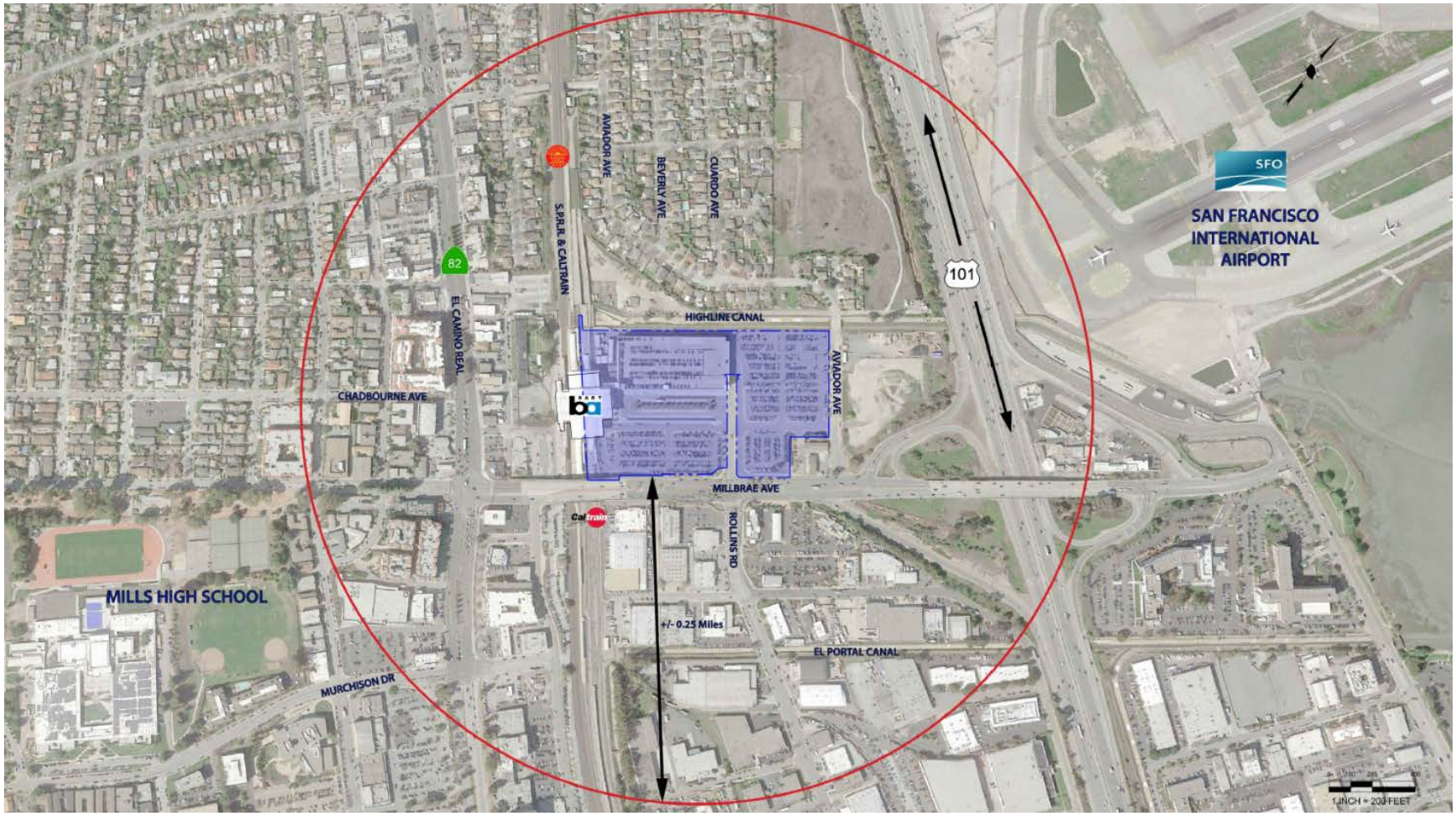
This Plan also builds on the circulation and parking analysis and recommendations of the recently adopted MSASP, as well as the significant amount of data collection and analysis accomplished in 2014, 2015 and 2016 to better understand existing and future conditions and necessary access improvements. The access improvements identified in this Plan were developed primarily by consensus of the parties listed above, as well as Millbrae community members, and the consulting team of PlaceWorks, Strategic Economics, and Fehr & Peers.

PLAN CONTEXT AND BACKGROUND

The Millbrae Station opened in June 2003 as part of BART's San Francisco International Airport (SFO) extension. Millbrae Station is a key intermodal connection between the BART and Caltrain commuter rail systems (see **Figure 9)**. In advance of Millbrae Station's opening, the City of Millbrae developed the Millbrae Station Area Specific Plan (MSASP) in 1998. The 1998 MSASP identified a vision for the area around Millbrae Station, created development standards for new buildings, and set implementation strategies for 13 sub-areas in the Specific Plan Area. While some development has successfully occurred under the 1998 MSASP, new development applications, including two proposed transit-oriented developments referred to as TOD #1 (located to the west of the station in MSASP Site 1) and TOD #2 (the proposed BART TOD located to the east of the station in MSASP Sites 5 and 6), as well as economic changes in the area, created a need to update the 1998 MSASP.

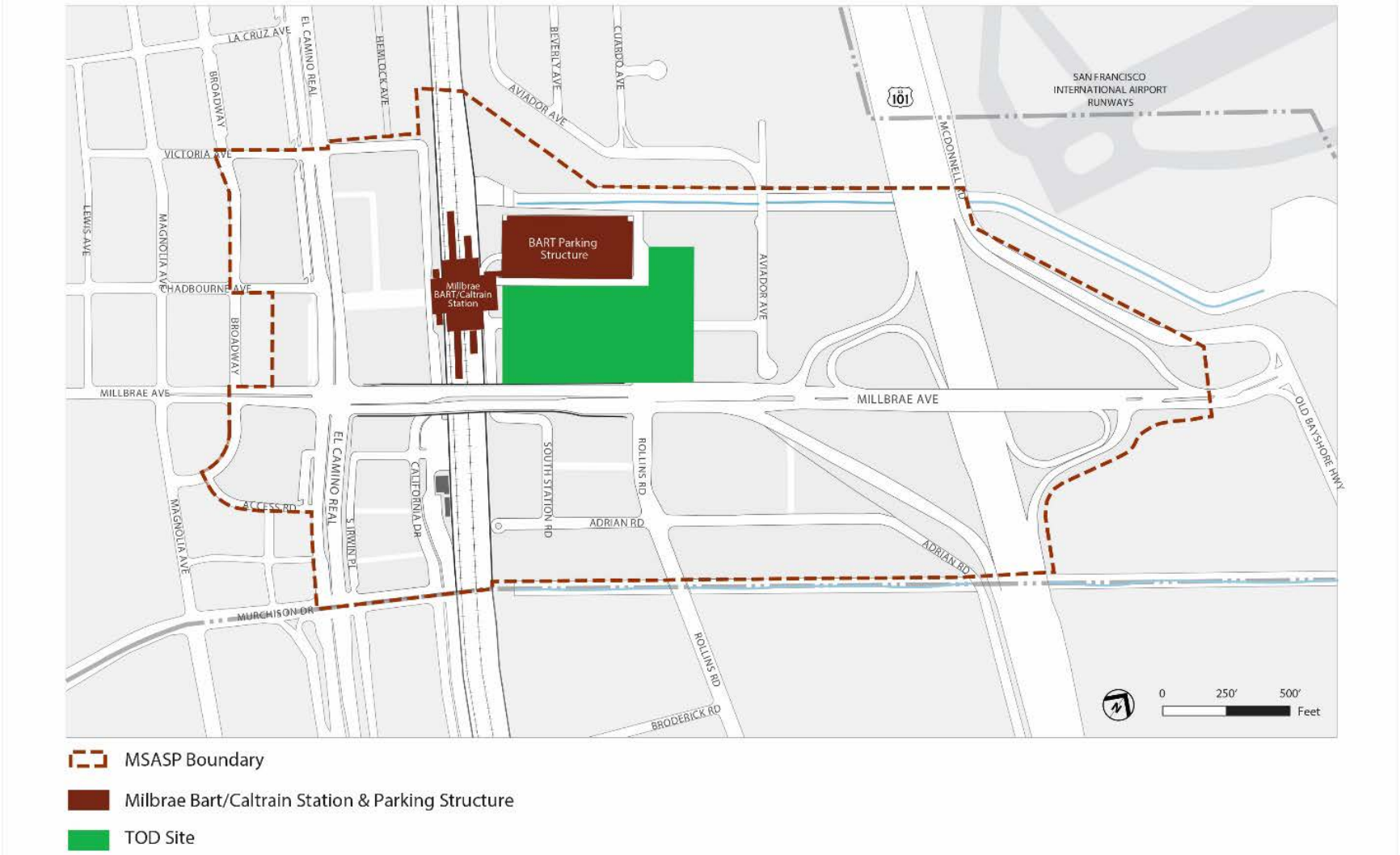
The MSASP update process, completed in February 2016 with the Council's adoption of Final Plan, refined the vision for the Specific Plan Area and multimodal and circulation improvements, as well as other infrastructure improvements. The Specific Plan Area, composed of approximately 116 acres of land, is shown on **Figure 10**. The southern edge of the Specific Plan Area is bounded by the City of Burlingame and Murchison Drive; the western edge is bounded by El Camino Real and Broadway; the northern edge is bounded by Victoria Avenue, the City's Public Works storage yard, and the Highline Canal; and the eastern edge is bounded by the US-101 freeway. The location of the proposed BART TOD on the east side of the station is also shown on **Figure 10**. Approximately nine acres of BART property are available for TOD development; however, approximately three acres of the northwest corner of the site cannot be developed due to restrictions resulting from a PG&E utility easement and the site's location within the SFO Runway Protection Zone.

Figure 9 Millbrae TOD Site Context



Source: BART

Figure 10: Millbrae Station Area Specific Plan Area



Source: MSASP, PlaceWorks

PLAN PURPOSE AND RELATIONSHIP TO MILLBRAE STATION AREA SPECIFIC PLAN

This Plan focuses on the BART-owned portion of the Specific Plan Area located immediately east of Millbrae Station, as shown in **Figure 9** and **Figure 10**. The TOD project site is located north of Millbrae Avenue, east of the railroad tracks, south of the Highline Canal and Bayside Manor neighborhood, and west of Aviador Avenue.

The Plan provides BART with an analysis of both existing and proposed (with completion of the TOD) multi-modal site access and circulation conditions, as well as improvement recommendations that reflect safe and convenient access via all modes. While Millbrae Station access occurs on both the east side and west side of the station, BART does not own or control the station areas outside of Sites 5 and 6 located on the east side of the station. For this reason, less detail is provided for the station's west side entrance, and no west side station access recommendations are included.

A separate, more comprehensive plan that addresses multi-modal station access improvements for both the east and west sides and for both the near and far terms will be conducted in the future. The mandate for this Plan was created in MSASP Circulation and Parking Policy P-CP 31.[6] This policy also states that "In the event the access plan is not complete at the time of application for projects within the TOD zone, applicants shall submit a plan of how multi-modal access and circulation to the transit station will be accomplished." Given that a comprehensive, multi-agency, multi-modal access plan has not yet been completed, this Plan fulfills the requirements of P-CP 31 by providing an access plan for the proposed TOD project on the BART property located on the east side of the station.

FUTURE MULTI-AGENCY MULTI-MODAL STATION ACCESS IMPROVEMENT PLAN

A future comprehensive multi-agency multi-modal Station Access Improvement Plan will be prepared as a collaborative effort of the City of Millbrae, Caltrans, BART, Caltrain, SamTrans, California High Speed Rail Authority, SFO, Silicon Valley Bicycle Coalition, San Francisco Bay Trail, C/CAG, commute.org, and other interested parties. It will identify, describe, and present cost estimates and funding sources for pedestrian, bicycle, shuttle, bus, and vehicle station access and on-site circulation improvements to meet projected long-term future needs for a horizon year of 2040 or later. It is anticipated that the City of Millbrae will lead

[6] *Millbrae Station Area Specific Plan, Final Plan*, February 10, 2016, p. 4.23.

this effort, and BART is committed to partnering with the City (and other partners) to complete the plan, including providing staff support and potential funding assistance.

TOD PROJECT SUMMARY

The proposed TOD project, (site plan shown in **Figure 11**), is a mixed-use development on approximately nine acres of land owned by BART and currently used for a large bus transfer facility, kiss-and-ride area, and parking lots. The development would include office, retail, restaurant, high- to medium-density multi-family residential, and hotel uses. Major circulation changes include a narrowed Rollins Road, new East Station Road to provide passenger drop–off and pick-up for shuttle buses (40-feet or less in length) near the station entrance, a redesigned main floor in the parking garage to accommodate kiss-and-ride activities (including private vehicles, taxis, and Transportation Network Company (TNC) services such as Uber and Lyft), the creation of a bicycle and pedestrian paseo on Garden Lane Paseo west of Rollins Road, and the relocation of large bus staging to southbound Rollins Road and Garden Lane East, and construction of a portion of the Bay Trail along Aviador Avenue.

The proposed TOD project would include four key components, as described by the names of the sub-areas (i.e., Sites 5A, 5B, 6A, and 6B). The following provides a summary of each of the project components by site number, based on the Site Development Application submitted by Republic Millbrae, LLC, on March 21, 2016:

- Site 5A, a 1.66-acre site located immediately south of the BART/Caltrain parking garage, would be developed with approximately 153 thousand square feet ("ksf") of office and 22 ksf of retail/restaurant uses. The site would include a vehicular parking garage with 314 spaces. A transit station plaza would be located between Site 5A and Millbrae Station.
- Site 5B, a 2.63-acre site located south of Site 5A, would be developed with 321 units of residential, 5 ksf of office, 2 ksf of community space, and 16 ksf of retail/restaurant uses. The site would include a vehicular parking garage with 381 spaces. A transit station plaza and pedestrian and bicycle paseo would run east-west between Sites 5A and 5B.
- Site 6A, a 1.28-acre site located east of Site 5A and the BART/Caltrain parking garage and west of Aviador Avenue, would be developed with a 126-room hotel and 5 ksf of retail/restaurant uses. A large portion of this site would remain a vehicular surface parking lot that would be reconfigured as part of the project and include around 462 spaces, including 392 spaces available for BART patrons. SFO's runway protection zone and a utility easement restrict both the height of buildings on this site and require that the eastern portion of the site remain surface parking.

- Site 6B, a 0.95-acre site located east of Site 5B and south of Site 6A, would be developed with approximately 55 housing units for veterans and 4 ksf of space for veteran support services. The site would include a vehicular surface parking lot with 39 spaces.

The proposed TOD project would eliminate 863 surface level BART parking lot spaces, 62 spaces in the parking garage to accommodate kiss-n-ride operations, and provide 392 replacement BART parking spaces, for a total net reduction of 533 parking spaces.

Figure 11 Proposed TOD Project

Source: HMH & Republic Millbrae LLC

PLAN GOALS AND OBJECTIVES

The primary goal of the Millbrae Station Access & Circulation Plan is to improve multi-modal station access in order to facilitate continued BART ridership growth. To that end, the Plan has the following objectives:

- Provide a review of the currently proposed TOD project in terms of station access opportunities and identify specific recommendations to be implemented in conjunction with the TOD project (identified as Tier One improvements in the Plan);
- Develop strategies to increase access to Millbrae Station for non-auto modes that will continue to grow BART ridership with reduced station parking; and
- Develop strategies that can be implemented with the proposed TOD project to increase access to Millbrae Station for all modes, to decrease vehicle trip generation, and to manage parking.

The Station Access & Circulation Plan for the proposed TOD project at Millbrae Station focuses on safety and comfort for four primary user groups, in the following prioritized order: people who walk, people who ride transit, people who bicycle, and people who arrive in private vehicles.

PEDESTRIAN ACCESS OBJECTIVES

Based on existing conditions and anticipated access needs associated with enhanced development around the station area, the objectives for pedestrian access include:

1. Provide attractive, safe and efficient connections between Millbrae Station and El Camino Real, Victoria Avenue, Rollins Road, Millbrae Avenue, East Station Avenue, Garden Lane Paseo, Garden Lane East, and Aviador Avenue.
2. Provide a continuous and convenient sidewalk network to connect uses on the TOD site to the station entrance and adjacent roadways such as Rollins Road, Millbrae Avenue, and South Station Road.
3. Provide attractive, safe crossing opportunities of arterials surrounding the site (i.e., El Camino Real and Millbrae Avenue).
4. Provide attractive, safe crossing opportunities of roadways internal to the site (i.e., Rollins Road, Garden Lane East, and the East Station Road).
5. Enhance personal safety for pedestrians to enable the efficacy of non-auto access strategies and incentives.
6. Provide consistent pedestrian wayfinding.

TRANSIT ACCESS OBJECTIVES

Based on existing conditions and anticipated access needs associated with enhanced development around the station area, the objectives for transit access include:

1. Maintain or improve attractive, safe and efficient transit access to the station and TOD site.
2. Provide flexible design for bus bays and layover areas to accommodate existing and future ridership demand and a variety of transit vehicle types with a measure of flexibility for future changes.
3. Enhance personal safety for transit patrons.
4. Minimize transit impacts associated with traffic congestion and drop-offs/pick-ups as well as transit/pedestrian conflicts.
5. Provide consistent wayfinding for transit passengers to facilitate transfers.

BICYCLE ACCESS OBJECTIVES

Based on existing conditions and anticipated access needs associated with enhanced development around the station area, the objectives for bicycle access include:

1. Provide attractive, safe and efficient bicycle circulation through the TOD site, especially at intersections.
2. Support the goals and policies of the area's broader bicycle plans and provide connections to the Bay Trail.
3. Provide sufficient and secure bicycle parking facilities easily accessible via designated bicycle routes.
4. Provide consistent wayfinding for bicyclists.
5. Accommodate potential future Bay Area Bike Share service.

AUTOMOBILE ACCESS OBJECTIVES

Based on existing conditions and anticipated access needs associated with enhanced development around the station area, the objectives for automobile access include:

1. Provide efficient but slow-speed vehicle access to and through the TOD site.
2. Provide intuitive wayfinding, including signage to Millbrae Station and new development parking areas.

3. Provide sufficient as well as attractive, safe and efficient space for existing and future station drop-off/pick-up, taxi, and Transportation Network Company (e.g., Uber and Lyft) access modes.
4. Implement parking management techniques to reduce over-saturation and vehicles "cruising" for parking in the TOD site.
5. Maintain vehicle access to Millbrae Avenue by minimizing queuing from Rollins Road onto Millbrae Avenue and its resultant effects on the intersection of Millbrae Avenue and Rollins Road.

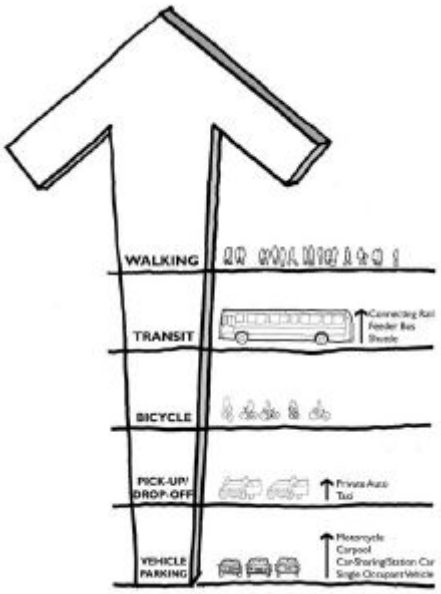
2. POLICY AND PLANNING CONTEXT

This chapter provides a brief summary of the primary BART policies and guidelines that informed the creation of this Plan. Caltrain policies are also referenced since Millbrae is a unique intermodal station. Station access policies by both agencies place a stronger emphasis on improvements to pedestrian, transit, and bicycle access than on improvements to automobile access.

BART STATION ACCESS GUIDELINES

The *BART Station Access Guidelines* (2003) map out how BART can enhance access to stations by all modes. The document provides a clear framework for designing optimal facilities at both new and existing stations, presenting access guidelines for wayfinding, walking, transit, bicycles, drop-off/pick-up/taxi, and park-and-ride. The guidelines also prioritize station access according to the following hierarchy:

1. Pedestrians
2. Transit and shuttles
3. Bicycles
4. Carpools, taxis and pick-up/drop-off
5. Single-occupancy automobiles



Source: BART Station Access Guidelines (2003)

BART TRANSIT-ORIENTED DEVELOPMENT GUIDELINES

The *BART Transit-Oriented Development Guidelines* (2003) was developed to help inform planning and development around BART stations. The guidelines emphasize that building a successful TOD relies on defining station identity, providing high-quality station access, and planning station area development.

BART BICYCLE PLAN

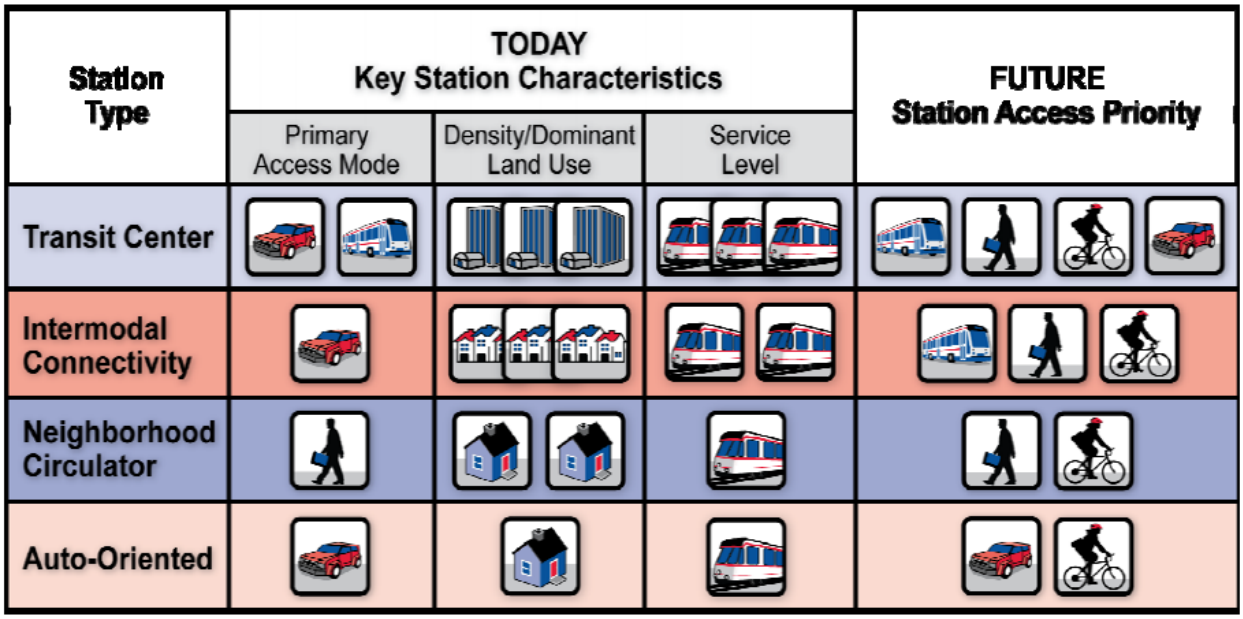
The *BART Bicycle Plan: Modeling Access to Transit* (2012), defines system-wide strategies to encourage bicycling to BART stations. The plan provides an update to the *BART Bicycle Access and Parking Plan* (2002).

It evaluates existing bicycle accommodations within the BART system, including how bicyclists access and use the system, as well as opportunities for improvement. It recommends strategies to double BART's bicycle access mode share to eight percent of all trips by 2022 through improvements to bicycle circulation, parking, local bicycle route connections, on-board facilities, and programs.

CALTRAIN STATION ACCESS POLICY

The *Caltrain Comprehensive Access Policy* (2010) defines station access priorities for the Caltrain system. The *Comprehensive Access Policy* seeks to increase access capacity to support ridership growth, prioritize sustainable access, more effectively manage land and capital assets, prioritize cost-effective access modes, enhance customer satisfaction, and solidify partnerships to implement improvements. The *Comprehensive Access Policy* develops a framework for access priorities at four prototypical station types – Transit Center, Intermodal Connectivity, Neighborhood Circulator, and Auto-Oriented:

> *"**Transit Center** stations are located in high employment density areas with high Caltrain service levels and strong transit feeder service. Today, the primary access modes are auto and transit. The parking lot is or near full. Future transit-oriented development (TOD) opportunities are high. The access priority for this station type is transit, walk, bike, then auto.*
>
> ***Intermodal Connectivity** stations are located in high residential density areas with moderate Caltrain service levels and strong intermodal connections to light rail, rapid rail or bus. Today, the primary access mode is auto. The parking lot is near full. Future TOD opportunities are high. The access priority for this station type is walk, transit then bike.*
>
> ***Neighborhood Circulator** stations are located in moderate residential density areas with low Caltrain service levels. Today, the primary access mode is walk. The parking lot is underused. Future TOD opportunities are moderate. The access priority for this station type is walk then bike.*
>
> ***Auto-oriented** stations are located in low residential density areas with low Caltrain service levels. Today, the primary access mode is auto. The parking lot is underused. Future TOD opportunities area low. Bikes are still a viable option since the average bike trips are greater than three miles. The access priorities for this station type are auto and bike."*



Caltrain framework for access priorities; Source: *Comprehensive Access Policy* (2010)

The *Comprehensive Access Policy* is intended to serve as a guide for general priorities and does not classify specific stations. However, Millbrae Station exhibits the characteristics closest to a "Transit Center" or "Intermodal Connectivity" station as a major transportation hub, although in the future, the Millbrae Station will be closer to the "Transit Center" type. The access priorities for these station types are defined as walk/transit, then bicycle, then automobile.

MILLBRAE STATION AREA SPECIFIC PLAN

The MSASP, adopted by the City Council in February 2016, has the following goals for the Plan Area:

- A vibrant daytime and evening activity center where people live, work and visit;
- A significant regional and local transit hub;
- A balanced, safe and efficient circulation system in and around the Plan Area;
- A well-designed district that creates a sense of place for Millbrae;
- A network of public open spaces;
- A station area where new development is sensitive to surroundings;
- A district that benefits Millbrae's local economy; and

- An environmentally sustainable neighborhood.

Following are the MSASP Parking and Circulation Policies that are most relevant to the proposed east side TOD project and this Plan. A key focus of the parking and circulation policies and recommended improvements is to transform the Millbrae Station from a single purpose transportation facility oriented to park-and-ride and shuttle access to a community destination that is integrated with surrounding residential and commercial activity.

P-CP 1: *Provide superior pedestrian access and circulation in the Plan Area, especially to Millbrae Station, by providing sidewalks on all roadways and adding new routes where feasible.*

P-CP 2: *Accommodate projected pedestrian volumes by increasing sidewalk widths to a minimum of 6 to 10 feet.*

P-CP 4: *Enhance pedestrian safety at signalized intersections with pedestrian countdown signals, signal timing that minimizes pedestrian wait times and provides adequate crossing times (3.5 feet per second), crosswalks at all approaches, continental and/or high-visibility crosswalk striping, corner bulbouts, and perpendicular ADA-standard curb cuts on all corners.*

P-CP 5: *Design all streets to provide an attractive pedestrian and visual environment, including by adding pedestrian-scale lighting, benches, and street furniture.*

P-CP 6: *Improve bicycle access to Millbrae Station and bicycle connections among the surrounding Plan Area land uses through a system of on-street and off-street bicycle facilities including Class I bicycle paths and Class II bicycle lanes.*

P-CP 7: *Increase bicycle visibility to other road users through enhanced treatments at intersections, including bicycle signal detection (using bicycle-oriented loop detectors or push buttons) and colored pavement markings.*

P-CP 8: *Provide secure, short- and long-term bicycle parking facilities at the Mill-brae Station and at all developments.*

P-CP 9: *Provide wayfinding signage in the Plan Area for all modes, with emphasis at the nearest entrances and exits, and web-available maps for users, as required in Chapters 6 and 7 of this Specific Plan.*

P-CP 10: *Require development projects in the vicinity of the station to provide wayfinding signage along wayfinding paths, which include all streets and paseos within the Plan Area, major intersections, and designated bicycle routes.*

P-CP 11: *Accommodate kiss-n-ride (passenger pick-up and drop-off) and taxis near station entrances on both the east side and west side of the Millbrae Station.*

P-CP 12: *Provide bus and shuttle transfer facilities near station entrances on both the east side and west side of the Millbrae Station to accommodate the peak projected vehicles to support bus and shuttle as a priority access mode to BART, Caltrain, and future rail service, such as High-Speed Rail (HSR).*

P-CP 13: *Accommodate SamTrans Route ECR bus service by enhancing stops at Linden Avenue (El Camino Real) northbound at pedestrian paseo) and Murchison Drive (El Camino Real) northbound and southbound) and by providing a deviated route southbound (off El Camino Real) on California Drive Extension with a stop at the pedestrian paseo near the station entrance.*

P-CP 14: *Coordinate with SamTrans, the Peninsula Corridor Joint Powers Board and BART to ensure implementation of all Millbrae station area improvements.*

P-CP 16: *Expand the South Station Road as a two-way public street connecting from the station entrance to Adrian Road.*

P-CP 18: *Encourage the shared use of station area parking facilities for off-peak users. For example, drivers visiting restaurants in the evening could use station area parking during evening hours.*

P-CP 19: *Establish parking standards that are adequate to serve new development but encourage the use of transit and alternate modes.*

P-CP 21: *Design and locate parking facilities to be compatible with adjacent areas and to reinforce the pedestrian environment.*

P-CP 22: *Require new developments within the Plan Area to accommodate alternative modes of transportation and to provide support facilities for bicyclists, such as showers and changing areas.*

P-CP 23: *Require Plan Area employers, property managers, and housing providers to prepare Transportation Demand Management (TDM) Plans that include measures to increase the number of residents and employees walking, biking, using transit, or ridesharing (using carpools and vanpools) as commute modes and to reduce vehicle congestion. Where future projects have the potential to impact facilities under the Congestion Management Plan, the TDM Plan shall meet the current City/ County Association of Governments of San Mateo County (C/CAG) requirements to reduce the number of trips on the Congestion Management Plan roadway network and be approved by both the City and C/CAG. TDM Plans shall achieve at least a 20 percent reduction in trip generation, and the Plan shall include provisions for monitoring, enforcement, and assessment of financial penalties for non-compliance.*

P-CP 24: *Require site-specific transportation studies to address on-site circulation, driveway designs, loading, access, and safety for all modes as part of the development review process.*

P-CP 25: *Plan for and implement public parking on the west side of the BART/Caltrain Station should transit parking be lost due to the development of the BART parking lot on the east side of the station.*

P-CP 26: *he City shall work with Caltrans to modify the existing El Camino Real/Millbrae Avenue intersection footprint through restriping, with a preference for two right-turn lanes from westbound Millbrae Avenue onto northbound El Camino Real.*

P-CP 30: *The City shall work with the City of Burlingame to improve the El Camino Real/Millbrae Avenue intersection lane configurations, as appropriate.*

P-CP 31: *Development projects shall participate in funding and implementing a comprehensive, multi-agency, multi-modal access plan to the Millbrae Transit Station. The Plan shall provide sufficient multimodal access to and from the station to sup-port expected growth in transit rider-ship. In the event the access plan is not complete at the time of application for projects within the TOD zone, applicants shall submit a plan of how multi-modal access and circulation to the transit station will be accomplished. All transit operators serving the Millbrae Station, including BART, California High-Speed Rail Authority, Caltrain, and SamTrans, shall have an opportunity to review and provide comments on the developer proposed multi-modal access and circulation plan prior to City entitlement approval. In addition, private shuttle operators and pedestrian and cyclist communities shall also have an opportunity to review and provide comments.*

P-CP 33: *Work with Caltrans to explore the potential of adding a separate entry for shuttles or other transit into BART parking/TOD 2 site, either from the southbound US 101 off ramp directly, or from Millbrae Avenue where Aviador could be extended to intersect Millbrae Avenue. It is likely that either of these measures will require a design exception from Caltrans.*

3. SETTING AND EXISTING CONDITIONS

This chapter provides an overview of the Millbrae Station and its current layout, as well as existing multi-modal access conditions surrounding the station. Existing BART and Caltrain ridership data and counts of pedestrians, bicycles, transit/shuttle riders, kiss-and-ride operations, and parked vehicles are presented to describe existing levels of activity at the station. Future ridership forecasts and access modes are also presented.

STATION SETTING

Millbrae Station Eastern Entrance

Millbrae Station is located at 200 Rollins Road approximately 1/4 mile from downtown Millbrae and one mile from San Francisco International Airport (SFO). The station has three at-grade BART train platforms on its eastern side and two at-grade Caltrain commuter rail platforms on its western side, providing an intermodal connection between the two systems.

Millbrae Station is bounded by the Highline Canal to the north, Millbrae Avenue to the south, US-101 to the east, and El Camino Real to the west. US-101, El Camino Real, and Millbrae Avenue provide the primary regional auto access to the station.

BART SERVICE

BART currently operates over 100 miles of double track rapid rail passenger service, serving 45 stations and over three million people in four densely populated Bay Area counties: Contra Costa, Alameda, San Francisco, and San Mateo. BART carries more than 430,000 riders on weekdays.

BART System Map; Source: BART, 2015

Millbrae Station is the southern terminus of the Richmond-Millbrae BART Line and the Pittsburg/Bay Point-SFO Airport-Millbrae Line. Millbrae Station is the only BART station that provides a direct intermodal connection to Caltrain. While the station has three available tracks/platforms, most BART trains utilize the western-most track/platform (adjacent to the northbound Caltrain platform) for arrival and departure of revenue service (i.e., passenger-carrying) trains, while the remaining tracks are used for storage of trains during the midday.

As shown in **Table 6**, BART provides service on the Richmond-Millbrae Line from 4:00 AM to 12:00 AM on weekdays with typical headways of 15 minutes and provides service on the Pittsburg/Bay Point-SFO Airport-Millbrae Line after 8:00 PM and from 6:00 AM (8:00 AM on Sundays) to 12:00 AM on weekends with typical headways of 20 minutes.

TABLE 6: MILLBRAE BART SCHEDULE

Line	Headway (Minutes)		
	Weekday before 8:00 PM	**Weekday after 8:00 PM**	**Weekend**
Richmond-Millbrae	15	No Service	No Service
Pittsburg/Bay Point-SFO Airport-Millbrae	No Service	20	20

Source: BART, 2015.

Between both BART and Caltrain service, there are 157 trains per weekday serving the Millbrae Station, with about 20 percent of the service in the morning and evening commute periods, respectively (about 35

percent of service during peak periods and 65 percent during off-peak times). **Table 7** summarizes total BART and Caltrain service at Millbrae Station during peak commute periods, on weekdays and on weekends.

TABLE 7: TRAINS SERVING MILLBRAE STATION

Type of Service	Number of Trains (Both Directions)				
	Weekday			Weekend	
	AM Commute Period	PM Commute Period	Daily	Saturday (Daily)	Sunday (Daily)
BART	13	13	75	54	49
Caltrain					
Local	No Service	1	28	32	28
Limited	8	7	32	No Service	No Service
Baby Bullet	8	6	22	4	4
TOTAL	**29**	**27**	**157**	**90**	**81**

Source: BART 2016, Caltrain and Fehr & Peers, 2014

STATION LAYOUT

Millbrae Station has two primary access points, one on the eastern side of the station and one on the western side. Above the station platforms is a covered concourse that houses BART faregates, a passenger waiting area, bicycle racks (for 20 bicycles), restrooms, a station agent booth, and service rooms dedicated for use by BART staff. The concourse level also contains a Caltrain ticket and information booth, which is currently closed. Add-fare and parking payment machines, BART schedules, restrooms, and employee support facilities are located within the BART faregate area. Caltrain ticket machines are located at ground level between the northbound Caltrain platform and BART platforms.

Patrons can access the train platforms by four elevators, four escalators, and five staircases. The platform level of the station consists of three platforms serving three BART tracks and two Caltrain tracks. The eastern platform serves two BART tracks, though it is not currently used for revenue service.

The middle platform serves one BART track and the northbound Caltrain track, with BART faregates providing a connection between the two systems. The western platform serves the southbound Caltrain track.

Millbrae Station Concourse Level

Platform canopies cover the middle third of the platform length for most platforms. To cross between platforms, patrons must go up to the concourse level and then back down to the opposite platform. The exception to this is the middle platform, which allows patrons to cross from the northbound Caltrain platform to the primary BART platform through BART faregates on the platform.

Bus stops are provided on both sides of the station, with a 10-bay bus transfer facility on the eastern side and a two-bay facility on the western side. Parking is provided on both sides of the station, with three surface lots and one parking garage on the eastern side (operated by BART) and one, 148-space surface lot on the western side (operated by Caltrain). There are sidewalks on Rollins Road, Millbrae Avenue, California Drive, and El Camino Real surrounding the station site. A description of access points and on-site circulation for pedestrian, bicycles, transit vehicles, and personal vehicles is provided in the following sections.

BART RIDERSHIP

The Millbrae Station has seen significant growth in ridership over the past five years, growing at a faster rate than systemwide BART ridership, as shown in **Table 8**.

TABLE 8: BART STATIONS WITH HIGHEST RIDERSHIP GROWTH, 2010-2015

Station	Ridership Growth 2010-2015	Average Annual Growth 2010-2015
1. San Bruno	52%	9%
2. North Concord/Martinez	48%	8%
3. Millbrae	47%	8%
4. Ashby	42%	7%
5. West Oakland	41%	7%
BART Systemwide	26%	5%

Source: BART Station Exit Data 2009-2016

Table 9 shows the average peak and daily entries and exits of BART patrons at Millbrae Station for January through March 2016. There were approximately 7,364 total daily boardings at the station, and approximately 20 percent of boardings take place during the morning peak hour (8:15-9:15 AM). Similarly, about 20% of exits occur during the evening peak hour (5:30-6:30 PM).

TABLE 9: MILLBRAE STATION AVERAGE WEEKDAY ENTRIES/EXITS JANUARY-MARCH 2016

	Number of Riders
Entries	7,364
Exits	6,957
Total	*14,321*

Source: BART Entry/Exit Data January, February, and March 2016

TRANSFERS BETWEEN BART AND CALTRAIN

In 2013, Fehr & Peers conducted an intercept survey of Caltrain riders that asked questions about trip origin, destination, and mode of access. Through analysis of these responses, it was estimated that approximately 1,600 riders transfer between BART and Caltrain daily. Each passenger would make two (2) transfers per day: one (1) transfer during the initial trip and one (1) transfer in the opposite direction for the return trip. This estimate was validated by BART who estimated a similar number of daily transferring riders.

Using the 2013 boarding data from BART and Caltrain, about 25 percent of passengers boarding BART at Millbrae transferred from Caltrain, and about 49 percent of Caltrian passengers boarding at Millbrae transferred from BART. Subtracting transfer trips, approximately 4,830 daily BART boardings and approximately 1,655 daily Caltrain boardings had an origin or destination at the Millbrae Station in 2013 (and did not transfer from either BART or Caltrain).[7] **Table 10** summarizes this information.

TABLE 10: MILLBRAE STATION DAILY BOARDINGS AND TRANSFERS, 2013

	Non-Transfer	Transfer	Total
BART	4,830	1,600	6,430
Caltrain	1,655	1,600	3,255

Source: MSASP DEIR, p. 4.13-25

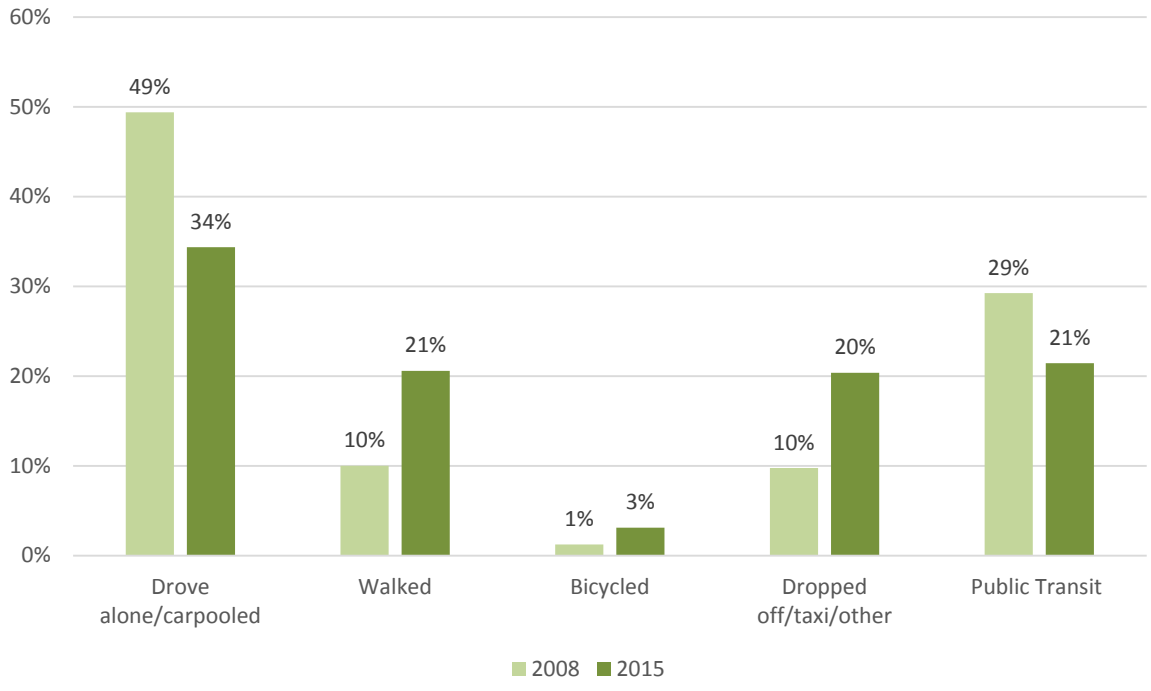
[7] Millbrae Station Area Specific Plan and Transit-Oriented Development #1 and #2 Draft EIR, p. 4.13-25.

STATION PROFILE SURVEYS

BART completed its most recent Station Profile Survey, a comprehensive survey of BART customers, in spring 2015. The survey includes topics such as access modes to stations, origin and destination locations, and demographics. The results of both the 2015 Station Profile Survey and the earlier 2008 Survey provide important information about how riders are currently accessing the Millbrae Station, as well as how access characteristics have changed over time.

A greater proportion of BART riders are using access modes *other* than driving to and parking at the Millbrae Station than ever before. Currently, about two-thirds of BART passengers boarding a BART train at the Millbrae Station are walking, biking, being dropped off, or using public transit to access the BART station, as shown in **Figure 12**. This is a significant change from 2008, when nearly half of BART riders boarding at Millbrae Station drove to the station.

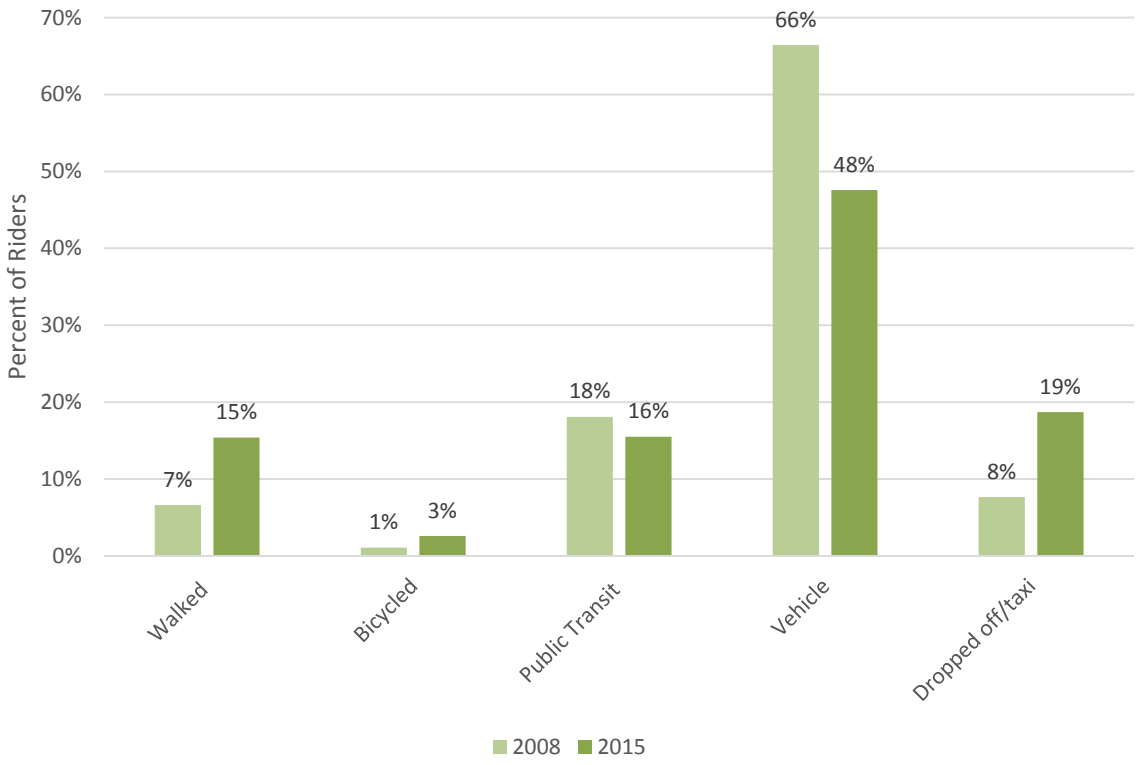
Figure 12: Modes of Access to BART Millbrae Station, 2008 and 2015 Station Profile Surveys



Source: 2008 and 2015 BART Station Profile Study (home- and non-home origins combined)

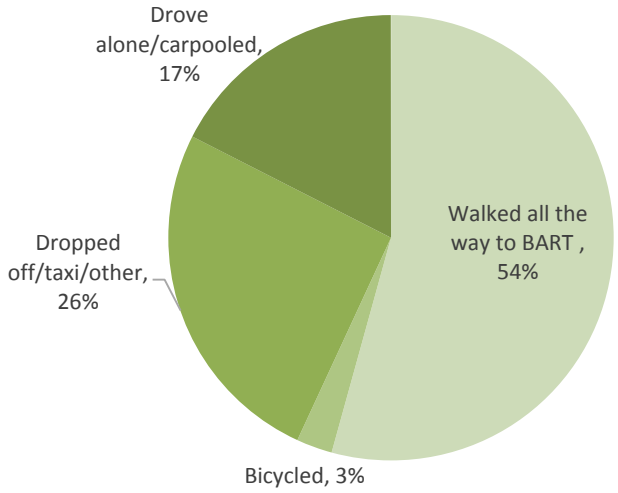
For BART riders traveling from their homes to the Millbrae Station, there has been a substantial shift away from driving to the station and parking toward walking, and drop-off/taxi as shown in **Figure 13**. Driving and parking at the station remains the primary access mode for these riders. However, for those riders who live in the City of Millbrae, the majority (54 percent) walked to the station and a relatively small proportion, only 17 percent, drove to the station and parked, as shown in **Figure 14**.

Figure 13: Mode of Access to Millbrae BART, Home-Based Riders



Source: BART 2015 Station Profile Survey

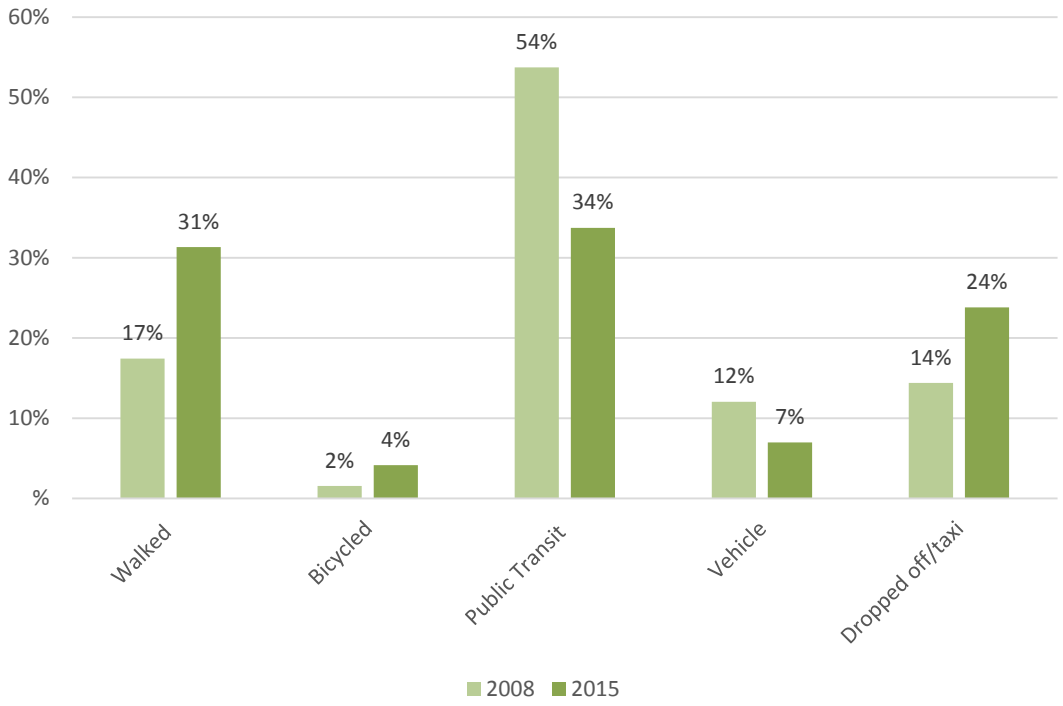
Figure 14: Access Mode for BART Riders with Home Origin in Millbrae



Source: BART 2015 Station Profile Survey

For riders accessing the station from non-home-based origins, there was also a shift toward walking and drop-off/taxi, as shown in **Figure 15**. Non-home-based riders primarily access the station via public transit, however, with a relatively small proportion driving a vehicle to and parking at the station.

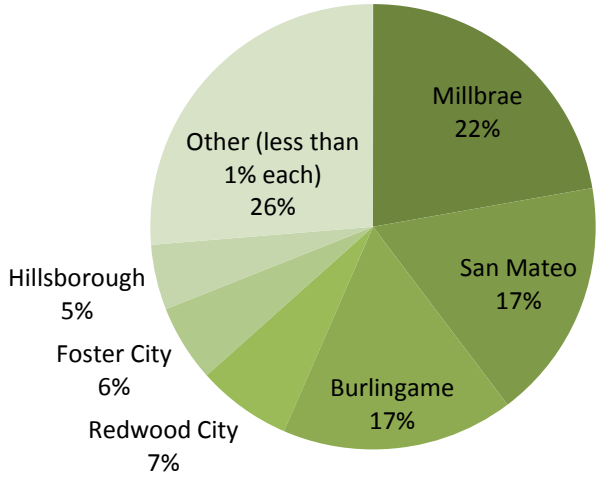
Figure 15: Mode of Access to Millbrae BART, Non-Home Based Riders



Source: BART 2015 Station Profile Survey

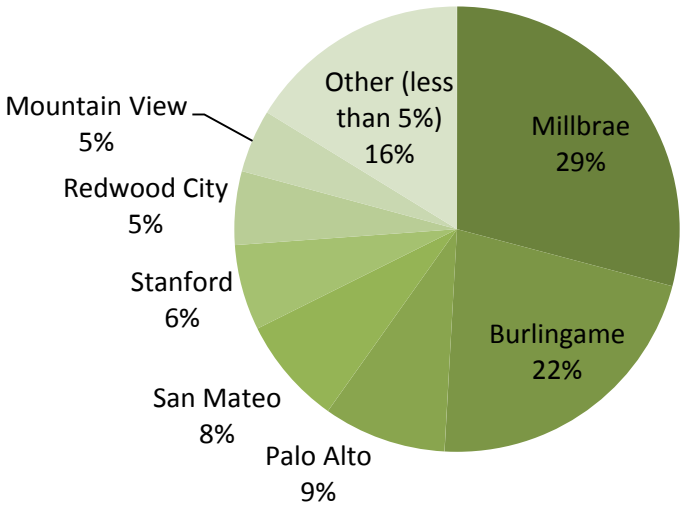
As shown in **Figure 16** and **Figure 17**, the majority of riders, whether coming to the station from home or elsewhere, originate in San Mateo County. The station has a relatively dispersed catchment area for home-based trips, with 26% of home-based riders having origins that comprise less than one percent of all home-based origins.

Figure 16: Origin Cities for Home-Based BART Riders Boarding at Millbrae Station



Source: BART 2015 Station Profile Survey

Figure 17: Origin Cities for Non-Home-Based BART Riders Boarding at Millbrae Station



Source: BART 2015 Station Profile Survey

Table 11 and **Table 12** summarize the types of trip purposes for the destination of both home- and non-home-based trips and the types of trip purposes for the origins of non-home-based riders. The majority of home-based riders were destined for work (64 percent), while the majority of non-home-based riders were coming from work (66 percent) and were heading home (70 percent). Approximately 10% of riders, regardless of origin type, were traveling to the airport or for a social/recreational purpose.

TABLE 11: TRIP PURPOSE AND DESTINATIONS FOR BART RIDERS BOARDING AT MILLBRAE STATION

Trip Destination	Home Based	Non-Home Based
Home	-	70%
Workplace	64%	2%
Airplane trip	8%	10%
Social/recreational (includes visiting friends/family)	9%	8%
College/university (student)	8%	1%
Work-related/business appointment	3%	2%
Restaurant/cafe	2%	0%
Shopping	1%	2%
Personal errands	1%	1%
Medical / dental	1%	0%
Hotel	0%	1%
Sports event	0%	1%
Theater or concert	0%	1%
Other (less than 1% each)	3%	1%

Source: BART 2015 Station Profile Survey

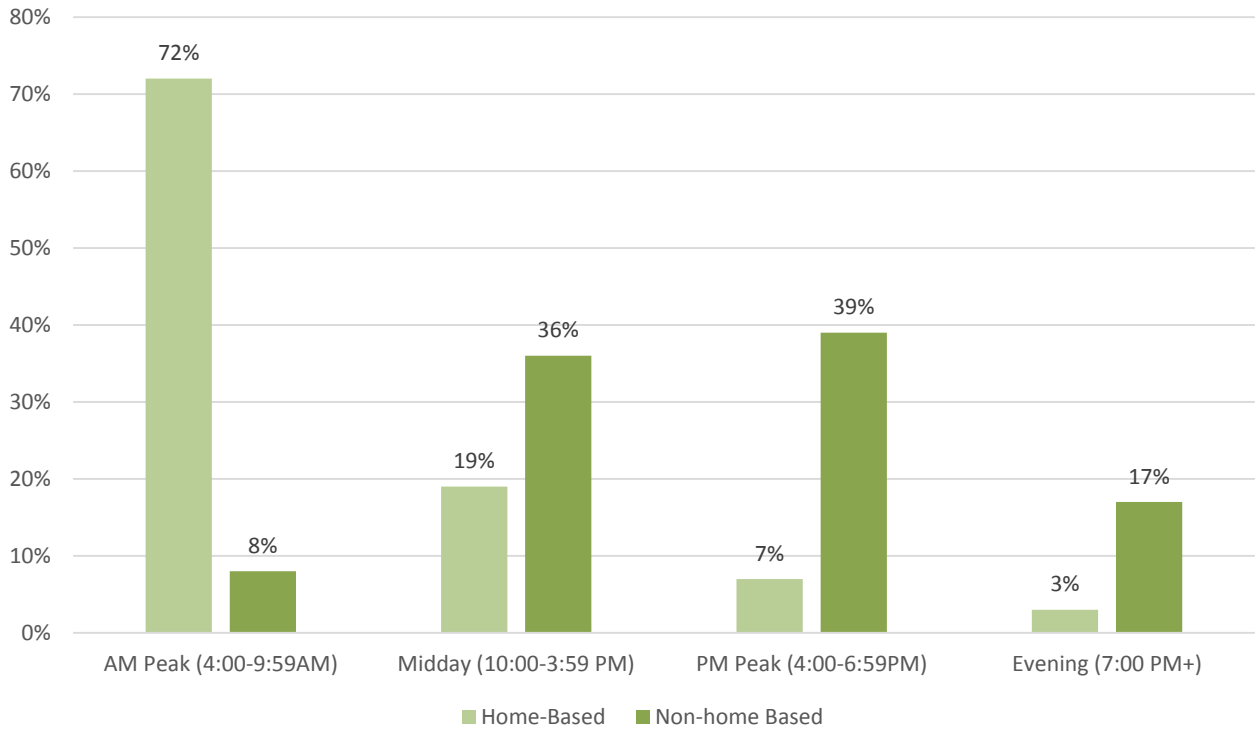
TABLE 12: TRIP PURPOSE, NON-HOME-BASED ORIGINS

Trip Origin	Non-Home Based
Workplace	66%
Work-related/ business appointment	4%
Social/ recreational	16%
College/ university (student)	4%
Airplane trip	<1%
Personal Errands	2%
Restaurant/cafe	3%
Hotel	3%
Medical/dental	1%
Escorting others	<1%

Source: BART 2015 Station Profile Survey

Figure 18 shows when home-based and non-home-based riders access the station over the course of a weekday. Most of the riders boarding at the station during the morning are coming from home, while most riders boarding at the station throughout the rest of the day are coming from non-home origins.

Figure 18: Origins for Trips Boarding BART at Millbrae Station by Time of Day



Source: BART 2015 Station Profile Survey

SUMMARY OF OBSERVED ACCESS DATA

In February 2016, Pirzadeh & Associates conducted observations of the east side of Millbrae Station for two days, Wednesday, February 10th and Thursday, February 11th from approximately 6:00 AM to 9:00 PM. Observers counted the number of parking vehicles, shuttle vehicles and passengers, pedestrians, bicyclists, and drop-off/pick-up passengers entering or exiting the east side of the Millbrae Station. The total number of observations and their relative proportions are summarized in **Table 13**, and more specific information from these counts is presented in the other sections throughout this chapter.

It is important to note that these data count all people and vehicles who used curb or parking facilities on the east side of the station, but they do not distinguish whether or not individuals then rode BART or Caltrain. Instead, these data provide an overview of general activity on the east side of the station, but do not necessarily provide specific information about how BART or Caltrain riders accessed the east side of Millbrae Station.

TABLE 13: OBSERVED STATION ACCESS MODES FOR EASTSIDE MILLBRAE STATION

Access Mode	Total Count	
Parking Vehicles (garage and lots)	2,865	55%
Pedestrians	457	9%
Bicyclists	60	1%
Shuttle Passengers (including public shuttles)*	936	18%
Pick-up/Drop-off Passengers	853	16%
TOTAL	5,171	100%

Source: Pirzadeh & Associates, counts for Wednesday, February 10, 2016

*Note: Shuttle passengers include Commute.org and private employer shuttles, but do not include transfers from other public transit (SamTrans, Caltrain, etc.).

PEDESTRIAN ACCESS

Millbrae Station is located within a 10- to 20-minute walk of Downtown Millbrae, residential neighborhoods, commercial areas, employment centers, schools, local parks, and the Bay Trail. However, the relatively few direct pedestrian connections, the presence of high-volume and high-speed roadways on three of its sides, and the poor quality of sidewalks (in terms of width and pedestrian comfort and other amenities) and crossing facilities in and around the station present challenges to walking as a mode of access.

Despite these challenges, there is a high level of pedestrian activity at the Millbrae Station. Approximately 21 percent of all BART riders walk to the station, according to the 2015 Station Profile Survey. Observations from February 2016 by Pirzadeh & Associates counted 457 pedestrians entering and exiting the east side of the station on a weekday. Given that the west side of the station currently provides more direct pedestrian access to Millbrae's residential and commercial areas, most people who are walking to BART or Caltrain are entering via the westside station entrance.

EXISTING FACILITIES

Millbrae Station is surrounded by several pedestrian generators, including commercial areas, employment hubs, residential neighborhoods, and hotels. Most pedestrian generators are located to the west and to the south of Millbrae Station, including Downtown Millbrae, Mills-Peninsula Medical Center, and several residential areas. The airport to the north and industrial area to the east generally produce limited walk trips, although several hotels located along Millbrae Avenue/Old Bayshore Highway generate some

pedestrian activity. Pedestrian circulation around and within Millbrae Station is provided via sidewalks and marked crosswalks on the surrounding and internal roadways.

Surrounding Area

The following sections describe the pedestrian facilities immediately surrounding Millbrae Station.

West

The pedestrian facilities to the immediate west of Millbrae Station are typical of an urban environment. Many of the streets have sidewalks and marked crosswalks at intersections with major roadways. Pedestrian signal heads and pedestrian activation devices, such as push buttons, are also provided at most of the signalized intersections.

Typical Sidewalk Conditions along El Camino Real

However, pedestrian access to the west of Millbrae Station is challenging. Downtown Millbrae is geographically close to the station, but the indirect and uninviting connection between the two nodes limits pedestrian travel. El Camino Real serves as a barrier to pedestrian circulation due to its width (six to eight lanes), fast vehicle speeds, narrow and uneven sidewalks, frequent driveways, and long and intimidating crossings. At multiple intersections, El Camino Real lacks marked and signal-protected crosswalks – including at Linden Avenue, the gateway to Millbrae Station. The overall walkability of the sidewalks also suffers from a lack of street trees, pedestrian-scale light fixtures, and pedestrian amenities.

South

Multiple major arterials provide direct pedestrian access from the areas to the south of Millbrae Station: Millbrae Avenue, Rollins Road and El Camino Real. These busy roadways can be intimidating for pedestrians, with no buffer separation from fast-moving traffic and wide intersections spaced far apart. Signals on the roadways provide insufficient time for pedestrians moving at a moderate speed to fully cross within the designated green time, and they lack median refuges for pedestrians to comfortably wait. Sidewalks are generally narrow and in poor condition.

In particular, the intersections of Millbrae Avenue/Rollins Road and Millbrae Avenue/El Camino Real represent key barriers to pedestrian circulation. Both intersections pose challenges for pedestrians due to

their long crossing distances without median refuge islands and lack of human scale. Despite serving as the gateway to Millbrae Station, the Millbrae Avenue/Rollins Road intersection contains crosswalks at only three of the four intersection legs (no crosswalk is present on the east leg). The crosswalk crosses eight lanes of traffic (a distance of approximately 106 feet) without a median refuge.

Pedestrian connectivity is further limited by barriers along Millbrae Avenue and El Camino Real. The Millbrae Avenue Bridge over the Caltrain and BART tracks provides relatively narrow sidewalks that are isolated from intersecting walkways for nearly 1/4 mile. El Camino Real lacks sidewalks south of Murchison Drive.

East/North

The industrial uses to the east and north of Millbrae Station generate limited pedestrian activity, and direct pedestrian connections to these areas are correspondingly sparse. Several hotels along Millbrae Avenue and Old Bayshore Highway generate some pedestrian activity; however, these uses are largely cut off from Millbrae Station by the US-101/Millbrae Avenue interchange. The interchange poses multiple obstacles to pedestrian circulation, including a lack of a northern sidewalk and a southern sidewalk with unprotected crossings of high-speed right turn lanes onto the southbound and northbound US-101 onramps. Consequently, little pedestrian activity occurs across the interchange.

Station Facilities

Most pedestrians who enter the eastside entrance of Millbrae Station originate from the parking facilities on the east side of the station. Walkways are provided along the north and south sides of the pick-up/drop-off area and the bus transfer facility. A standard crosswalk is marked on the western end of the pick-up/drop-off area to guide people from the southern sidewalk across an internal circulation roadway to the station entrance, as well as across Rollins Road providing access between the parking lots to the east of Rollins Road and the northern walkway of the bus transfer facility. Patrons who park in the garage to the north of the bus transfer facility use a pedestrian bridge that links the structure directly to the ticketing level of Millbrae Station.

Pedestrian facilities at the east entrance do not follow pedestrian desire lines. The Rollins Road crossing at the bus transfer facility entrance is inconvenient for many patrons who instead often cross at various unmarked locations across the seven lanes of Rollins Road, waiting for a gap in traffic traveling to and from the parking garage and surface parking lots. The crosswalk on the western end of the pick-up/drop-off area is also rarely used, as patrons cross to and from the southern parking lots along the entire length of the internal roadway.

Wayfinding

Wayfinding signage within and to Millbrae Station is minimal. Patrons arriving at the west entrance at times are unsure how to access the opposite platform for the northbound train or how to connect to BART. Patrons arriving at the east entrance were observed to struggle in locating the correct staircase or escalator to take them down to the appropriate train platform.

PEDESTRIAN VOLUMES

Pirzadeh & Associates conducted pedestrian counts at the station on a Wednesday and on a Thursday in mid-February 2016. The counts were conducted between 6:30 and 9:30 AM and between. In the morning three-hour period (6:30-9:30 AM), an average of 30 pedestrians walked to the station and 134 exited. During the evening three-hour period (4:00-7:00 PM), an average of 90 pedestrians walked to the station and 32 exited. This implies that pedestrians using the east side of the station are likely going to and from non-home destinations/origins such as school or work.

Pedestrian counts were taken at intersections surrounding Millbrae Station during the morning (7:00 – 9:00 AM) and evening (4:00 – 6:00 PM) peak periods in March 2014. The counts show that pedestrian activity is generally highest at the intersections closest to the station: El Camino Real and Millbrae Avenue (169 AM crossings; 193 PM crossings), Rollins Road and Millbrae Avenue (121 AM crossings; 141 PM crossings), and El Camino Real and Victoria Avenue (94 AM crossings; 154 PM crossings). Pedestrian volumes are also high during the PM peak period along El Camino Real north of the station at La Cruz Avenue (123 PM crossings) and Hillcrest Boulevard (195 PM crossings). The high counts at these intersections indicate that most pedestrians access the station from areas to the west and southwest of the station, which are the most walkable and provide direct access to residential neighborhoods.

2015 Station Profile Survey Pedestrian Origins

The 2015 BART Station Profile Survey found that 15 percent of riders coming from home origins walked to the Millbrae Station. For those riders whose home origins were in the City of Millbrae (about 22 percent of riders traveling from home to the station), 54 percent reported that they walked all the way from home to BART. For those accessing the station from non-home origins, 31 percent reported walking to the station. Overall, 21 percent of BART riders walk to Millbrae Station. This information is summarized in **Table 14**.

TABLE 14: PERCENTAGE OF BART RIDERS WALKING FROM ORIGIN TO MILLBRAE STATION

Type of Rider	Percent of Type
Home Origins in Millbrae	54%
All Non-Home Origins	31%
All Home Origins	15%
All Origins (Home and Non-home)	21%

Source: 2015 BART Station Profile Survey

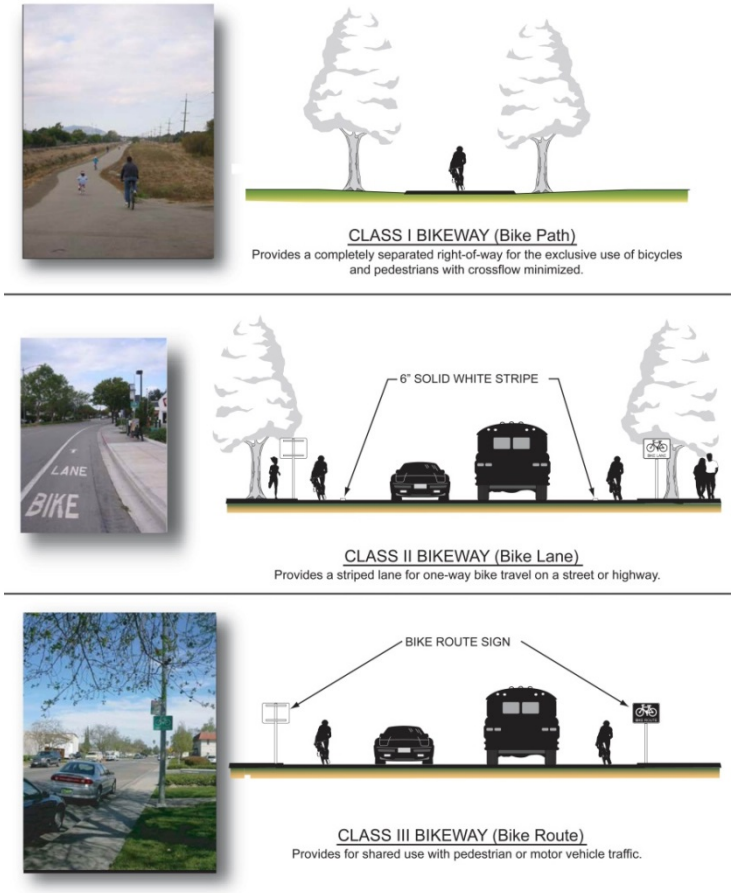
BICYCLE ACCESS

Millbrae's temperate climate and flat terrain near the station could be conducive to bicycling. However, the lack of continuous bicycle facilities and the busy auto-oriented streets around Millbrae Station can make bicycling challenging and uncomfortable, even for the most confident riders. Surrounding roadways with high traffic volumes and speeds, such as El Camino Real, Millbrae Avenue, Rollins Road, and US-101, create significant barriers to bicycling.

TYPES OF BIKEWAY FACILITIES

Bikeway planning and design in San Mateo County generally relies on the guidelines and design standards established by Caltrans as documented in "Chapter 1000: Bikeway Planning and Design" of the Highway Design Manual (5th Edition, California Department of Transportation, January 2001). These standards provide for three distinct types of bikeway facilities, which are described below.

- **Multi-Use Paths (Class I)** are a completely separate right-of-way designated for the exclusive use of bicyclists and pedestrians with minimal vehicle and pedestrian cross-flow. Class I paths are for non-motorized use only.
- **Bike Lanes (Class II)** are a portion of roadway designated by striping, signage, and pavement markings for the preferential or exclusive use of bicyclists. Bike lanes are generally appropriate for major arterials and collector roadways. They are generally at least five feet wide.
- **Bike Routes (Class III)** are streets designated for shared use with motor vehicles by signs or pavement markings. Shared lanes are appropriate for roads with low speeds and low traffic volumes. They can also be used for short stretches along Class II bikeways where there is insufficient right-of-way for a separate bicycle lane.



EXISTING FACILITIES

The biggest bicycle trip generators from the surrounding areas are the residential neighborhoods and commercial/employment zones to the west and south of Millbrae Station, as well as the Bay Trail to the east. The airport to the north and industrial area to the southeast generally produce limited bike trips to/from the station. The collection of bicycle facilities both around and within Millbrae Station is disconnected and often uninviting.

Surrounding Area

There are few existing bicycle facilities located in the station area. El Camino Real is a Class III facility north of Millbrae Avenue, with shared lane markings ("sharrows") in its outside lanes. California Drive is also a Class III facility marked with sharrows south of Millbrae Station. Although signage exists on El Camino Real, only experienced and confident bicyclists ride on this wide, high-volume, and high-speed roadway. El Camino Real has no bicycle facilities south of Millbrae Avenue, where California Drive serves as a preferred

alternate route. However, California Drive provides access only to the areas west of the train tracks and south of the station. For the many riders who access Millbrae Station from the west, the road network in those neighborhoods encourages bicycling, but the poor connection between the neighborhood network and Millbrae Station is a significant barrier. Bicyclists face the same challenges that pedestrians face in crossing El Camino Real to access the west entrance of the station. Bicyclists are forced either to take a circuitous and uncomfortable route via Millbrae Avenue or to cross El Camino Real and ride along the east sidewalk for the final leg of their journey.

Bicycle access to the east station entrance is poor. Both Millbrae Avenue and Rollins Road are the primary roadways surrounding Millbrae Station, and they are inhospitable to bicyclists due to their high traffic volumes, high travel speeds, and wide cross-sections.

Station Facilities

The lack of existing accommodations makes it challenging for bicyclists to safely and comfortably access Millbrae Station. Few bicyclists enter Millbrae Station from the east entrance. Those that do must ride through the bus transfer facility with heavy bus traffic, through the pick-up/drop-off area with frequent vehicle activity or, more commonly, on the walkways crowded with pedestrians. Numerous bicyclists access Millbrae Station via the west entrance, but no special accommodations are provided.

Bicycle Parking

Bicycle Lockers and Racks near Caltrain Platforms

The west entrance of Millbrae Station has three sets of bicycle parking facilities. The set closest to the westside entrance is located directly under the station behind the escalators. It consists of four blocks of electronic lockers with four spaces each and four inverted u-racks. These facilities are the most utilized by bicyclists. The other two bicycle parking facilities at the westside station entrance are further from the entrance and are underutilized. North of the station along the tracks is four blocks of lockers, with eight keyed spaces each, and around six inverted u-racks. South of the station below the Millbrae Avenue overpass are two blocks of eight keyed lockers each, one set of 12 keyed lockers, and a "coat hanger" rack. These additional parking facilities to the north and south of the westside station entrance are fairly hidden and are largely unused.

The eastside station entrance has only one bicycle rack for short-term parking. **Table 15** summarizes the bicycle parking facilities that are currently available at Millbrae Station. Consistent with the access patterns for bicyclists, bicycle parking on the west side of the station is much more heavily utilized, with the racks on the concourse and east side of the station remaining relatively empty.

TABLE 15: EXISTING BICYCLE PARKING FACILITIES AT MILLBRAE STATION

	Number of Bicycles Accommodated		
Bicycle Parking Type	**West Side**	**East Side**	**Concourse**
Bike Link Electronic Lockers	18	6	0
Racks	24	16	20
Keyed Lockers	40 (Caltrain Platform)	0	0

Source: BART, 2016

Wayfinding

Millbrae Station lacks wayfinding to bicycle parking and bicycle access routes, such as elevators or bike channels on stairways.

BAY TRAIL

Millbrae Station is situated close to the Bay Trail, which runs the along the Bay coastline and provides regional bicycle access. The only existing route between Millbrae Station and the Bay Trail is Millbrae Avenue, which is not a welcoming roadway for bicyclists. Bicyclists can either ride in a wide travel lane with fast-moving cars or on a narrow and poorly maintained sidewalk on the south side of the street. With either route, a bicyclist must cross the path of vehicles making free right turns at four separate locations. Signs warning drivers to "Yield to Pedestrians" are placed at these crossings, but during field visits drivers were observed, at times, to fail to yield. The connection between Millbrae Station and the Bay Trail is not only uncomfortable, but it also lacks signage guiding bicyclists or pedestrians between the two.

BICYCLE USAGE

Pirzadeh & Associates conducted bicycle counts at the station on a Wednesday and on a Thursday in mid-February, 2016 between 6:30 and 9:30 AM and between 4:00 and 7:00 PM. In the morning three-hour period, an average of four bicyclists entered the station and 18 exited. During the evening three-hour period, an average of 14 bicyclists entered the station and 10 exited. Similar to the pedestrian observed

pedestrian counts, these data imply that bicyclists are currently using the east side of the station to access non-home destinations/origins.

Bicycle counts were taken at intersections surrounding Millbrae Station during the AM (7:00 – 9:00 AM) and PM (4:00 – 6:00 PM) peak periods in March 2014. The counts indicate that the majority of cyclists access the station's westside entrance from the south via California Drive, which is a low volume, low speed street that travels parallel to El Camino Real for several miles and connects to the station's westside entrance. The highest bicycle volumes were observed on California Drive at Murchison Drive in the northbound direction during the AM peak period (14 cyclists) and in the southbound direction during the PM peak period (15 cyclists). These relatively low peak counts indicate that bicycling is currently an under-utilized access mode at Millbrae Station. Since most bicycle access is on the westside, bicycle storage facilities near the westside station entrance are mostly full during the peak periods, while storage facilities near the eastside station entrance are mostly empty.

2015 Station Profile Survey Bicyclist Origins

The 2015 BART Station Profile Survey found that only three percent of riders coming from home origins bicycled to the Millbrae Station. For those riders whose home origins were in the City of Millbrae (about 22 percent of riders traveling from home to the station), three percent reported that they bicycled all the way from home to BART. For those accessing the station from non-home origins, only four percent reported bicycling to/from the station. For both home-and non-home origins, bicycling is the least likely mode of access to the Millbrae Station compared with walking, transit/shuttles, drive and park, or being dropped off.

TRANSIT AND SHUTTLE ACCESS

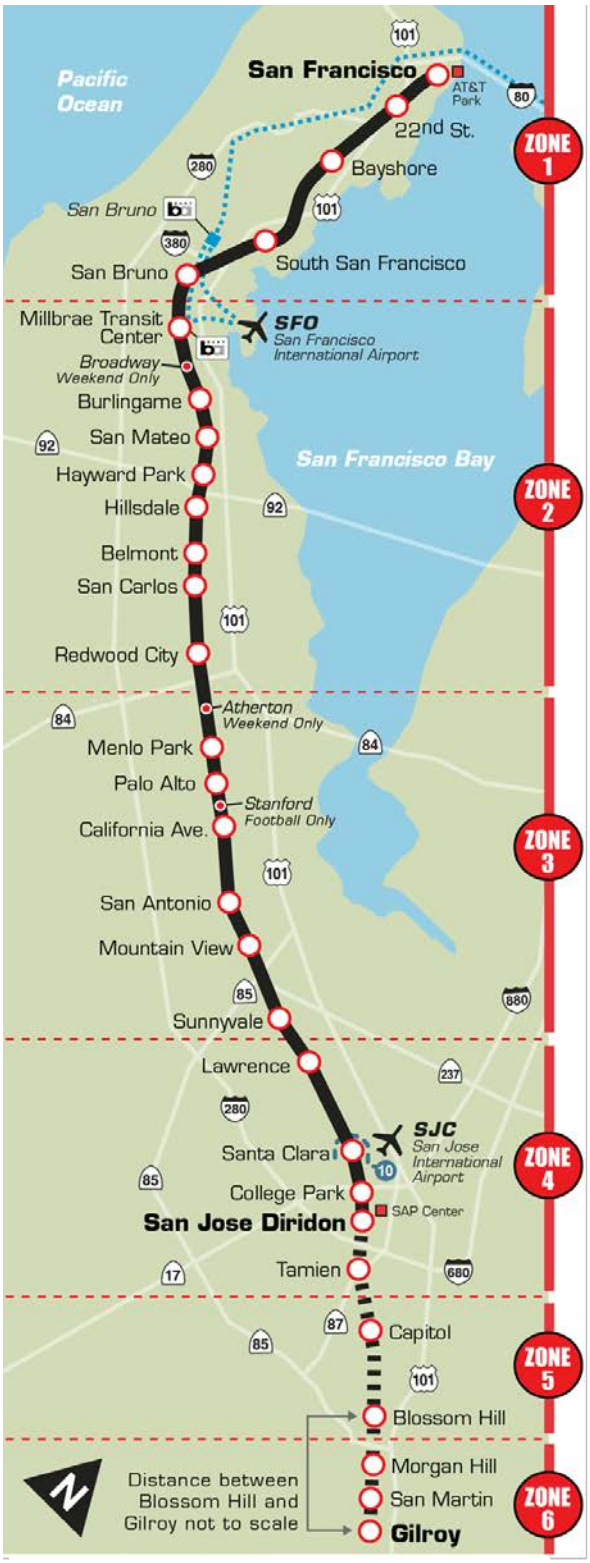
This section describes the transit and shuttle services and facilities that provide access to BART at Millbrae Station, including Caltrain, San Mateo County Transit District, and commuter and employer-based shuttles.

TRANSIT AND SHUTTLE SERVICES

Caltrain

Caltrain provides commuter rail service on the Peninsula between San Francisco and San Jose with stops throughout San Mateo and Santa Clara Counties. Limited service is available south of San Jose to Gilroy. Caltrain currently operates 46 northbound and 46 southbound (total of 92) trains per day between San Jose and San Francisco during the week. Caltrain operates five trains per direction during the AM and PM peak periods and one train per hour per direction off-peak. Caltrain serves 58,245 passengers per weekday (Joint Powers Board, 2015). Ridership grew by 71 percent between 2010 and 2015 and by 243 percent between 2004 and 2015.

Caltrain currently operates three types of service: Baby Bullet, Limited, and Local. As shown in **Table 16**, Caltrain provides service at Millbrae Station from 5:15 AM to 12:00 AM on weekdays with eight limited and Baby Bullet trains in the AM peak and one local, seven limited, and six Baby Bullet trains in the PM peak. On weekends, Caltrain provides service from 8:30 AM to 10:00 PM with local trains every hour and four Baby Bullet trains throughout the day.



Caltrain System Map; Source: Caltrain, 2014

TABLE 16: MILLBRAE CALTRAIN SCHEDULE

Type of Service	Number of Trains (Both Directions)				
	Weekday			Weekend	
	AM Commute Period	PM Commute Period	Daily	Saturday (Daily)	Sunday (Daily)
Local	No Service	1	28	32	28
Limited	8	7	32	No Service	No Service
Baby Bullet	8	6	22	4	4

Source: Caltrain and Fehr & Peers, 2014.

As shown in **Table 17,** Millbrae Station is the fifth-busiest station in the Caltrain system, with over 3,500 boardings per weekday. Average weekday Caltrain ridership grew by seven percent at Millbrae station from 2014 to 2015.

TABLE 17: CALTRAIN AVERAGE WEEKDAY RIDERSHIP (AWR), 2014-2015

	2014		2015		
Station	**Rank**	**AWR**	**Rank**	**AWR**	**% Change**
San Francisco	1	12,160	1	13,571	11.6%
Palo Alto	2	6,156	2	7,197	16.9%
Mountain View	3	4,274	3	4,570	6.9%
San Jose Diridon	4	3,714	4	4,160	12.0%
Millbrae	5	3,291	5	3,536	7.4%
Sytemwide		52,611		58,245	10.7%

Source: Caltrain 2015 Annual Passenger County Key Findings

San Mateo County Transit District (SamTrans)

SamTrans operates 73 bus routes and paratransit service throughout San Mateo County and parts of San Francisco and Palo Alto. The following SamTrans routes operate near Millbrae Station.

Route ECR is a north-south bus line that provides regional, trunk-line transit service between Daly City and Palo Alto via El Camino Real. The route operates from 4:00 AM to 2:00 AM on weekdays with headways of 15 minutes during the peak commute and midday periods. On weekends, the route operates from 5:00 AM

to 2:00 AM with headways of 20 to 30 minutes. The closest ECR northbound stop to Millbrae Station is at the intersection of Linden Avenue and El Camino Real – a 400-foot walk from the station. The closest ECR southbound stop is located between a frontage road and El Camino Real near the intersection of Victoria Avenue and El Camino Real – a 1/4-mile walk from the station.

Route 397 is a north-south bus line that provides late night regional transit service between Downtown San Francisco and Palo Alto primarily via El Camino Real. The route operates every night from 1:00 AM to 6:00 AM with one-hour headways. The route stops in the eastside bus transfer facility.

Table 18 summarizes the scheduled headways for each line during a typical week. The ECR has the highest average weekday ridership of all Samtrans' routes, carrying an average of 12,460 riders per weekday in 2014.[8]

TABLE 18: MILLBRAE SAMTRANS SCHEDULE

Route	Headway (Minutes)				
	Weekday			Weekend	
	AM Commute Period	PM Commute Period	Daily	Saturday (Daily)	Sunday (Daily)
ECR	15	15	15 – 30	20 – 30	20 – 30
397[1]	No Service	No Service	60	60	60

Notes:
1. Route 397 is an owl service that operates nightly between 1:00 AM and 6:00 AM.

Source: SamTrans, 2014.

Commuter and Employer-Based Shuttles

Commuter shuttles provide important first/last mile access to jobs from regional transit connections (i.e., BART and Caltrain stations). These shuttles typically pick up commuters at BART/Caltrain stations in the mornings and drop them off near their employers; the reverse trip occurs in the evenings. Shuttles meet most trains and operate during weekdays only.

Publicly-operated commuter shuttles at Millbrae Station include the Sierra Point shuttle, the Broadway-Millbrae Caltrain shuttle, and three shuttles operated by the Peninsula Traffic Congestion Relief Alliance (also known as Commute.org) – Burlingame-Bayside, North Foster City, and North Burlingame.

[8] SamTrans Short Range Transit Plan, FY2014-FY2023, p. 42.

- The Sierra Point shuttle travels between Millbrae Station and a large office park located southeast of the City of Brisbane. The shuttle route utilizes cutaway buses and operates from 7:30 to 9:55 AM and from 4:20 to 6:50 PM on weekdays with approximately nine total buses per day in both directions.
- The Broadway-Millbrae Caltrain shuttle travels between Millbrae Station and Broadway Caltrain Station, since Caltrain does not provide weekday train service to the Broadway station. The shuttle operates from 6:15 to 9:10 AM and 3:20 to 7:15 PM every day with approximately 24 buses per day.
- The North Foster City shuttle, operated by The Alliance, travels between Millbrae Station and businesses in the North Foster City area. The shuttle operates from 6:50 to 9:00 AM and from 4:15 to 6:15 PM on weekdays with approximately 11 total buses per day in both directions.
- The Burlingame-Bayside Alliance shuttle travels between Millbrae Station and the Burlingame Bayside Area, a series of office buildings located along Bayshore Highway/Airport Boulevard and Rollins Road. The shuttle operates from 6:35 to 8:30 AM and from 4:30 to 6:15 PM on weekdays with approximately eight total buses per day in both directions.
- The North Burlingame Alliance shuttle travels among Millbrae Station, Mills-Peninsula Health Service, Sisters of Mercy of the Americas, and the Easton-Burlinghome neighborhood. The shuttle operates from 6:15 to 9:30 AM and from 3:30 to 6:00 PM on weekdays with approximately 16 total buses per day in both directions.

Private commuter shuttles serving Millbrae Station include Genentech, Google, Cisco, and Mercy High School.

- The Genentech shuttle operates between Millbrae Station and Genentech office buildings located east of US-101 in the City of South San Francisco using large, over-the-road coaches with a capacity of 40 or more people. The shuttle operates from 6:30 to 10:15 AM and from 2:50 to 7:45 PM on weekdays with approximately 22 total buses per day in both directions.
- The Google, Cisco, and Mercy High School shuttles travel between Millbrae Station and their respective campuses during the AM and PM peak periods with headways of 30 to 60 minutes. The Google and Cisco shuttles utilize large, over-the-road coaches with a capacity of 40 or more people, while Mercy High School utilizes cutaway shuttle buses with a capacity of 20 to 30 people.

The private employer shuttles – Genentech, Google, and Cisco – utilize the eastside bus transfer facility, as do the publically accessible Sierra Point shuttle, Burlingame-Bayside shuttle and North Foster City shuttle. The substantial capacity of the eastside bus transfer facility (11 bus bays total) is more than adequate for shuttles to operate efficiently during the peak periods. Based on data collected by Pirzadeh & Associates in February 2016, no more than nine shuttle vehicles accessed the east side of the station during a 15-mintue period in the morning or evening peak period. These nine vehicles used seven of the 11 available bus bays.

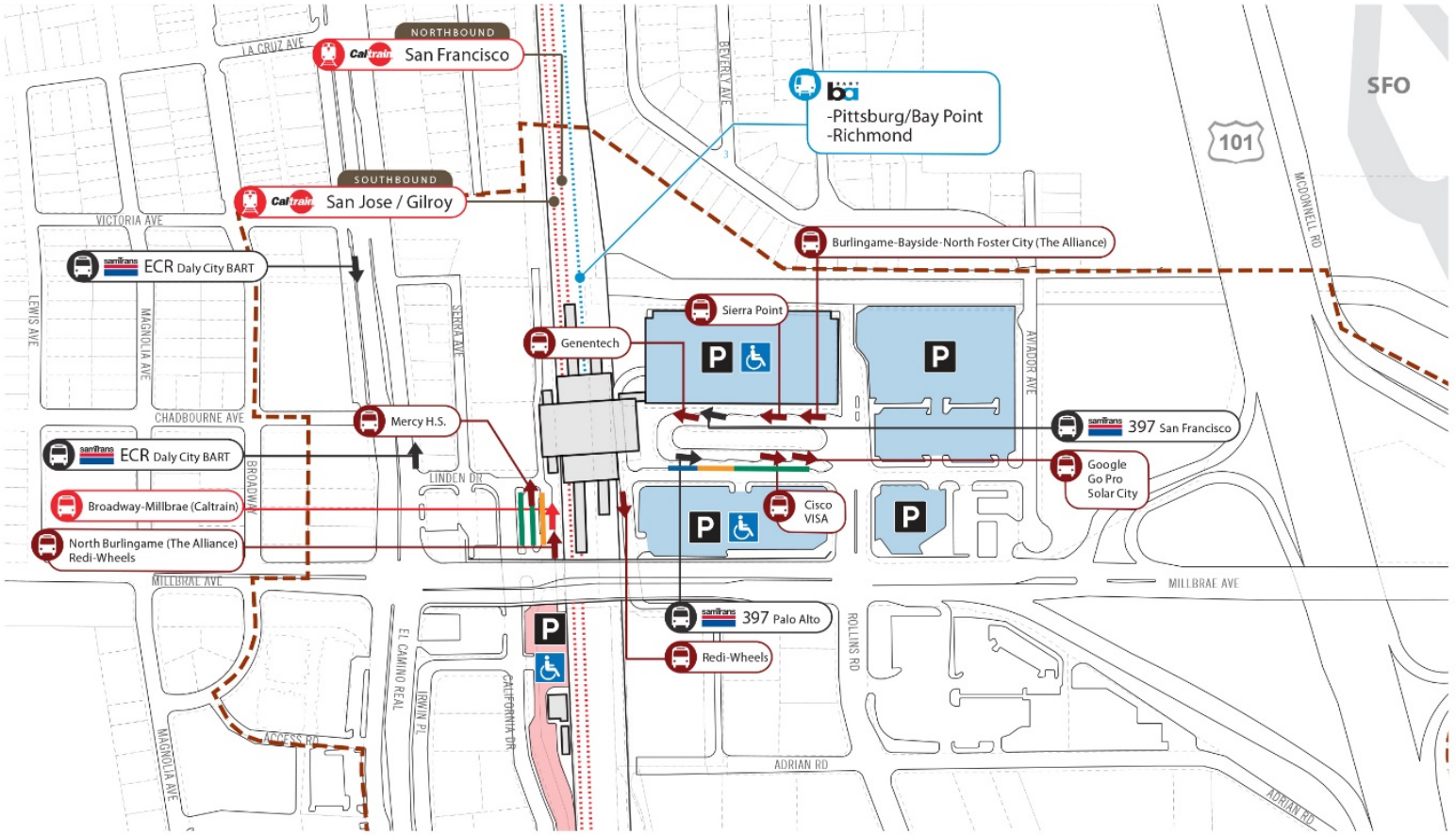
Mercy High School utilizes the westside bus transfer facility, along with the publically available Broadway-Millbrae Caltrain and North Burlingame Alliance shuttles. The two designated bus loading zones at the westside entrance provide sufficient capacity for the public shuttles that utilize that entrance. The private Mercy High School shuttle occupies open curb space in the designated kiss-and-ride area at the western entrance.

STATION FACILITIES

Pirzadeh & Associates also collected data on commuter and employer shuttle operations and facility usage in February 2016. These observations found that the greatest number of shuttles (12 vehicles) access the east side of the station between 7:00-7:30 AM with an average dwell time of three minutes. Six of the 11 available bus bays were used during this time period. During the remainder of the morning peak period, there are eight to ten shuttles arriving within a particular 30-minute time period. During the evening peak, the greatest number of shuttles accessed the station between 6:00-6:30 PM.

Generally, shuttle arrivals and departures are spread throughout the time period, and there are few if any overlaps or simultaneous arrivals. Dwell times for passenger boarding/alighting averaged about three minutes in length. These observations also found that the majority of shuttle vehicles accessing the east side of the station are 40 feet in length or less, and that a relatively small number (approximately 10 percent) of shuttle vehicles are greater than 40 feet in length. Stop locations for the transit and shuttle providers serving Millbrae Station are illustrated in **Figure 19**.

Figure 19: Millbrae Station Transit Stop Locations and Vehicle Access Points



Source: MSASP, PlaceWorks

TRANSIT AND SHUTTLE USAGE

As an intermodal Caltrain/BART station with Caltrain Baby Bullet service, the Millbrae Station provides a key access point for two regional rail systems, and there are a significant number of intermodal transfers. As an intermodal station and the southernmost BART station in San Mateo County, it also provides an optimal shuttle pick-up/drop-off location for many commuter and employer shuttles.

Caltrain, SamTrans and Public Shuttles

Average weekday ridership at the Millbrae Caltrain station is 3,500, which represents about six percent of systemwide ridership. This station has the fifth highest ridership in the system. It also experienced a 7.4 percent growth in riders between 2014 and 2015, as shown in **Table 17**.

According to the 2015 Station Profile Survey, the majority of BART passengers who use another public transit mode to access the Millbrae Station are transferring from Caltrain. For those who responded that they used bus, train or other public transit to access the station (16 percent for home-based origins and 34 percent for non-home-based origins), approximately 80 percent used Caltrain regardless of origin location.

Approximately 18 percent of riders who used public transit to access the Millbrae Station from home used SamTrans. For those who used public transit to access the station from non-home origins, 10 percent used SamTrans.

Transfers between BART and Caltrain

In 2013, Fehr & Peers conducted an intercept survey of Caltrain riders that asked questions about trip origin, destination, and mode of access. Through analysis of these responses, it was estimated that approximately 1,600 riders transfer between BART and Caltrain daily. Each passenger would make two (2) transfers per day: one (1) transfer during the initial trip and one (1) transfer in the opposite direction for the return trip. BART, who estimated a similar number of daily transferring riders, validated this estimate.

Using the 2013 boarding data from BART and Caltrain, about 25 percent of passengers boarding BART at Millbrae transferred from Caltrain, and about 49 percent of Caltrian passengers boarding at Millbrae transferred from BART. Subtracting transfer trips, approximately 4,830 daily BART boardings and approximately 1,655 daily Caltrain boardings had an origin or destination at the Millbrae Station in 2013 (and did not transfer from either BART or Caltrain).[9] **Table 19** summarizes this information.

[9] Millbrae Station Area Specific Plan and Transit-Oriented Development #1 and #2 Draft EIR, p. 4.13-25.

TABLE 19: MILLBRAE STATION DAILY BOARDINGS AND TRANSFERS, 2013

	Non-Transfer	Transfer	Total
BART	4,830	1,600	6,430
Caltrain	1,655	1,600	3,255

Source: MSASP DEIR, p. 4.13-25

Commuter and Employer-Based Shuttles

Based on field observations, commuter and employer shuttles are an important mode of access for Millbrae Station patrons. (The 2015 Station Profile Survey did not specifically ask customers about the use of commuter or employer-based shuttles as a station access mode.) **Table 20** summarizes the observed ridership for all shuttles during the AM and PM peak periods by bus location (westside and eastside) conducted in March 2014. It is important to note that these observations did not determine shuttle riders' connecting modes to the station (e.g., Caltrain, BART, park-and-ride, bike, or walk). Consequently, we do not know how many of these shuttle passengers were transferring to or from BART.

TABLE 20: MILLBRAE STATION SHUTTLE RIDERSHIP, MARCH 2014

Area	Number of Passengers	
	AM Peak (7:00 to 9:00 AM)	PM Peak (4:00 to 6:00 PM)
Boardings		
Westside Bus Transfer Facility	45	45
Eastside Bus Transfer Facility	256	28
Total	***301***	***73***
Alightings		
Westside Bus Transfer Facility	36	16
Eastside Bus Transfer Facility	3	300
Total	***39***	***316***

Source: Fehr & Peers, March 2014. Based on observations.

Pirzadeh & Associates conducted additional data collection in February 2016 for the east side of the station. These results are presented in **Table 21**, which shows the number of shuttle passengers boarding and alighting during morning and evening peaks.

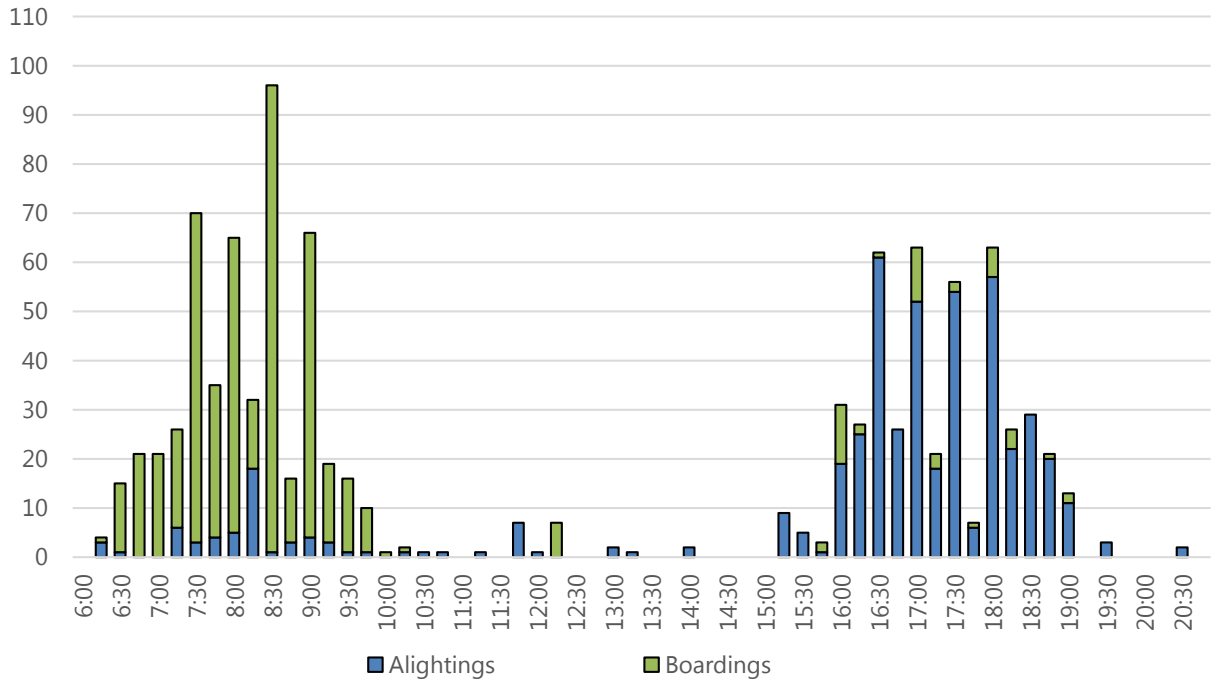
TABLE 21: MILLBRAE STATION SHUTTLE RIDERSHIP, FEBRUARY 2016

Area	Number of Passengers	
	AM Peak (6:30 to 9:30 AM)	PM Peak (4:00 to 7:00 PM)
Boardings		
Eastside Bus Transfer Facility	425	33
Alightings		
Eastside Bus Transfer Facility	46	387

Source: Pirzadeh & Associates, February 2016. Based on observations.

As shown in **Figure 20**, most shuttle passengers arrive at the station in the morning (presumably via BART or Caltrain, although data was not collected on this aspect) and then board shuttles to their final destinations. In the afternoon/evening peak, the opposite situation occurs.

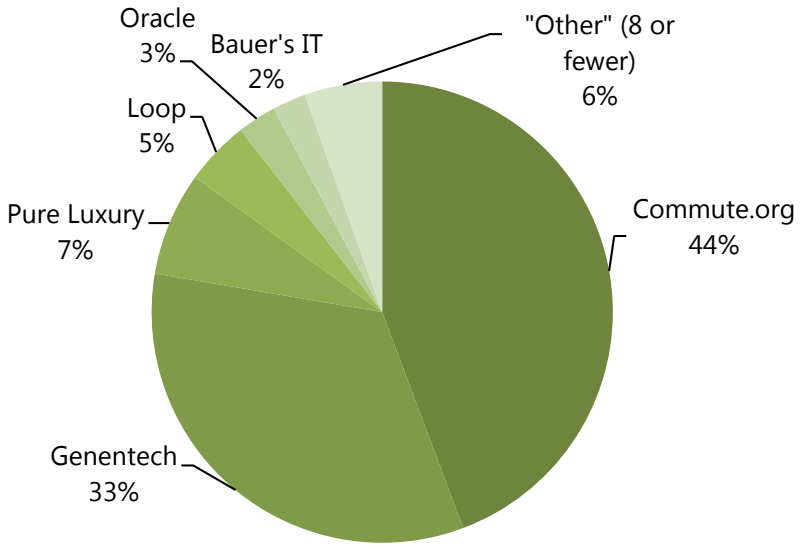
Figure 20: Temporal Distribution of Commuter and Employer Shuttle Alightings and Boardings at Eastside Station Area



Source: Pirzadeh & Associates, February 2016

Figure 21 shows the breakdown of shuttle passengers by type of shuttle. Passengers using Commute.org and Genentech shuttles account for 77 percent of commute and employer shuttle users on the station's east side.

Figure 21: Percent of Commute or Employer Shuttle Passengers by Provider



Source: Pirzadeh & Associates, February 2016

AUTOMOBILE ACCESS

This section provides a description of the existing roadway system providing vehicular access to and from Millbrae Station.

STATION ACCESS

Millbrae Avenue and El Camino Real provide primary automobile access routes to Millbrae Station. Vehicles access the BART-operated parking garage and surface parking lots at the eastside station entrance from Millbrae Avenue via Rollins Road; vehicles access the Caltrain-operated surface parking lots at the westside station entrance from El Camino Real via Linden Avenue and California Drive. Regional access to the Millbrae Station is provided via US-101 to the east and El Camino Real to the west. The station's primary automobile access points are presented in **Figure 19**.

REGIONAL ROADWAY FACILITIES

U.S. Highway 101 (US-101) is an eight-lane freeway located approximately one-third of a mile east of Millbrae Station. US-101 links the Peninsula and the South Bay with San Francisco and the North Bay. US-101 connects to I-280 north of the station via I-380.

El Camino Real (State Route 82) is a major north-south arterial located west of the station that extends from San Francisco to San Jose, providing alternate regional access to the station. Near the station, El Camino Real has six lanes, a median that provides left-turn bays at most intersections, and on-street parking.

LOCAL ROADWAY FACILITIES

Millbrae Avenue is a major east-west arterial that extends from Bayshore Highway to El Camino Real. West of El Camino Real, Millbrae Avenue is a local street until its terminus near Vallejo Drive and I-280. Millbrae Avenue connects residential areas in western Millbrae to El Camino Real and US-101. Millbrae Avenue crosses over and provides a regional connection to US-101 at an interchange east of the station. Millbrae Avenue varies in width from two to six lanes, with six lanes and a median providing left-turn pockets at major intersections near the station.

California Drive is a local north-south street that extends from Millbrae Station to Peninsula Avenue near the City of San Mateo and crosses underneath Millbrae Avenue. Near the station, California Drive has two lanes, left-turn pockets at most intersections, and on-street parking.

Rollins Road is a north-south arterial that extends south from Millbrae Station to Broadway in Burlingame, providing connections to US-101 and El Camino Real via Millbrae Avenue and Broadway for commercial land uses along the corridor. Near the station, Rollins Road has four lanes with on-street parking.

South Station Road is a local one-way southbound street that extends from Millbrae Station two blocks to Adrian Road. South Station Road has two lanes north of Millbrae Avenue and one lane south of Millbrae Avenue.

Existing Intersection Operations

Operations were evaluated at the Millbrae Avenue/El Camino Real and Millbrae Avenue/Rollins Road intersections during the weekday AM and PM peak hours as part of the MSASP EIR. The operating characteristics of intersections are evaluated using the concept of Level of Service ("LOS"). LOS is a qualitative description of driver comfort and convenience. Intersection levels of service range from LOS A, which indicates free flow conditions with short delays, to LOS F, which indicates congested or overloaded vehicle flow conditions with extremely long delays. Typically, LOS A through LOS D is considered acceptable,

and LOS E and LOS F are considered unsatisfactory service levels. The intersections were evaluated using the 2000 *Highway Capacity Manual* (HCM) methodology. For signalized intersections, this methodology determines the capacity for each lane group approaching the intersection. Intersection LOS is based on average delay (in seconds per vehicle) for the various movements within the intersection. A combined weighted average delay and LOS is presented for each intersection. Intersection turning movement counts at the study intersections were collected in March 2014 on a typical weekday.

Intersection operations analysis results are presented in **Table 22**. As shown in the table, both study intersections operate at an acceptable level of service (LOS D or better) during the AM peak hour. During the PM peak hour, Millbrae Avenue/Rollins Road operates at acceptable LOS D while Millbrae Avenue/El Camino Real operates at LOS E due to high turning movement traffic volumes.

TABLE 22: EXISTING INTERSECTION PEAK-HOUR LEVELS OF SERVICE

Intersection	Traffic Control	Peak Hour	Vehicle Delay (seconds)[1]	LOS[2]
Millbrae Avenue/ Rollins Road	Signal	AM	31	C
		PM	37	D
Millbrae Avenue/ El Camino Real[3]	Signal	AM	50	D
		PM	**74**	**E**

Notes:

1. Delay is reported as seconds per vehicle, defined as a combined weighted average delay for the various movements within the intersection.
2. Level of Service (LOS) is based on average intersection delay, calculated according to the methodology in the *Highway Capacity Manual*, 2000.
3. Millbrae Avenue/El Camino Real is a designated intersection in the CMP Roadway System (see CMP Monitoring Report, 2013), and the adopted LOS standard is LOS E.

Bold indicates unacceptable operations per City of Millbrae threshold (LOS D).

Source: Fehr & Peers, 2015.

Future Intersection Operations

As part of the MSASP EIR, future intersection operations were evaluated under Near Term (2020) and Far Term (2040) conditions with traffic generated by the proposed TOD project (analyzed as "TOD Site #2" in the EIR). Near Term conditions include traffic from approved development projects in the area. Far Term conditions are based on projected 2040 land use projections for the area and planned transportation improvements, including the Caltrain upgrade project. The results are presented in **Table 23.** The Millbrae Avenue/El Camino Real intersection operates at LOS E or LOS F under all conditions, while the Millbrae Avenue/Rollins Road intersection operates at LOS D or better under Near Term (2020) conditions but

operates at LOS E under Far Term (2040) conditions. Intersection operations would be further exacerbated with other planned and projected growth in the area.

TABLE 23: INTERSECTION PEAK HOUR LEVELS OF SERVICE – EXISTING, FUTURE WITH TOD AND FUTURE WITHOUT TOD

Intersection	Traffic Control	Peak Hour	Vehicle Delay (seconds)[1]	LOS[2]
Existing (2014) No Project				
Millbrae Avenue/ Rollins Road	Signal	AM	31	C
		PM	37	D
Millbrae Avenue/ El Camino Real[3]	Signal	AM	50	D
		PM	**74**	**E**
Near Term (2020) with TOD				
Millbrae Avenue/ Rollins Road	Signal	AM	37	D
		PM	53	D
Millbrae Avenue/ El Camino Real[3]	Signal	AM	**67**	**E**
		PM	**>80**	**F**
Far Term (2040) with TOD				
Millbrae Avenue/ Rollins Road	Signal	AM	**60**	**E**
		PM	**58**	**E**
Millbrae Avenue/ El Camino Real[3]	Signal	AM	**>80**	**F**
		PM	**>80**	**F**
Far Term (2040) No Project				
Millbrae Avenue/ Rollins Road	Signal	AM	54	D
		PM	48	D
Millbrae Avenue/ El Camino Real[3]	Signal	AM	**75**	**E**
		PM	**>80**	**F**

Notes:

1. Delay is reported as seconds per vehicle, defined as a combined weighted average delay for the various movements within the intersection.
2. Level of Service (LOS) is based on average intersection delay, calculated according to the methodology in the *Highway Capacity Manual*, 2000.

3. Millbrae Avenue/El Camino Real is a designated intersection in the CMP Roadway System (see CMP Monitoring Report, 2013), and the adopted CMP LOS standard is LOS E.

Bold indicates unacceptable operations per City of Millbrae LOS standards (LOS D).

Source: Fehr & Peers, 2015; summarized from Millbrae Station Area Specific Plan Update and Transit-Oriented Development #1 and #2 Draft EIR, pp. 4.13-106 – 4.13-121.

STATION PARKING

This section provides a description of the on-site parking supply and demand at Millbrae Station.

PARKING SUPPLY

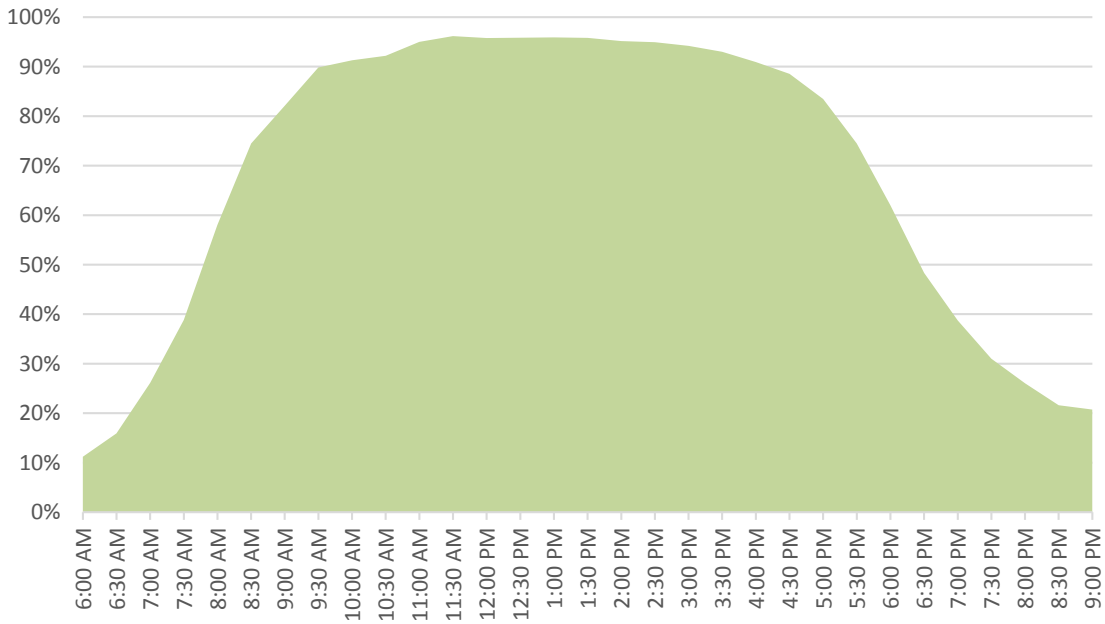
BART provides approximately 2,980 parking spaces at the Millbrae Station. The location and capacity of the parking facilities are shown in **Figure 23**. The proposed TOD project would eliminate 863 surface level BART parking lot spaces, 62 spaces in the parking garage to accommodate kiss-n-ride operations, and provide 392 replacement BART parking spaces, for a total net reduction of 533 BART parking spaces.

BART Daily Parking Facility

PARKING DEMAND

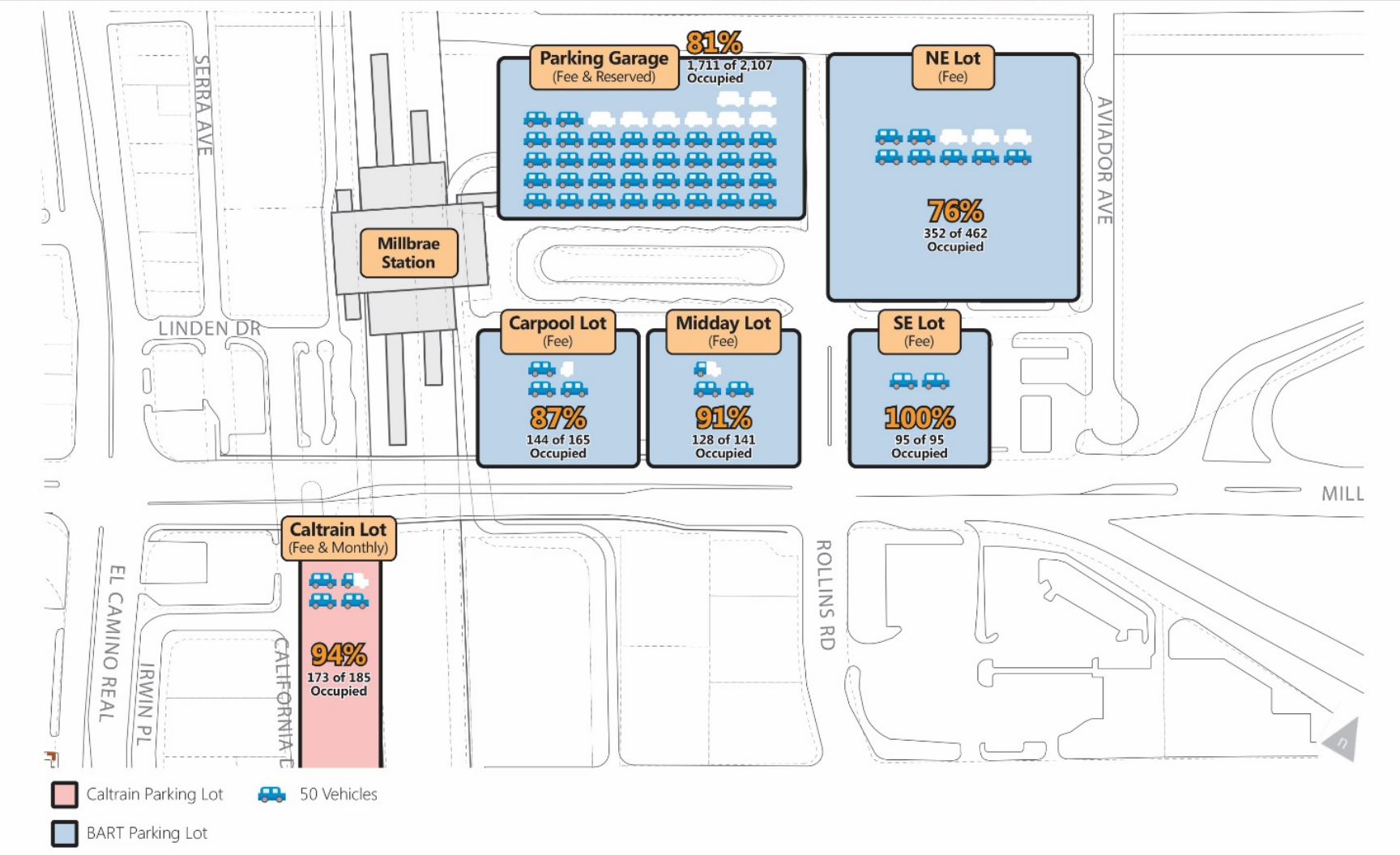
A graph of the results of the parking occupancy counts conducted in February 2016 are shown in **Figure 22**. The parking spaces are 55 to 60 percent full by 8:00 AM on a typical weekday. The spaces reach a peak occupancy of 96 percent around 11:00 AM. Parking facilities are considered full when they reach an occupancy of 85 to 90 percent. At the Millbrae Station, the BART parking spaces are full between 9:30 AM and 5:00 PM.

Figure 22: BART Weekday Parking Occupancy (Total for All Facilities) by Time of Day



Source: Pirzadeh & Associates, data collected on February 10, 2016

Figure 23: Millbrae Station BART Parking Facilities



Source: MSASP, PlaceWorks

TOD TRAVEL AND PARKING DEMAND

Estimated travel demand by mode (i.e., person trip generation), traffic operations at major intersections, and parking demand for the TOD project are summarized below. For more information on the TOD trip generation and intersection operations analysis, see the Transportation and Circulation section of the MSASP Draft EIR (Chapter 4.13.4); for more information on the TOD parking assessment, see Appendix A of this report.

TOD PERSON TRIP GENERATION

Initial trip generation estimates for the TOD site are based on trip generation rates by land use type from the *ITE Trip Generation Manual* (9th Edition), with adjustments to account for trip internalization based on the Fehr & Peers MXD+ methodology, and projected transit ridership. **Table 24** summarizes trip generation by land use and travel mode.

The transit mode share includes BART riders, Caltrain riders, and bus/shuttle riders. Most transit riders would walk from the TOD uses to the Millbrae Station eastside entrance or the bus transfer facilities, thereby increasing the number of pedestrians on the TOD site. These pedestrian trips would be partially offset by the removal of the surface parking lots that currently generate pedestrian trips at the site.

TABLE 24: TOD TRIP GENERATION (PERSON-TRIPS)

Land Use	Daily	AM Peak Hour			PM Peak Hour		
		Vehicle	Transit	Walk/Bike	Vehicle	Transit	Walk/Bike
Residential	2,500	140	45	5	160	40	5
Retail[1]	1,970	80	15	5	110	20	5
Office	1,740	180	55	5	145	45	5
Hotel	1,030	45	20	0	45	20	0
Total	**7,240**	**445**	**135**	**15**	**460**	**125**	**15**

Notes:

1. Based on primarily retail uses. Trip rates would be higher with substantial restaurant uses.

Source: Fehr & Peers, 2016.

TOD PEAK PARKING DEMAND

The MSASP utilizes a shared parking approach to accommodate parking demand in aggregate, rather than assigning parking to specific uses. The proposed TOD project would provide a total of 804 parking spaces (see **Table 25**) plus the additional 392 spaces in the northeast corner surface parking lot, which could be shared between BART and TOD patrons, particularly during evenings and weekends.

TABLE 25: PARKING PROPOSED PER DEVELOPER PARKING PLAN

Land Use	Parking Ratio	Site 5/6 Land Use Amount	Parking Spaces Proposed
Retail/Restaurant	1.88 per 1,000 sf	46,100 sf	87
Office	1.82 per 1,000 sf	157,900 sf	288
Hotel	0.49 per room	126 rooms	62
Residential	0.98 per unit	376 units	367
TOTAL			**804**

Notes: sf = square feet

Source: Republic Millbrae LLC, March 21, 2016

An estimated 914 to 940 spaces may be needed to accommodate peak parking demand at the TOD site during the midday period. (See Appendix A for more information on the TOD parking assessment.) The higher peak parking demand of 940 spaces (which assumes no sharing of parking between land uses during the midday peak period) is summarized in **Table 26**.

While this analysis shows that the proposed TOD project is providing fewer parking spaces than may be needed during times of peak demand, it is important to note that restricted parking (whether through amount or pricing) when combined with other transportation demand management (TDM) measures such as transit incentives and improved transit, biking and walking access can result in a shift to non-automobile modes and reduction in vehicle trips. Building enough parking to accommodate peak demand may provide an incentive for vehicle trips to the site, which is in direct conflict with the MSASP's policy objective to reduce vehicle trips associated with new development.

TABLE 26: TOD PEAK PARKING DEMAND BETWEEN 10AM AND 2PM BY USE

Land Use	Peak Parking Demand (between 10 AM and 2 PM)	Hours of Peak Demand
Retail	43	1 PM
Restaurant	116	12 PM
Office	328	10-11 AM
Hotel	65	10 AM – 12 PM
Residential	388	10 AM – 2 PM
Total Demand	**940**	

Source: Fehr & Peers, 2016

MILLBRAE STATION AREA TRAVEL AND PARKING DEMAND

Projected overall growth and development in the station area will also increase travel to Millbrae Station. Daily BART and Caltrain boardings under Existing and 2040 Cumulative Plus TOD conditions are summarized in **Table 27**. (See Appendix B for a detailed description of this analysis.) Daily ridership on BART and Caltrain (excluding transfers between the two systems) is projected to more than double from 6,485 to 13,310 by 2040 with the buildout of the MSASP.

TABLE 27: MILLBRAE STATION DAILY BART AND CALTRAIN BOARDINGS (EXCLUDING TRANSFERS)

	Existing (2014)	Cumulative (2040) Plus TOD
BART	4,830	7,250
Caltrain	1,655	6,060
TOTAL	6,485	13,310

Notes:

1. Boardings exclude transfers between BART and Caltrain.

Source: Fehr & Peers, 2015

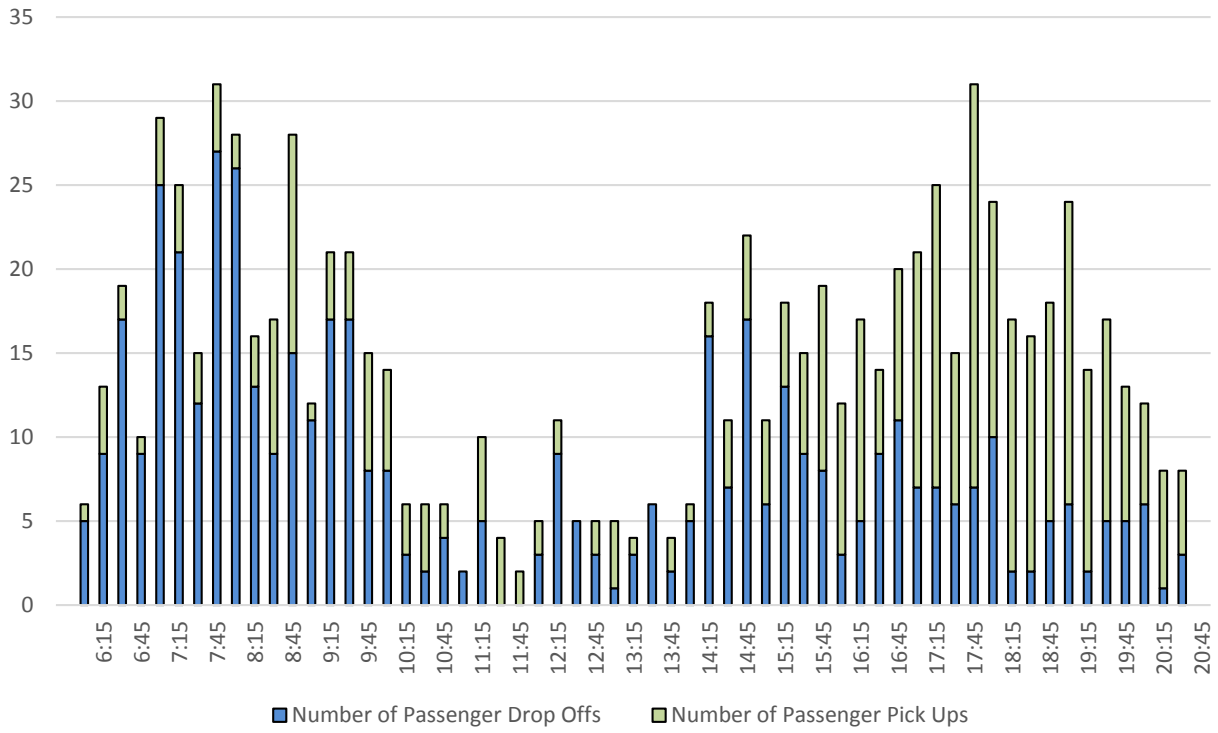
PICK-UP/DROP-OFF ACCESS

Millbrae Station has designated pick-up/drop-off areas on both sides of the station. The eastside pick-up/drop-off area is located along a roadway just south of the bus transfer facility. The westside pick-up/drop-off area is located in a parking zone west of the bus/shuttle transfer facility. Both pick-up/drop-off areas have spaces designated for taxi and kiss-and-ride loading. Given the Millbrae Station design, informal pick-up/drop-off occurs in the ADA loading spaces in the eastside pick-up/drop-off area due to their close proximity to the station entrance.

Eastside Pick-Up/Drop-Off Area

Based on pick-up/drop-off observations conducted at Millbrae Station in March 2014 during the AM peak period (7:00 to 9:00 AM), 268 patrons were dropped off and 33 patrons were picked up at the station's designated areas. During the PM peak period (4:00 to 6:00 PM), 107 patrons were dropped off and 206 patrons were picked up. There were seven observed taxi drop-offs during the AM peak period and 17 taxi pick-ups during the PM peak period. Data collected by Pirzadeh & Associates in February 2016 showed similar amounts of pick up and drop off activity. **Figure 24** shows the pattern and number of passenger drop offs and pick ups for Wednesday, February 10, 2016. The majority of passengers are dropped off during the morning peak, and the majority of passengers are picked up during the evening peak.

Figure 24: Temporal Distribution of Personal Vehicle and Taxi Drop Offs and Pick Ups



Source: Pirzadeh & Associates, February 10, 2016

While the use of the informal pick-up/drop-off area at the eastside station entrance allows patrons the closest access to the station entrance, this informal operation presents a potential safety hazard for pedestrians accessing parking lots south of the pick-up/drop-off area. Based on field observations, personal vehicles frequently entered this informal loading area at a high speed, since the road that provides access to the eastside pick-up/drop-off area is long, straight, and does not have traffic-calming features such as speed bumps. In addition, as mentioned previously, the only painted crosswalk along the roadway is located at the western end, which is not a convenient crossing location for most patrons. As a result, most patrons accessing the station from the southern parking lots cross this road in a variety of locations.

4. GENERAL ACCESS STRATEGIES

This chapter summarizes general strategies to enhance multi-model access within and around Millbrae Station. These strategies incorporate policies from the BART Station Access Guidelines, Caltrain Station Access Policy, and the Millbrae Station Area Specific Plan. They are intended to guide capital investments that may be considered in conjunction with or independent of a specific development project.

PEDESTRIAN ACCESS STRATEGIES

This section presents a menu of strategies to enhance pedestrian access to Millbrae Station, with a particular focus on TOD site improvements. Pedestrian access is defined as a high priority by both the *BART Station Access Guidelines* and *Caltrain Station Access Policy*. The *BART Station Access Guidelines* identify the following key pedestrian access issues:

- Directness and speed of route. Passengers want direct walking routes, with minimum delays when crossing streets.
- Safety and security. Passengers need to perceive that their route is secure and visible to other road users, particularly in the evening. Highway safety is also important, particularly when crossing busy arterials. Overall roadway design issues are discussed in the section below on automobile access.
- Pedestrian-friendly design. Lighting, building setbacks and orientations, and sidewalks are important determinants of whether a pedestrian feels like an "unwelcome guest", or perceives that the street is designed to meet their needs. They should be designed at a "human scale".
- Information. Occasional travelers in particular need wayfinding information to reach local destinations.

A more detailed discussion of these issues as they relate to Millbrae Station is provided below.

Millbrae Station Direct Access

To improve pedestrian access to Millbrae Station, all station entrances and parking areas should connect directly to a sidewalk, eliminating the need for pedestrians to walk through a parking area or a bus loading zone. Station and parking structure pedestrian access points should be located to shorten walking distances.

Sidewalks

The sidewalk network on the periphery of and internal to the TOD site should be continuous, with sidewalks provided on both sides of the street. (The exception to this may be areas where no pedestrian travel is expected due to land use and site configurations.) Sidewalks should be a six to ten feet wide on minor streets and even wider on major roadways like Millbrae Avenue and Rollins Road.

Pedestrian Crossings

All large and small intersection crossings throughout the TOD site, both signalized and uncontrolled, should receive a set of improvements to enhance the safety and convenience of pedestrian access. The following treatments are recommended for all crossings:

- Crosswalks marked on all legs to accommodate pedestrian crossing desires, where feasible.
- Advance stop lines (solid white lines 12 to 24 inches wide) across all approach lanes to indicate where vehicles must stop in compliance with stop sign or signal. Advance stop lines reduce vehicle encroachment into the crosswalk and improve drivers' view of pedestrians.
- Pedestrian signage with fluorescent yellow-green background color installed in advance of crossings to alert drivers to upcoming pedestrian activity.
- Fully accessible, ADA-compliant curb ramps and landings on all corners to provide safe place for people to wait and enter the crosswalk. Two curb ramps per corner to directly align with crosswalks.
- Corner bulb-outs at all feasible corners to shorten pedestrian crossing distance and improve pedestrian visibility.
- Streetlights on all intersection corners to ensure proper illumination.
- Pedestrian refuge islands on roadways with four or more lanes to break up crossing and slow cars, where feasible.
- Audible pedestrian countdown timers installed facing all directions to give notice to both drivers and pedestrians of time remaining on crossing signal (signalized intersections only).
- Signal timings to allow for pedestrian crossing speed of 3.5 feet per second and aimed to minimize pedestrian wait times (signalized intersections only).

Wayfinding & Design

A consistent wayfinding and design strategy should be implemented throughout the TOD site to direct pedestrians to the station entrance and help them reach local destinations easily and comfortably. Signage and street amenities should be oriented towards the pedestrian experience and should include elements

such as pedestrian-scale lighting, street trees, seating and other street furniture, where not already provided. Wayfinding should be provided throughout the TOD site, with a particular focus on Millbrae Station, since directional route signage is essential to facilitate pedestrian access to the station.

BICYCLE ACCESS STRATEGIES

This section presents a menu of strategies to enhance bicycle access to Millbrae Station, with a particular focus on TOD site improvements. Bicycle access is defined as a moderate priority by both the *BART Station Access Guidelines* and *Caltrain Station Access Policy*. The *BART Station Access Guidelines* identify the following key bicycle access issues:

- Access. Bicyclists need to know the most direct, safest route to and from the BART station, and must be able to quickly locate parking areas.
- Convenient, Available Parking. Sufficient bicycle parking to meet demand should be located near the station entrance within sight of the station agent and/or in a heavily traveled area. There should be no barriers between the bicycle parking and the station entrance. In order to encourage casual cycling, it is important that bicycle parking be available without prior reservations.
- Secure, Sheltered Parking. Passengers should be confident that a bicycle left at a BART station will not be stolen, vandalized or exposed to the rain, even if it is left for 10 hours or more.

A more detailed discussion of these issues as they relate to Millbrae Station is provided below.

Millbrae Station Direct Access

To improve bicycle access to Millbrae Station, all station entrances should connect directly to a bicycle facility, eliminating the need for bicyclists to ride through a parking area, a bus loading zone, or a pedestrian zone. Stair channels should be provided to allow riders to wheel their bicycles up and down all stairways, and elevators large enough to accommodate a bicycle should also be located in a central location. Designated bicycle routes through the transit center should aim to minimize conflicts between bicyclists and pedestrians, autos, and buses.

Bicycle Facilities

The TOD site should have a diverse network of on-street and off-street bicycle facilities, including Class I bicycle paths and Class III marked bicycle routes. Class II bicycle lanes are not recommended on the site due to roadway width constraints, and shared lane markings should be used instead to indicate these streets as bicycle routes.

Intersections

Controlled crossings at major intersection (e.g., Rollins Road and Millbrae Avenue) should receive a set of improvements to enhance the safety and convenience of bicycle access. These treatments help reduce conflict between bicyclists and vehicles by heightening the level of visibility and denoting a clear right-of-way.

Intersection crossing markings indicate the intended path of bicyclists and are used to guide bicyclists on a safe and direct path through signalized intersections. They provide a clear boundary between the paths of through bicyclists and either through or crossing motor vehicles in the adjacent lane. Striped dotted lines bind the bicycle crossing space, and chevrons and/or colored pavement may be used for increased visibility across intersections. Intersection crossing markings are recommended at the intersection of Rollins Road and Millbrae Avenue.

Bicycle detection is used at actuated signals to alert the signal controller of bicycle crossing demand on a particular approach. Proper bicycle detection meets two primary criteria: 1) accurately detects bicyclists; and 2) provides clear guidance to bicyclists on how to actuate detection (e.g., what button to push, where to stand). Bicycle detection would be recommended where approaches, including left-turn lanes, require actuation. Bicycle detection can occur through a number of strategies, including:

- Push-button - user-activated button mounted on a pole facing the street
- In-pavement loops - induction loop embedded in the pavement, calibrated to detect bicycle metallic mass
- Video - video detection aimed at bicyclist approaches and calibrated to detect bicyclists
- Microwave - miniature microwave radar that picks up non-background targets

Bicycle Parking

Secure and sheltered bicycle parking should be provided throughout the TOD site to provide reassurance that if someone bicycles to his or her destination, the bicycle will not be stolen, vandalized, or exposed to the elements. Class I bicycle lockers and Class II bicycle racks should be provided at entrances to Millbrae Station to accommodate both long-term commuter parking and short-term trip parking. All new developments on the site should be required to construct bicycle lockers or storage rooms at a convenient location within the building for residents and/or employees. Outdoor bicycle racks should also be provided near all building entrances.

Wayfinding & Design

A consistent wayfinding and design strategy should be implemented across the TOD site to help bicyclists determine the most direct and safest routes, as well as quickly identify bicycle parking areas. Wayfinding should be provided through on-site signage and web-available maps, focused particularly on guiding bicyclists into and out of Millbrae Station. Directional route signage is essential to facilitate bicycle access to the station.

TRANSIT ACCESS STRATEGIES

This section presents a menu of strategies to enhance transit access to Millbrae Station, with a particular focus on TOD site improvements. Transit access is defined as a high priority by both the *BART Station Access Guidelines* and *Caltrain Station Access Policy*. The *BART Station Access Guidelines* identify the following key transit access issues:

- Minimal and predictable wait times between modes. Passengers tend to consider time spent waiting for a bus or train as more burdensome than time actually spent traveling. Giving passengers real-time information about bus, BART and connecting rail arrival times helps alleviate this burden.
- Short walk distances and safe, direct routes between the BART platform and connecting services.
- Coordinated ticketing that avoids the inconvenience and cost penalty of purchasing separate tickets.
- Staff members who are knowledgeable about all transit services from a station, regardless of which agency provides them.
- Secure, comfortable environment at the bus or streetcar stop or rail platform. This is one of the most important components of the station as this is where the passengers spend a considerable portion of their time. Passengers need to clearly know where they can stand safely.

A more detailed discussion of these issues as they relate to Millbrae Station is provided below.

Millbrae Station Direct Access

Millbrae Station is the focal point of transit in the TOD site, currently serving BART and Caltrain. There are no planned changes to the station footprint; however, improvements to station area wayfinding and directional signage are strongly recommended to improve user access. Improving Caltrain directional signage at the station entrance, BART signage on the platforms, and bicycle parking signage throughout the station will make for an easier rider experience.

Shuttles

The San Francisco Bay Area has witnessed significant growth in shuttle operations in recent years. The increase has been especially pronounced with private employer shuttles that provide direct service to employment sites from residential neighborhood stops or from major transit hubs, including Millbrae Station. Considering this growing demand for "last mile" connections from regional transit hubs, sufficient shuttle facilities should be provided in the TOD site.

Recommended dimensions for consecutive bus loading zones are based on VTA design criteria. They include a standard lane width of 12 feet for circulation and a 10-foot-wide loading zone. If a sawtooth design is feasible, these dimensions may be reduced.

- Clearance between loading zones = 20'
- Minimum 20' approach/departure clearance
    - 50' minimum if duckout
- Loading zones by vehicle type/length:
    - 45' loading zone for 30' and smaller vehicles
    - 50' loading zone for 31-35' vehicles
    - 55' loading zone for 40' transit buses (or >35' vehicles)
    - 60' loading zone for 45' over-the-road coaches

Fixed Route Bus Service

The TOD site is served by only one fixed route bus line: Route 397. Route 397 is an owl (late-night) service that stops currently stops at the existing eastside transit center. The eastside transit facility should continue to accommodate its operation; the late-night service span will not conflict with any shuttle activity.

Stop Enhancements

Enhanced stops are a key feature for improving rubber-tire access in the TOD site. Amenities can range from simple and elegant stylized shelters to more elaborate rail-like stations with high platforms and large seated waiting areas. Other amenities include better lighting, sheltered waiting areas, and real-time passenger information. Enhanced stops are recommended at all bus loading areas in the TOD site, including one three-seat bench, a 66-foot canopy structure, a new concrete platform or removal and replacement of the existing concrete platform, real-time passenger information display, map or advertising display cases, windscreens, lighting, signage, and electrical and PG&E service.

ROADWAY ACCESS STRATEGIES

This section presents a menu of strategies to enhance automobile access to Millbrae Station, with a particular focus on TOD site improvements. Automobile access is defined as a low priority by both the *BART Station Access Guidelines* and *Caltrain Station Access Policy*.

With respect to kiss-and-ride, the *BART Station Access Guidelines* identify the following key vehicle access issues:

- The key constraint to increasing the share of drop-off/pick-up trips is the need for satisfactory conditions in households, i.e., the availability of a driver to make a dedicated trip to the station, or pass the station en route to another destination.
- Curb space is also a constraint to accommodating drop-off/pick-up trips. While space needs to drop off passengers in the morning peak are minimal, cars generally need space to wait for their passengers to arrive in the afternoon peak. At many stations, these lines of waiting cars are considerable. If space is not provided for pick-up vehicles to pull out of traffic and safely stop, they can also disrupt traffic flow and delay other vehicles. This is a particular issue for buses, and bus stops frequently are used informally as drop-off areas.

Within and adjacent to the TOD site, roadways would be reconfigured and added, and intersections would be modified. These improvements should complement pedestrian, bicycle and transit improvements in order to safely, effectively, and efficiently accommodate all modes through the site. Vehicle access should not impede other priority modes such as walking, biking, and transit.

PARKING ACCESS STRATEGIES

This section presents strategies to enhance parking access to Millbrae Station, with a particular focus on TOD site improvements. Parking access is defined as a low priority by both the *BART Station Access Guidelines* and *Caltrain Station Access Policy*. The *BART Station Access Guidelines* identify the following key transit access issues:

- Ability to find a space. Drivers want to be able to find a space without spending considerable time driving in search of space either in a lot or on station area streets. Real-time information about parking space availability – and alternative parking locations – would be particularly valuable to motorists.
- Moderate travel time approaching station. Passengers do not want to their commute times lengthened by congestion on streets approaching BART stations.

- Safety and security. For driving BART passengers, this has three elements: those driving to stations and parking spaces should feel safe from the threat of vehicle accidents; drivers want to feel safe moving from their car to the faregate; and drivers should feel that their property is secure while parked in the station area.
- Comfortable as a pedestrian. Drivers must eventually become pedestrians to access the station.

Millbrae Station should clearly delineate parking for BART from other uses through the use of wayfinding and parking signage. Time limits should be enforced for publicly-accessible parking to discourage use by BART riders. Access to parking should not impede other priority modes such as walking, biking, and transit.

5. STATION ACCESS IMPROVEMENTS

The proposed TOD project and other planned development in the area would increase the number of people walking, bicycling, taking transit, and driving to and through the area east of Milllbrae Station. BART ridership at the Millbrae Station has grown significantly since the station's opening in 2003, with an average of over 7,000 weekday boardings in early 2016. In conjunction with this ridership growth, there has been a major shift in how passengers access the station, with a significant increase in the proportion of riders walking or using drop-off/taxi, and a decrease in the percentage of riders who drive and park or take transit (see Chapter 3 for a complete discussion of data on ridership and access modes). Given the changes in land use and circulation patterns in and around the station area as well as in the greater Bay Area, it is likely that this trend will continue into the future, with an even greater share of riders relying on walking, biking, shuttles, and drop-off/pick-up.

With this increase in activity and change in access modes that further reduces the park-and-ride demand at the station, it is important that the on-site transportation facilities and external transportation facilities providing direct access to the site are designed to accommodate the projected volumes and to be safe, attractive, convenient, and easily navigable, especially by foot and bicycle. Furthermore, the *BART Station Access Guidelines* designate walking, transit, and bicycling as primary modes of access, and they deemphasize the role of automobile access and parking.

The station access improvements listed in this chapter focus on the TOD site itself and are expected to be implemented in conjunction with the TOD development. They were developed in close coordination and consultation with BART, the TOD site developer, and local area partners, including the City of Millbrae, Caltrain, SamTrans, California High Speed Rail Authority, SFO, Silicon Valley Bicycle Coalition, San Francisco Bay Trail, C/CAG, and commute.org. They were also developed in response to the findings from significant data collection and analysis undertaken in 2014, 2015 and 2016 as part of the MSASP and site development planning and engineering.

This Plan and its access recommendations fulfills the requirements of Millbrae Station Area Specific Plan (MSASP) Circulation and Parking Policy P-CP 31 which requires project applicants within the TOD zones identified by the MSASP to "…submit a plan of how multi-modal access and circulation to the transit station will be accomplished." A separate, more comprehensive plan that addresses multi-modal station access improvements for both the east and west sides and for both the near and far terms will be conducted in the future. The mandate for this Plan was created in MSASP Circulation and Parking Policy P-CP 31. This policy also states that "In the event the access plan is not complete at the time of application for projects within the TOD zone, applicants shall submit a plan of how multi-modal access and circulation to the transit

station will be accomplished." Given that a comprehensive, multi-agency, multi-modal access plan has not yet been completed, this Plan fulfills the requirements of P-CP 31 by providing an access plan for the proposed TOD project on the BART property located on the east side of the station.

While the access improvements described in this Plan are near-term improvements (to be implemented in conjunction with the proposed TOD project) that address eastside station access, this chapter also summarizes the broader, longer term improvements identified in the recently adopted MSASP. Although these longer term improvements are beyond the scope of this Plan, they are included for the following reasons:

- To explain how the near-term improvements will integrate with future, more comprehensive station access improvements;
- To identify the future conditions under which these longer-term improvements are likely to be needed and how circulation and access conditions on the TOD site may change; and
- To generally identify the key public and private partners that will be needed to plan, design, fund, and eventually construct these longer term improvements.

SUMMARY OF ACCESS CONSTRAINTS AND ISSUES

As summarized in the earlier chapters of this Plan, the Millbrae Station is a highly constrained site, bordered by major roadways to the west, south and east, and the Highline Canal to the north. The at-grade BART and Caltrain tracks also present a significant constraint in terms of station access and circulation. Further exacerbating these conditions is the fact that development on the eastern portion of the site is restricted by a PG&E utility easement and its proximity to runways at SFO (approximately three acres).

Currently, station access and design is oriented toward vehicle and shuttle access, with most if not all of the station area occupied by multi-lane roadways, surface and structured parking, bus bays, and taxi and other passenger drop-off areas. Both BART and the City of Millbrae have adopted goals of transforming the Millbrae Station area into a multi-modal, mixed-use neighborhood. The introduction to the Circulation and Parking chapter of the MSASP framed the issue best:

> *Rather than treating the Millbrae Station as a single purpose transportation facility oriented to park-and-ride and shuttle access, the Specific Plan sets a strong vision for the redevelopment of adjacent sites in a manner that will better integrate the Millbrae Station into the surrounding residential and commercial activity.*

Although there is consensus on the future vision for the Millbrae Station, articulating the realization of that vision has been much more challenging. There will continue to be significant vehicle, shuttle, and transit access and circulation needs within and around the station area. Millbrae Station is also a planned High-Speed Rail Station, which will bring additional access and circulation needs to the site (primarily on the west side of the station). These facts, combined with the significant constraints present on the site, have made accommodating both future development and access needs a challenge that has required both significant data collection and analysis and compromise to overcome.

The following sections describe the access improvements that will be implemented in conjunction with the proposed TOD project and explain how these improvements address the access challenges and issues that have arisen throughout the process. In some cases, particular access issues and challenges will need to be addressed as part of the future comprehensive, multi-agency, multi-modal access plan because they are outside the scope of this Plan and the TOD project. To the extent that improvements identified in the MSASP address these broader issues, they are included and discussed with the near-term access improvements that are the focus of this Plan.

ACCESS IMPROVEMENTS

This Plan focuses on identifying access and circulation changes related to the proposed TOD project on BART property. A broad range of stakeholders has worked with BART since 2013 to develop the approach for the TOD project and to consider how broader land use and infrastructure changes within and around the station area affect the TOD project site plan and vice versa. However, the relatively short timeline for this TOD project requires that some of these issues, such as the future High Speed Rail alignment or Caltrain electrification project, be resolved as part of a future, comprehensive, multi-modal station access planning effort. As identified in the MSASP (P-CP 31), the City of Millbrae will lead this comprehensive, multi-modal access planning effort to address both longer term and broader access issues related to Millbrae Station.

Consequently, the access improvements are organized by tiers that reflect their priority and readiness for implementation. Following is an overview of the tier structure.

Tier One improvements are to be made in conjunction with the TOD project development and are the focus of this Plan. They provide for the access needs of BART and Caltrain through 2040. The Tier One improvements were developed based on the data and analysis from the Millbrae Station Area Specific Plan (MSASP) EIR, and they are consistent with the findings and transportation mitigations determined in the EIR. They are to be implemented within the next three to five years and would be completed in conjunction with the development of BART property on the east side of the station.

Tier Two improvements provide further access enhancements, but are not critical to providing adequate station access for BART and Caltrain through 2040, including construction of the TOD project on the east side of the station. BART will provide necessary staff time and consideration of matching funds for the development and implementation of BART-related Tier 2 improvements. BART will maintain a proactive role in continuing to work with the City and other partners in advancing Tier 2 improvements. Further developing and defining the scope and implementation strategy for Tier Two improvements should be a focus of the future comprehensive, multi-agency, multi-modal access plan to be led by the City of Millbrae. Many of these improvements are included as concepts in the MSASP, and relevant figures from the MSASP are included in this chapter.

PEDESTRIAN ACCESS IMPROVEMENTS

The site plan for the proposed TOD project includes multiple pedestrian circulation improvements, as shown in **Figure 25**. Development would be focused around Garden Lane Paseo, a pedestrian promenade that connects the station entrance to Rollins Road and Aviador Avenue. A public gathering space or plaza would be featured at the end of Garden Lane Paseo near the station entrance. The site plan includes continuous wide sidewalks throughout much of the plan area with pedestrian crossings at many of the intersections.

A new Class I multi-use path would be constructed from the intersection of Aviador Avenue and Garden Lane East to a planned City of Millbrae Pedestrian/Bicycle overcrossing of US-101 connecting to the Bay Trail that runs along the shoreline south of Millbrae Avenue. A two-way bicycle/pedestrian path along the north side of Garden Lane East behind the planned bus stop will connect the new pathway and eventual US-101 overcrossing to the Garden Lane Paseo and station entrance.

The TOD project will maintain all existing pedestrian connections from the east side of the station to other locations within the City of Millbrae. Currently, pedestrians can travel via existing sidewalks to locations north, south, east and west of the station area via Millbrae Avenue, Rollins Road, South Station Road, and Aviador Avenue.

Tier One improvements are described below and their locations are shown on **Figure 25**.

Tier One

1. Add wayfinding signage to direct pedestrians through the station to connect the east side with the west side.

2. Add a crosswalk across Rollins Road connecting the hotel site with the sidewalk and shuttle bus transit stops on the south side of the existing BART parking garage.

3. Install an intersection treatment at Rollins Road and Garden Lane East that balances the need to provide safe, comfortable and direct pedestrian and bicycle access across Rollins Road at Garden Lane East with the need to prevent excessive vehicle queueing on Rollins Road and Millbrae Avenue.

   The final intersection treatment will be developed based on the results of an updated microsimulation analysis that will be conducted by the TOD project developer as part of the signal redesign for the intersection of Millbrae Avenue and Rollins Road. (See Appendix C for a report on the original microsimulation analysis for Rollins Road.) The output of the microsimulation will inform the signal design and crossing treatments used at both Rollins Road and Garden Lane, as well as at the intersection of Millbrae Avenue and Rollins Road in order to ensure safe conditions for all users. BART and the developer will work closely with the City on designing and implementing an intersection control that creates a safe, inviting crossing for pedestrians and bicyclists, and ensures motorist safety by preventing the potential for excessive queueing.

4. Add enhanced pedestrian crossing treatments to on-site intersections to include continental or ladder crosswalk striping, signage, advance stop bars, shark teeth, and other treatments to improve pedestrian visibility and comfort.

5. Install a Class 1 multi-use path along the east side of Aviador Avenue to provide a Bay Trail segment (minimum pathway width is 2.4 meters with 0.6 meter clearance on either side per the California *Highway Design Manual*).

6. Construct a two-way bicycle/pedestrian path along the north side of Garden Lane East behind the planned bus stop.

7. Add wayfinding signage to provide direction from the development to El Camino Real, Downtown Millbrae, and other local destinations per the direction and policies in the MSASP.

Figure 25: Pedestrian Access Improvements

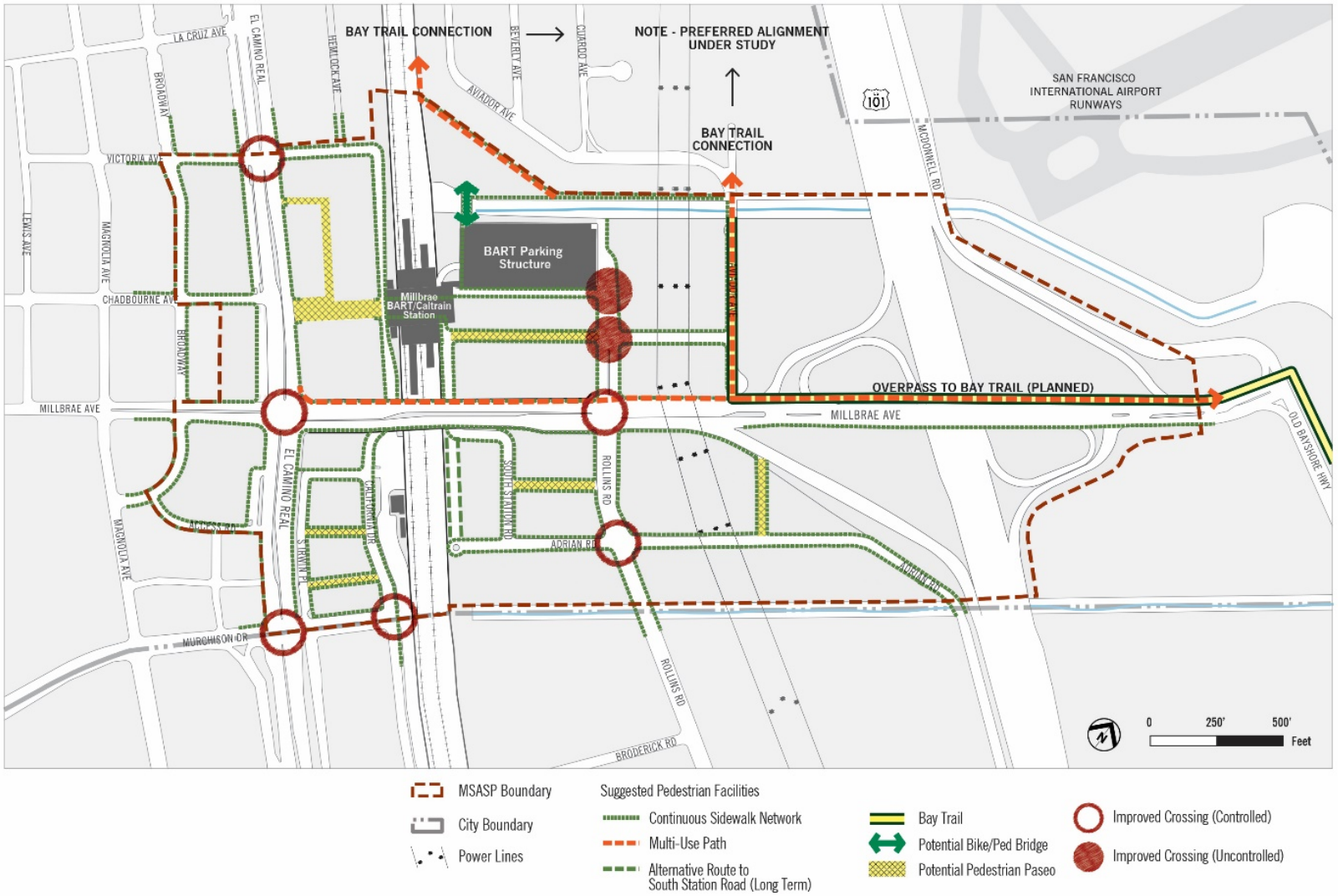
Source: HMH & Republic Millbrae LLC

Tier Two

The following Tier Two improvements are included in the MSASP Pedestrian Circulation Concept, shown in **Figure 26**. All of these improvements are outside of BART property (with the exception of additional vertical circulation improvements at the station). Consequently, their implementation will require coordination between the City of Millbrae, C/CAG, Caltrans, and individual property owners. BART will provide necessary staff time and consideration of matching funds for the development and implementation of BART-related Tier Two improvements. BART will maintain a proactive role in continuing to work with the City and other partners in advancing these improvements.

1. If future increases in pedestrian volumes due to the addition of High Speed Rail service warrants additional access to the concourse level, consider adding station escalators, elevator, and stairs near shuttle bus turnaround on East Station Road to accommodate increased shuttle rider volumes generated by High Speed Rail riders. This improvement is tied directly to potential growth in rail passenger ridership from the addition of High Speed Rail service and the need for safe and efficient vertical circulation from the at-grade shuttle boarding/alighting area to the elevated station concourse.
2. Narrow lanes on Millbrae Avenue and add 10-foot wide pedestrian refuge on west leg of Rollins Road intersection to facilitate north-south connections.
3. Eliminate one of the westbound left-turn lanes on Millbrae Avenue at El Camino Real and create a pedestrian refuge to facilitate north-south connections.
4. Add a painted curb extension on the east side of El Camino Real north of Millbrae Avenue to provide more separation between pedestrians and northbound traffic as an interim improvement. Narrow this segment of El Camino Real concurrently with redevelopment of adjacent property.
5. Add Class 1 multi-use path along north side of Millbrae Avenue with well-designed crossings at Rollins Road and at the existing gas station.
6. Construct Class 1 overpass over US 101 to provide a Bay Trail connection.
7. Construct a bridge over the canal to the north of the parking structure and a Class I multi-use pathway on the north side of the canal to provide a Bay Trail connection.
8. Implement pedestrian improvements in the greater station area to be identified as part of the future multi-modal, multi-agency station access plan.

Figure 26: MSASP Pedestrian Circulation Concept



Source: MSASP, PlaceWorks

BICYCLE ACCESS IMPROVEMENTS

The site plan for the proposed TOD project includes several improvements to bicycle circulation. As discussed previously, a new Class I multi-use path would be constructed from the intersection of Aviador Avenue and Garden Lane East to a planned City of Millbrae Pedestrian/Bicycle overcrossing of US-101 connecting to the Bay Trail that runs along the shoreline south of Millbrae Avenue. This facility will become part of the Bay Trail. A new Class I multi-use pathway will be constructed adjacent to Aviador Avenue to complete the Bay Trail route by connecting to a planned Bay Trail extension north of the project site that will continue past the airport.

Bicycles through the TOD site would travel along a new two-way bicycle/pedestrian path along the north (westbound) side of Garden Lane East. In addition, sharrows will be installed on Garden Lane (eastbound), Rollins Road (both directions) and Garden Lane Paseo (both directions). The Garden Lane Paseo (west of the cul de sac) would serve as a shared bicycle and pedestrian facility providing direct access to the Millbrae Station eastside entrance.

Bicycle racks and bicycle storage facilities will be provided as a project design feature for all land uses within the project site. Retrofitted bicycle parking would be installed in the current station parking structure; staple style bicycle racks would be installed at the western terminus of the Garden Lane Paseo; secure bicycle parking (likely a bike room or bike cages) would be located in the Site 5A and Site 5B parking garages; BART bike lockers would be placed at the station plaza; and bike lockers would be placed in the Site 5B parking garage.

Figure 27 shows the bicycle access improvements that will be incorporated in to the TOD project and the eastside station entrance. These Tier One improvements are detailed below.

1. Add wayfinding signage to direct bicyclists through the station to connect the west side with the east side.
2. Install a Class 1 multi-use path along east side of Aviador Avenue to provide a Bay Trail segment.
3. Provide treatments to facilitate bicycle transitions to and from the proposed Class I multi-use path at the intersection of Aviador Avenue and Garden Lane East, including wide curb ramps, pavement markings, and clear signage.
4. Construct a two-way bicycle/pedestrian path along the north side of Garden Lane East behind the planned bus stop.

5. Add Class 3 bike route striping (sharrows) and signage on the eastbound direction of Garden Lane East, and on Garden Lane Paseo and Rollins Road (north of Millbrae Avenue) in both directions.

6. Install an intersection treatment at Rollins Road and Garden Lane East that balances the need to provide safe, comfortable and direct pedestrian and bicycle access across Rollins Road at Garden Lane East with the need to prevent excessive vehicle queueing on Rollins Road and Millbrae Avenue.

   The final intersection treatment will be developed based on the results of an updated microsimulation analysis that will be conducted by the TOD project developer as part of the signal redesign for the intersection of Millbrae Avenue and Rollins Road. (See Appendix C for a report on the original microsimulation analysis for Rollins Road.) The output of the microsimulation will inform the signal design and crossing treatments used at both Rollins Road and Garden Lane, as well as at the intersection of Millbrae Avenue and Rollins Road in order to ensure safe conditions for all users. BART and the developer will work closely with the City on designing and implementing an intersection control that creates a safe, inviting crossing for pedestrians and bicyclists, and ensures motorist safety by preventing the potential for excessive queueing.

7. Add bicycle facilities within the existing right-of-way of South Station Road within the project site to facilitate connection to a future bicycle facility on South Station Road south of Millbrae Avenue. This could include either Class 3 bike route striping (sharrows) and signage or a Class 2 bicycle lane in the southbound direction and a contra-flow Class 2 bicycle lane in the northbound direction.

The following Tier One improvements occur outside of the TOD project boundaries within the City of Millbrae's public right-of-way. Consequently, the City will be responsible for designing and restriping the roadway in order to implement these improvements.

8. Add Class 3 bike route striping (sharrows) and signage on Rollins Road between Millbrae Avenue and Adrian Road in both directions.

9. Add bike lanes on southbound Rollins Road between Adrian Road and Broderick Road. This bike lane will connect with the southbound bike lane already installed on the portion of Rollins Road south of Broderick Road located within the City of Burlingame.

Figure 27: Bicycle Access Improvements

Source: HMH & Republic Millbrae LLC

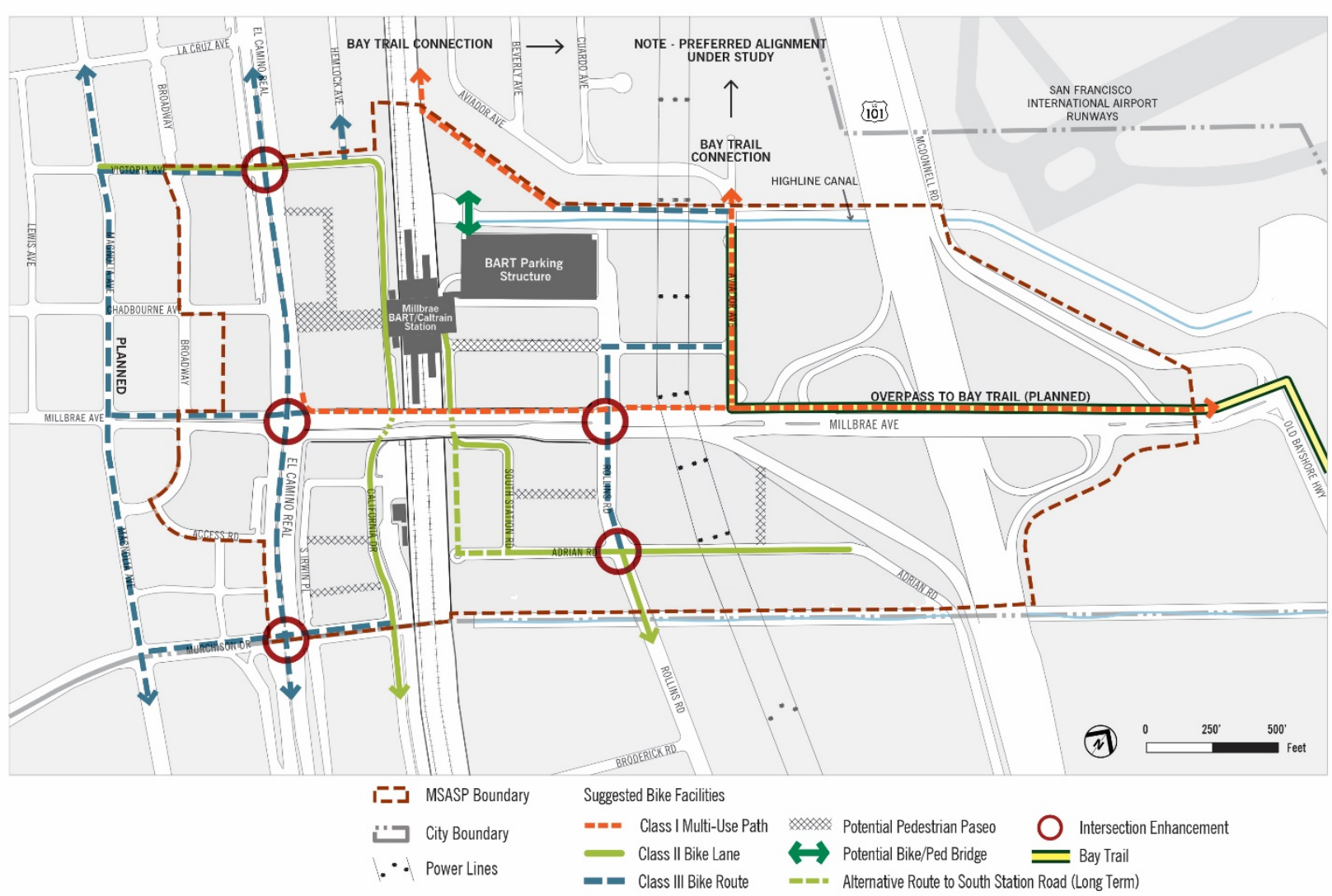
Tier Two

The following Tier Two improvements are included in the MSASP Bicycle Circulation Concept, shown in **Figure 28**. All of these improvements are outside of BART property. Consequently, their implementation will require coordination between the City of Millbrae, C/CAG, Caltrans, and individual property owners. BART will provide necessary staff time and consideration of matching funds for the development and implementation of BART-related Tier Two improvements. BART will maintain a proactive role in continuing to work with the City and other partners in advancing these improvements.

1. Add a Class 1 multi-use path along north side of Millbrae Avenue with well-designed crossings Rollins Road and at the gas station. Potential contra-flow options should be considered to facilitate bi-directional bicycle travel along the north side of the roadway.
2. Construct Class 1 multi-use path overpass over US 101 to provide a Bay Trail connection.
3. Consider constructing a bridge over the canal to the north of the parking structure and a Class I multi-use pathway on north side of the canal to provide a Bay Trail connection. This improvement was not considered in the MSASP, however it would provide more direct access to the eastside station entrance from the north than the currently proposed pathway alignment along Aviador Avenue.
4. Add bike lanes to widened and realigned South Station Road. The realignment would occur in concert with redevelopment of the parcels adjacent to South Station Road south of Millbrae Avenue. Bike lanes should continue underneath Millbrae Avenue to the eastside BART station entrance.
5. Add bike lanes to Adrian Road.
6. Create a bicycle connection from the east side to downtown via a Class III bike route on Aviador Avenue and Hillcrest Boulevard.
7. Provide bicycle safety improvements across Rollins Road, such as marked crossings, signage, and other treatments to improve bicyclist visibility and comfort.
8. Implement bicycle improvements in the greater station area to be identified as part of the multi-modal, multi-agency station access plan, including those referenced in the MSASP:
    - Add bike lanes to California Drive to create a primary north-south bicycle access route connecting to the west entrance of Millbrae station.
    - Add sharrows to El Camino Real and Victoria Avenue west of El Camino Real to indicate these streets as bicycle routes with the intention of striping bicycle lanes once the right-of-way is provided in the future. If striped on El Camino Real, a vehicle high-speed and high-volume roadway, bicycle lanes should be located adjacent to the curb and consist of

a four-foot bicycle lane with a three-foot striped buffer between the bicycle lane and motor vehicle travel lane to enhance bicyclist separation from vehicle traffic.

Figure 28: MSASP Bicycle Circulation Concept



Source: MSASP, PlaceWorks

TRANSIT ACCESS IMPROVEMENTS

The TOD site will accommodate both current and future levels of public and private shuttle service by providing up to eight bus bays on the east side of the station. The MSASP EIR analyzed current and future ridership and access needs for both BART and Caltrain through 2040. The EIR analyzed access needs for both the east and west sides of the station and determined that a total of seven bus bays were recommended for a redesigned transit center on the east side of the station to accommodate current and future shuttle activity.[10]

Transit and shuttle access improvements are shown in **Figure 29**. Shuttles would enter the site on Rollins Road and stop at one of two locations: smaller shuttles and buses (up to 40 feet in length) would stage at one of four bus bays on East Station Road adjacent to the BART parking garage. Shuttles accessing East Station Road would pick up and drop off passengers along the roadway and turn around at the western end of the roadway near the station entrance to exit via the same entry point at Rollins Road.

Larger shuttle and transit vehicles (vehicles longer than 40 feet) would drop off and pick up passengers on southbound Rollins Road between East Station Road and Garden Lane Paseo (two bus bays) and at the bus transfer facility on Garden Lane East (two bus bays). Shuttles stopping on southbound Rollins Road would enter the eastside station area via northbound Rollins Road and turn around at the north end of Rollins Road (at the northern edge of the station area) to access the stops on the southbound side of the roadway. Shuttles stopping on Garden Lane East would enter the eastside station area via northbound Rollins Road, turn right at the end of Rollins Road and circle clockwise around the parking lot to Aviador Avenue to Garden Lane East.

Six of the eight shuttle and transit stop locations are located west of Rollins Road, and the majority of boarding and alighting areas are located immediately adjacent to the eastside station entrance along East Station Road. These stop locations maximize shuttle and transit passenger direct access to the station entrance and minimize the number of pedestrians crossing Rollins Road at Garden Lane East.

To maximize available curb space for passenger boarding and alighting, shuttle and transit vehicles would not be allowed to layover in any of the staging areas along East Station Road, Rollins Road, or Garden Lane East. All transit and shuttle layovers would occur along southbound Aviador Avenue north of Garden Lane East. **Table 28** summarizes the shuttle and transit vehicle capacity that will be provided within the TOD project site.

[10] Millbrae Station Area Specific Plan Update and Transit-Oriented Development #1 and #2 Draft EIR, p. 4.13-71.

TABLE 28: SUMMARY OF SHUTTLE/TRANSIT CAPACITY WITH TOD PROJECT

Shuttle/Transit Stop Location	Number of Bus Bays	Average Estimated Dwell Time	Vehicle Capacity per 15 minutes
East Station Road (vehicles up to 40')	4	5 minutes	12
Southbound Rollins Road (vehicles greater than 40')	2	5 minutes	6
Garden Lane East (vehicles greater than 40')	2	5 minutes	6
Aviador Avenue Layover Area	Up to 4, depending on size	Not Applicable	Not Applicable

Shuttle and Transit Vehicle Capacity

The proposed site plan provides eight bus bays, which is enough to accommodate both existing and projected future shuttle activity for both BART and Caltrain access. The MSASP EIR analyzed current and future ridership and access needs for both BART and Caltrain through 2040. The EIR analyzed access needs for both the east and west sides of the station and determined that a total of seven bus bays were needed for a redesigned transit center on the east side of the station to accommodate current and future shuttle activity.[11]

Currently, shuttles use seven of the 11 available bus bays during the peak 30-minute period. On average, shuttles accessing the eastside of the station are significantly less than capacity, carrying an average passenger load of only eight passengers per vehicle during the morning peak period from 6:30-9:30 AM. The observations conducted by Pirzadeh & Associates in February 2016 found that the greatest number of shuttle vehicles accessing the eastside station area during any 30-minute period was nine vehicles with an average dwell time of approximately three minutes. These nine vehicles used seven of the 11 available bus bays. As shown in **Table 21**, there were 425 shuttle passengers boarding on the east side of the station during the morning peak period. Fifty-six shuttle/transit vehicles transported these passengers, yielding an average passenger load of eight passengers per vehicle.

Arrivals and departures of shuttle vehicles was generally staggered with little if any overlap. As shown in **Table 28**, the TOD site plan would provide capacity for up to 24 smaller transit vehicles (up to 40 feet in length) and up to 12 larger transit vehicles (greater than 40 feet in length) within a 30-minute period. Over

[11] Millbrae Station Area Specific Plan Update and Transit-Oriented Development #1 and #2 Draft EIR, p. 4.13-71.

the entire morning peak period from 6:30-9:30 AM, a total of 144 smaller transit vehicles and 72 larger transit vehicles could be accommodated on the east side of the station.

An analysis conducted as part of the MSASP projected that the number of passengers using a transit or shuttle vehicle to access the east side of the station on an average weekday would grow to 1,901 by 2040 assuming full buildout of the development planned in the MSASP (see Appendix D). It is assumed that the great majority of shuttle/transit boardings will take place in morning peak period, as is currently the case. If 90 percent of shuttle/transit boardings occur in the morning peak period, then approximately 1,711 passengers will access shuttles on the east side of the station during this period. Assuming an average passenger load of 25 passengers per vehicle, approximately 68 vehicles would be needed to transport these passengers. This is 12 more vehicles than the 56 vehicles currently accessing the east side of the station during the morning peak period from 6:30-9:30 AM.

BART is currently developing a shuttle access policy and potential permitting system. This will better enable BART to regulate and control the use of curb space at its stations and ensure that shuttles using the stations are providing first/last mile connections to and from the stations for rail riders (and not using them as park-and-ride facilities). It will also enable BART to gather information about which shuttles are using the stations and how many rail passengers are using shuttles to access the station.

Tier One transit access improvements are described below and illustrated in **Figure 29**.

Tier One

1. Construct East Station Road for smaller shuttle bus (vehicles up to 40 feet long) pick-up/drop-off activities. Provide shelter/weather protection, benches, lighting, schedule information, and other amenities for waiting passengers.
2. Construct a bus bay on the west side (southbound direction) of Rollins Road between East Station Road and Garden Lane Paseo for longer (greater than 40 feet in length) buses. Provide shelter/weather protection, lighting, schedule information, and other amenities for waiting passengers.
3. Construct a bus bay on the west side (southbound direction) of Rollins Road south of Garden Lane Paseo for larger vehicles (greater than 40 feet in length). Provide shelter/weather protection and other amenities for waiting passengers.
4. Construct Garden Lane East with bus bays for longer buses and as bus/shuttle layover space along Aviador Avenue. Provide shelter/weather protection and other amenities for waiting passengers.
5. Add signage to prohibit passenger vehicle pick-up and drop-off activities in bus and shuttle areas.

6. Install adaptive, electronic signage identifying in-coming buses/shuttles and where they will be berthing on-site to facilitate operations and passenger wayfinding.

7. In addition to providing transit subsidies to TOD residents and workers, pedestrian and wayfinding improvements that facilitate access to bus service on El Camino Real should be implemented in conjunction with TOD development. For residents and workers of the future TOD planned for the eastside of the station, direct pedestrian access to fast, frequent bus service on El Camino Real will be critical in facilitating a reduction in vehicle trips.

Figure 29: Transit Access Improvements

Source: HMH & Republic Millbrae LLC

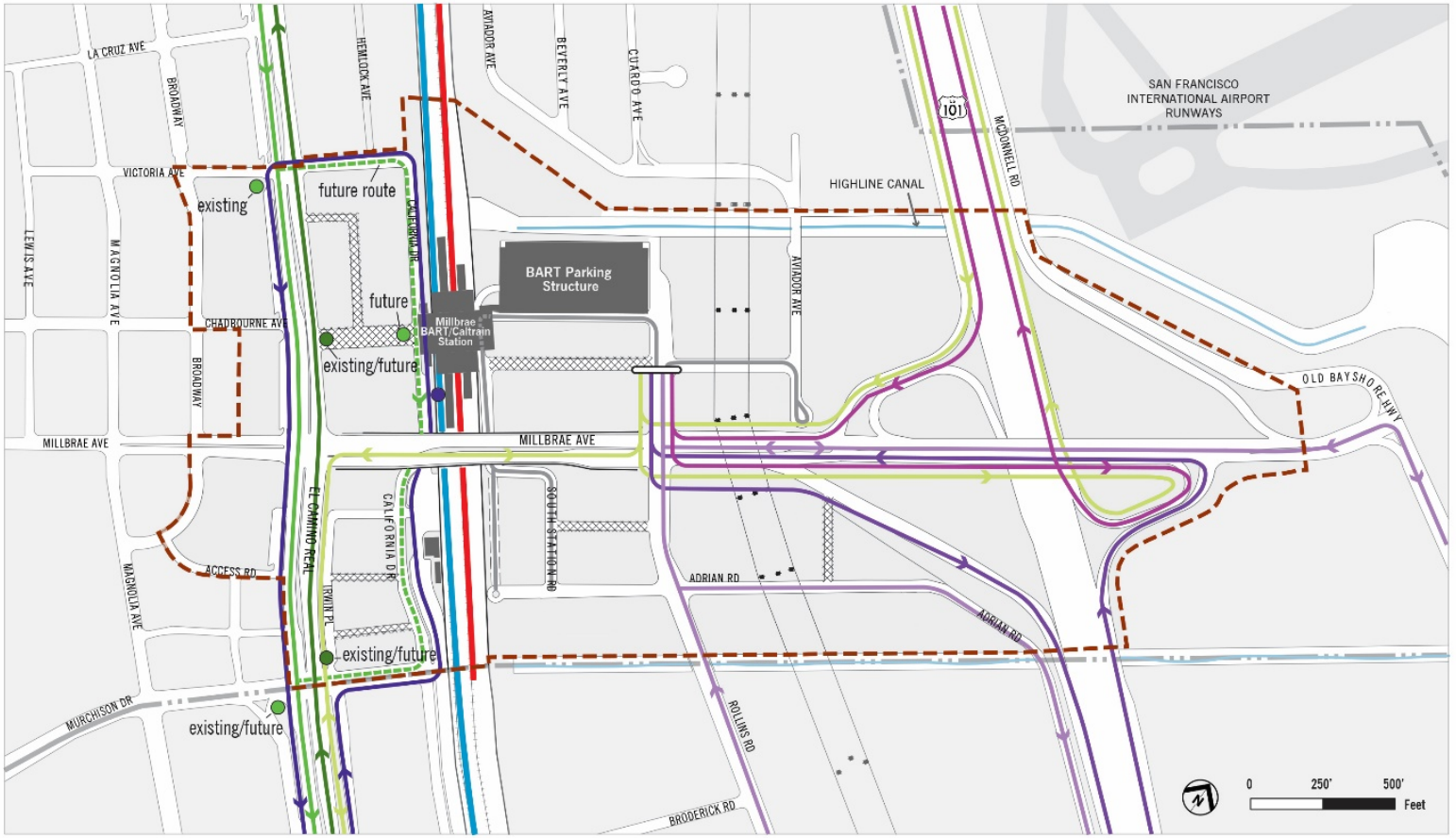
Tier Two

The following Tier Two improvements are included in the MSASP Transit Circulation Concept, shown in **Figure 30**. Some of these improvements fall outside of BART property. Consequently, their implementation will require coordination between the City of Millbrae, C/CAG, Caltrans, and individual property owners. BART will provide necessary staff time and consideration of matching funds for the development and implementation of BART-related Tier Two improvements. BART will maintain a proactive role in continuing to work with the City and other partners in advancing these improvements.

Some Tier Two improvements would require significant changes to the station structure and internal roadways. The Tier One access improvements do not preclude any of the potential longer term transit access improvements described below, nor would they require significant modification since the Tier Two improvements are focused primarily on providing additional shuttle access and circulation via South Station Road and other off-site improvements.

1. Implement transit improvements in the greater station area to be identified as part of the multi-modal, multi-agency station access plan.
2. Study the feasibility of a shuttle/bus-only connection between East Station Road and South Station Road behind the station escalators to facilitate on-site bus/shuttle circulation and enable secondary shuttle access via South Station Road. This option would require significant further study to determine the potential impacts to existing BART station facilities, potential negative impacts on direct pedestrian access to the station, as well as the overall cost-benefit of undertaking the improvement. This potential improvement is discussed further in Chapter 6.
3. If a shuttle/bus-only connection is provided between East Station Road and South Station Road, then widen, realign, and allow two-way traffic on South Station Road to provide additional shuttle/bus berthing and layover locations. This would also provide a second access point into and out of the east side of the station. The conversion and realignment would occur in concert with redevelopment of the parcels adjacent to South Station Road south of Millbrae Avenue. Please see Chapter 6 for a discussion of this potential improvement.
4. Study the feasibility of adding a separate entry for transit/shuttle vehicles into the east side of the station from either US 101 or from Millbrae Avenue. MSASP Policy P-CP 33 states, "Work with Caltrans to explore the potential of adding a separate entry for shuttles or other transit into BART parking/TOD 2 site, either from the southbound US 101 off ramp directly, or from Millbrae Avenue where Aviador could be extended to intersect Millbrae Avenue. It is likely that either of these measures will require a design exception from Caltrans."

Figure 30: MSASP Transit Circulation Concept



Source: MSASP, PlaceWorks

VEHICLE ACCESS IMPROVEMENTS

Automobile access to and from the TOD site would be from Millbrae Avenue via Rollins Road and South Station Road. The proposed TOD project would narrow Rollins Road from six lanes to four lanes of traffic and construct its northern terminus as a single-lane turnaround. It would accommodate north-south travel through the site and provide direct access to the BART parking garage, Garden Lane East and Garden Lane Paseo (for driveway entrance), and East Station Road. All intersections on Rollins Road would be stop-controlled at the intersecting side streets. Garden Lane Paseo, a narrow bi-directional, two-lane roadway, would terminate on its western end at a small, mid-block cul-de-sac at the pedestrian and bicycle paseo and on its eastern end its intersection with Aviador Avenue. South Station Road, a minor roadway located adjacent to the east side of the tracks, would continue to operate one-way southbound, serving vehicles exiting the BART parking garage and Site 5B parking garage.

The TOD project would include two new parking garages within the office and residential buildings and two reconfigured surface parking lots. The Site 5A parking garage would have two vehicle access points on East Station Road. The Site 5B parking garage would have one vehicle access point on the cul-de-sac on Garden Lane Paseo and another on South Station Road. The Site 6A surface parking lot would have vehicle access on both Rollins Road and Garden Lane East. The Residential Site 6B surface parking lot would have vehicle access on Garden Lane East. Additional on-street parking would be provided along Aviador Avenue, a bi-directional, two-lane roadway that would not provide vehicle connections north of the TOD site.

Kiss-and-ride and other passenger pick-up/drop-off (from transportation network company providers such as Uber and Lyft) would be accommodated within the BART parking garage on Level 2. Preliminary designs indicate that approximately 62 revenue-producing parking spaces would be eliminated from the BART parking garage in order to create a safe and convenient pick-up/drop-off location near the station entrance.

A key area of concern throughout the course of the TOD site plan development has been the intersection of Garden Lane and Rollins Road. At this intersection, the need to provide safe, comfortable and direct pedestrian and bicycle access across Rollins Road at Garden Lane East must be balanced with the need to prevent excessive vehicle queueing on Rollins Road and Millbrae Avenue, particularly during the morning peak period. To determine the appropriate treatment for this intersection, the TOD project developer will conduct an updated microsimulation analysis and will use the results to inform the signal design and crossing treatments used at both Rollins Road and Garden Lane, as well as at the intersection of Millbrae Avenue and Rollins Road in order to ensure safe conditions for all users. BART and the developer will work closely with the City on designing and implementing an intersection control that creates a safe, inviting

crossing for pedestrians and bicyclists, and ensures motorist safety by preventing the potential for excessive queueing. (See Appendix C for a report on the original microsimulation analysis for Rollins Road.)

Tier One vehicle access improvements are described below and illustrated in **Figure 31**.

Tier One

1. Redesign Level 2 in parking garage to accommodate passenger vehicle pick-up and drop-off activities, including taxi and transportation network company (TNC) vehicles such as Uber and Lyft. This will include safety and comfort amenities such as lighting, benches, security cameras, emergency call-box, real-time arrivals, and benches. The facility will be designed such that vehicles will exit the garage via South Station Road.
2. Add signage to direct passenger vehicle pick-up and drop-off activities to the parking structure and discourage/prevent pick-up and drop-off activities in all transit/shuttle staging areas and along Garden Lane Paseo and East Station Road.
3. Maintain access to motorcycle/motorized scooter parking on South Station Road underneath the Millbrae Ave overpass and install signage directing motorcyclists to this area. Alternatively, consider relocating motorcycle/motorized scooter parking inside the BART parking garage or to the surface parking area west of Aviador Avenue.
4. If needed, add signage within the garage to direct a greater share of garage traffic to exit via South Station Road in order to reduce the volume of vehicle traffic on Rollins Road during peak periods. BART will monitor the operations of the new facility in conjunction with the City and will work with the City to redesign or modify the circulation pattern for vehicles exiting the garage.

Figure 31: Vehicle Access Improvements

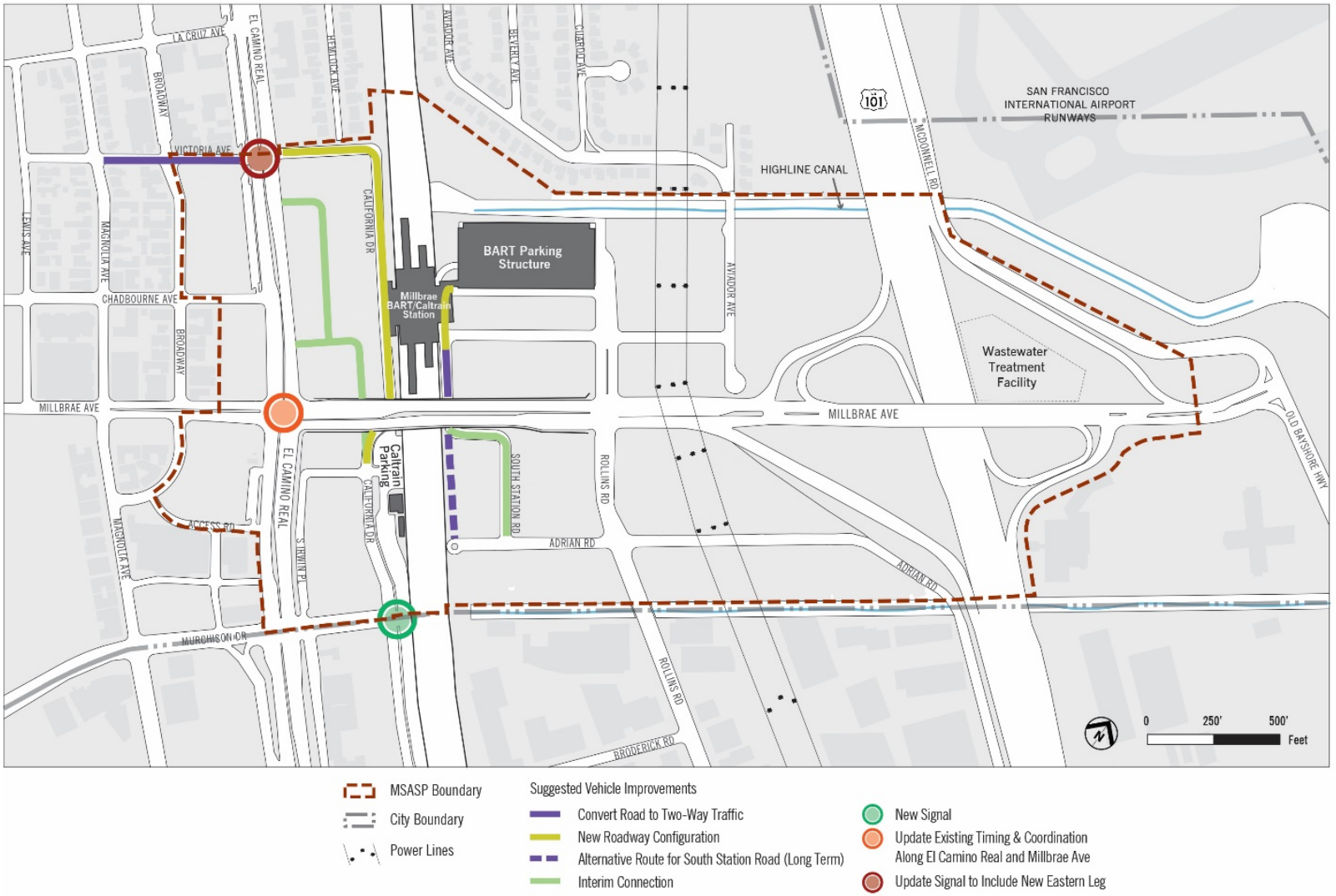
Source: HMH & Republic Millbrae LLC

Tier Two

The following Tier Two improvements are included in the MSASP Vehicle Circulation Concept, shown in **Figure 32**. Some of these improvements fall outside of BART property. Consequently, their implementation will require coordination between the City of Millbrae, C/CAG, Caltrans, and individual property owners. BART will provide necessary staff time and consideration of matching funds for the development and implementation of BART-related Tier Two improvements. BART will maintain a proactive role in continuing to work with the City and other partners in advancing these improvements. Other Tier Two improvements would require relatively minor changes to internal roadways.

1. Widen and realign South Station Road and convert to two-way operation to provide additional on-site vehicular circulation. The realignment and conversion would occur in concert with redevelopment of the parcels adjacent to South Station Road south of Millbrae Avenue.
2. Prohibit vehicles turning left from northbound Rollins Road onto Garden Lane Paseo (permanently or during peak traffic time periods) through signage, striping, and/or permanent features (e.g. raised medians) if traffic accessing the new TOD uses causes traffic to routinely back up onto Millbrae Avenue. Implement similar turn-restrictions if excessive queuing occurs.
3. Implement vehicle improvements in the greater station area to be identified as part of the multi-modal, multi-agency station access plan including those referenced in the MSASP:
    - Extending and realigning California Drive north from Linden Avenue to form the east leg of the El Camino Real/Victoria Avenue intersection
    - Signalizing the intersection of California Drive and Murchison Drive.
    - Converting Victoria Drive from one-way to two-way operations between El Camino Real and Magnolia Avenue.

Figure 32: MSASP Vehicle Circulation Concept



Source: MSASP, PlaceWorks

6. OVERVIEW OF KEY ISSUES AND THEIR RESOLUTION

This chapter provides an overview and summary of the key issues and concerns that have arisen since BART began planning for the proposed TOD project in 2013. These issues are discussed throughout this Plan, and are summarized here to provide a quick reference and summary for readers.

Many if not all of these issues stem from the fact that the station area has limited points of access, particularly on the east side, and is a highly constrained site with multiple user demands. Major roadways to the west, south and east, and the Highline Canal to the north, border the station area. The at-grade BART and Caltrain tracks also present a significant constraint in terms of station access and circulation. Further exacerbating these conditions is the fact that a PG&E utility easement and the site's proximity to runways at SFO restricts development on the eastern portion of the site (approximately three acres).

Currently, station access and design is oriented toward vehicle and shuttle access, with most if not all of the station area occupied by multi-lane roadways, surface and structured parking, bus bays, and taxi and other passenger drop-off areas. However, both BART and the City of Millbrae have adopted goals of transforming the Millbrae Station area into a multi-modal, mixed-use neighborhood. The significant challenges posed by transforming the existing vehicle-dominated design into one that is people-centered has required compromise and innovative design approaches that are reflected in the Tier One improvements presented in Chapter 5.

ROLLINS ROAD AND GARDEN LANE EAST

City of Millbrae staff have expressed several key concerns with regard to pedestrian and bicycle crossings of Rollins Road and Garden Lane East and excessive vehicle queueing spilling over from the intersection of Rollins and Garden Lane East into the intersection of Millbrae Avenue and Rollins Road. If vehicle traffic can flow relatively freely through the intersection of Rollins Road and Garden Lane East, then queueing should not be an issue. However, the lack of a stop or signal controlled intersection at Rollins and Garden Lane East may make pedestrian and bicycle crossings more risky and difficult at this intersection, particularly if the volume of pedestrians crossing at this location is expected to increase.

To reduce the number of pedestrians needing to cross Rollins Road and Garden Lane East, nearly all transit/shuttle stops have been located to the west of Rollins Road. Additionally, a crosswalk from the hotel entrance to the sidewalk on the north side of East Station Road will provide direct access between the hotel and retail development to the station entrance. Moreover, the majority of pedestrian traffic generated by the site originates west of Rollins Road.

As discussed in Chapter 5, the TOD project developer will develop the final intersection treatment for Rollins Road and Garden Lane East based on the results of an updated microsimulation analysis to be conducted as part of the signal redesign for the intersection of Millbrae Avenue and Rollins Road. (See Appendix C for a report on the original microsimulation analysis for Rollins Road.) The output of the microsimulation will inform the signal design and crossing treatments used at both Rollins Road and Garden Lane East, as well as at the intersection of Millbrae Avenue and Rollins Road in order to ensure safe conditions for all users. BART and the developer will work closely with the City on designing and implementing an intersection control that creates a safe, inviting crossing for pedestrians and bicyclists, and ensures motorist safety by preventing the potential for excessive queueing.

SOUTH STATION ROAD

The MSASP P-CP 16 calls for the expansion of South Station Road as a two-way public street connecting from the station entrance to Adrian Road. While this roadway may provide an important secondary access and point to the east side of the station in the future, its expansion and conversion to a two-way public street will depend on the redevelopment of the parcels adjacent to it.

The expansion and conversion of South Station Road to two-way operations is consequently outside of the timeline for the proposed TOD project and its Tier One access improvements. South Station Road will continue to be an important means of egress for vehicles exiting the BART parking garage, which will include both parking vehicles as well as vehicles dropping off and picking up passengers. Furthermore, the South Station Road right-of-way within the station area will be maintained, and any improvements will be designed to integrate with the future expansion and conversion of South Station Road to two-way operations south of Millbrae Avenue.

BICYCLE ACCESS TO THE EAST SIDE OF STATION

The planned Tier One bicycle access improvements will enable a direct connection to the future bicycle/pedestrian overcrossing over Highway 101. Access to the east side of the station will be provided via a pathway along Aviador Avenue and Garden Lane East. While a secondary east-west bicycle/pedestrian path along Millbrae Avenue will provide a direct connection from the Bay Trail to El Camino Real and residential and commercial areas within Millbrae, it will not directly serve the Millbrae Station. Consequently, it is not included as a Tier One bicycle access improvement. Furthermore, a two-way bicycle/pedestrian pathway along the north side of Millbrae Ave would require significant further study and design as well as

potential right-of-way acquisition. These efforts fall well outside the timeline for completing the proposed TOD project on the east side of the station.

As with other Tier Two improvements, BART is committed to partnering with the City of Millbrae and other partner agencies to further define access improvements that are outside of BART property and are not directly related to construction of the TOD project. BART will provide necessary staff time and consideration of matching funds for the development and implementation of BART-related Tier Two improvements. BART will maintain a proactive role in continuing to work with the City and other partners in advancing Tier Two improvements, including the development and implementation of the Comprehensive Access Plan to be led by the City of Millbrae.

SHUTTLE AND TRANSIT VEHICLE ACCESS

SHUTTLE AND TRANSIT VEHICLE CAPACITY

Overall, shuttle capacity near the station entrance is accommodated by the site plan in its current configuration. The MSASP EIR analyzed current and future ridership and access needs for both BART and Caltrain through 2040. The EIR analyzed access needs for both the east and west sides of the station and determined that a total of seven bus bays were needed for a redesigned transit center on the east side of the station to accommodate current and future shuttle activity.[12]

Currently, the greatest number of shuttle vehicles accessing the eastside station area during any 30-minute period is nine vehicles with an average dwell time of approximately three minutes. Arrivals and departures of shuttle vehicles was generally staggered with little if any overlap. As shown in **Table 28**, the TOD site plan would provide capacity for up to 24 smaller transit vehicles (up to 40 feet in length) and up to 12 larger transit vehicles (greater than 40 feet in length) within a 30-minute period.

BART is currently developing a shuttle access policy and potential permitting system. This will better enable BART to regulate and control the use of curb space at its stations and ensure that shuttles using the stations are providing first/last mile connections to and from the stations for rail riders (and not using BART stations as park-and-ride facilities for non-BART related shuttle operations). It will also enable BART to gather information about which shuttles are using the stations and how many rail passengers are using shuttles to access the station.

[12] Millbrae Station Area Specific Plan Update and Transit-Oriented Development #1 and #2 Draft EIR, p. 4.13-71.

CONSIDERATION OF A CONNECTION BETWEEN EAST STATION ROAD AND SOUTH STATION ROAD

During development of the MSASP, related EIR and this Plan, there was extensive discussion of a circulation plan that would extend East Station Road, located immediately south of the existing parking garage, to the southwest, connecting to South Station Road. The road extension was considered exclusively for shuttles and transit vehicles. This roadway design would allow additional vehicular egress to the south (and potentially ingress if South Station Road was widened and realigned to allow two-way traffic) under Millbrae Avenue. It was considered as a possible way to alleviate congestion at the Millbrae Avenue/Rollins Road intersection, and as a way to bring additional shuttle drop-off closer to the station entrance should shuttle bus activity increase in the future.

Two designs for this connecting roadway were evaluated. The first would extend East Station Road directly to the south at the west end of the turnaround adjacent to the eastside station entrance. The roadway would pass immediately in front of the main station entrance, through the TOD's public plaza area, shift to the west, and connect with South Station Road. This design was rejected by BART for a number of reasons. Most importantly, it would put pedestrians and shuttle vehicles in direct conflict, resulting in a negative impact on pedestrian safety and comfort. The great majority of people entering the station's eastside escalator are coming from the TOD and surface parking lots, and a vehicular route at this location would be in direct conflict with this pedestrian path of travel. The BART Access Hierarchy prioritizes pedestrians over every other mode of access, and at this location, the conflicts would be ongoing and potentially put pedestrians at risk.

Secondly, the area near the station entrance is the heart of the planned TOD and is planned as a community gathering area. This plaza area is planned for public open space and is intended to serve Millbrae as a locale for farmers' markets, performances, and community events. Occupying this valuable area with a widened road does not support the City's Project Objectives for TOD in the Specific Plan, including "[d]esign and construct a project that accommodates the needs of transit service providers to ensure safe and reliable transit access continues," and "[d]esign and construct a project that provides publicly accessible open spaces" (MSASP, page 3-65), which are not consistent with a road through the central plaza.

A second shuttle route design was evaluated to see if concerns about public safety and preservation of public space in the TOD could be met. This alignment would extend East Station Road farther west, past the west wall of the garage, through the columns and then southward on the existing one-lane portion of South Station Road, behind the existing eastside station escalator.

This design would avoid conflict with passengers using the escalator and avoid demolishing the plaza area. However, people using the stairs on the west side of the garage may have to cross the shuttle route.

Moreover, this alignment would require removal and relocation of the piers supporting the bridge between the fourth floor of the garage and the station concourse. It could require additional structural redesign and reconstruction of the station entrance. A full engineering analysis and cost study would be required to determine if this alignment is physically feasible and meets a benefit/cost standard.

While the MSASP included extending East Station Road as an "option," the alignment was not defined. With more review, it has become clear that the alignment in front of the escalator has two fatal flaws: pedestrian safety and loss of public space. The alignment behind the escalator also has significant flaws: potential pedestrian safety and costly structural work on the station that may or may not be feasible. However, these issues do not preclude further consideration of the second alignment, and if currently planned shuttle capacity and access proved inadequate, further analysis of the feasibility of this alignment could be undertaken. Safety of pedestrians using the westside garage stairs, relocation of the bridge columns and any other structural elements, and project cost would be primary concerns in such a review.

PARKING FOR THE TOD PROJECT AND BART

BART PARKING SUPPLY AND DEMAND

Table 29 summarizes the change in BART parking supply with and without the proposed TOD project. The proposed TOD project would eliminate 863 surface level BART parking lot spaces, 62 spaces in the parking garage to accommodate kiss-n-ride operations, and provide 392 replacement BART parking spaces, for a total net reduction of 533 parking spaces.

Appendix B of this report provides a detailed analysis of the impacts of the proposed TOD project on BART ridership and parking demand. In summary, while it is anticipated that some BART ridership may be lost due to the elimination of parking spaces, it is expected that this loss would be more than offset by the increase in BART riders generated by the TOD project itself. Furthermore, the demand for BART parking is not expected to increase significantly. While BART ridership is expected to grow by approximately 18 percent between 2014 and 2040, travel patterns of some BART riders accessing the Millbrae Station are expected to shift from park-and-ride access to transit access in the future, so that even though BART ridership would increase, the share of those riders driving and parking at the station would decrease.

TABLE 29: SUMMARY OF BART PARKING WITH AND WITHOUT TOD PROJECT

Existing BART Spaces (Garage and Lots)	2,979
Surface Spaces Eliminated by TOD Project	(863)
Garage Spaces Eliminated by Kiss n Ride	(62)
Surface Spaces Replaced by TOD Project	392
Total BART Spaces with TOD Project (Garage and Lots)	2,446
Peak BART Parking Demand	2,857
Potential Deficit	(411)

Sources: Pirzadeh & Associates, February 2016; HMH and Republic Millbrae LLC

TOD PEAK PARKING DEMAND

The MSASP utilizes a shared parking approach to accommodate parking demand in aggregate, rather than assigning parking to specific uses. The proposed TOD project would provide a total of 804 parking spaces (see **Table 30**) plus the additional 392 spaces in the northeast corner surface parking lot, which could be shared between BART and TOD patrons, particularly during evenings and weekends.

TABLE 30: PARKING PROPOSED PER DEVELOPER PARKING PLAN

Land Use	Parking Ratio	Site 5/6 Land Use Amount	Parking Spaces Proposed
Retail/Restaurant	1.88 per 1,000 sf	46,100 sf	87
Office	1.82 per 1,000 sf	157,900 sf	288
Hotel	0.49 per room	126 rooms	62
Residential	0.98 per unit	376 units	367
TOTAL			**804**

Notes: sf = square feet

Source: Republic Millbrae LLC, March 21, 2016

An estimated 914 to 940 spaces may be needed to accommodate peak parking demand at the TOD site during the midday period. (See Appendix A for more information on the TOD parking assessment.) The higher peak parking demand of 940 spaces (which assumes no sharing of parking between land uses during the midday peak period) is summarized in **Table 31**.

TABLE 31: TOD PEAK PARKING DEMAND BETWEEN 10AM AND 2PM BY USE

Land Use	Peak Parking Demand (between 10 AM and 2 PM)	Hours of Peak Demand
Retail	43	1 PM
Restaurant	116	12 PM
Office	328	10-11 AM
Hotel	65	10 AM – 12 PM
Residential	388	10 AM – 2 PM
Total Demand	**940**	

Source: Fehr & Peers, 2016

While this analysis shows that the proposed TOD project is providing fewer parking spaces than may be needed during times of peak demand, it is important to note that restricted parking (whether through amount or pricing) when combined with other transportation demand management (TDM) measures such as transit incentives and improved transit, biking and walking access can result in a shift to non-automobile modes and reduction in vehicle trips.[13] Building enough parking to accommodate peak demand may provide an incentive for vehicle trips to the site, which is in direct conflict with the MSASP's policy objective to reduce vehicle trips associated with new development.

[13] http://www.vtpi.org/tdm/tdm72.htm

APPENDIX A: MILLBRAE STATION AREA SPECIFIC PLAN SITE 5/6 TOD PARKING ANALYSIS

FEHR PEERS

MEMORANDUM

Date: May 5, 2016

To: Ellen Smith, BART

From: Jane Bierstedt, Fehr & Peers

Subject: Millbrae Station Area Specific Plan Site 5/6 TOD Parking Analysis

OK16-0100

This memorandum provides an estimate of parking supply needed to accommodate peak demand for the various land uses included in the Millbrae Station Area Specific Plan (MSASP) Sites 5/6 transit oriented development (TOD). The parking supply estimation utilizes the Urban Land Institute's (ULI's) shared parking methodology to provide a baseline estimate of peak demand, which is then adjusted to account for the expected needs of the various users at the development during the midday period when demand is greatest. In essence, no shared parking is accounted for during the midday period when the BART parking structure is full and sharing is focused on the evening/nighttime period when surplus spaces are available. Finally, a parking supply is recommended for consideration based on the calculated peak demand plus a contingency factor to account for fluctuations and ease of finding a space.

This memorandum describes:

- Parking supply proposed by the developer of the Sites 5/6 TOD
- ULI shared parking methodology including base rates and context-sensitive adjustments made for Sites 5/6 TOD
- ULI shared parking model results showing unadjusted peak demand
- Peak parking demand adjusted based on local context and the assumption that weekday midday shared parking would be inconvenient and impractical
- Assessment of shared parking potential based on demand by land uses (retail, restaurant, hotel, and residential visitors) that have an evening/nighttime demand that exceeds daytime demand.
- Sites 5/6 TOD parking supply recommendation based on the analysis and a contingency factor

DEVELOPER PROPOSED PARKING PLAN

Table 1 shows the amount of parking to be provided according to the developer based on their proposed site plan.

TABLE 1. PARKING PROPOSED PER DEVELOPER PARKING PLAN

Land Use	Parking Ratio	Site 5/6 Land Use Amount	Parking Spaces Proposed
Retail/Restaurant	1.88 per 1,000 sf	46,100 sf	87
Office	1.82 per 1,000 sf	157,900 sf	288
Hotel	0.49 per room	126 rooms	62
Residential	0.98 per unit	376 units	367
TOTAL			**804**

Notes: sf = square feet

Source: Republic Millbrae LLC, March 21, 2016

SHARED PARKING

The ULI sponsored a national study in 1984 that established a basic methodology for analyzing parking demand in mixed-use developments and developed averages for parking rates by land use. Fehr & Peers staff was involved in the 2004 update of this study, also sponsored by ULI[1]. The analysis presented in this memorandum utilizes the data from the updated *Shared Parking, Second Edition* report.

In the shared parking methodology, the base parking rate and daily/hourly/seasonal patterns for each land use are established, and then the overall parking demand is calculated by taking into account the unique travel characteristics of the project being analyzed. Adjustments were made for two travel factors: the potential for non-auto modes and internal capture of parking between the land uses in the area.

Shared Parking Parameters

In order to evaluate the number of spaces needed under shared parking conditions, a number of characteristics regarding a particular development must be known. The most important of these

[1] *Shared Parking, Second Edition*, Urban Land Institute, Washington, D.C., 2004

characteristics are the mix of land uses in the project and the size of each individual land use. Other parking-related factors must be estimated in order to determine peak parking demand by hour:

- Parking Ratio – The ULI model has the most recently updated parking ratios for each land use in this analysis. These ratios are based on the national study of parking occupancy data from across the United States.
- Mode Split/Walk-in – One factor that affects the overall parking demand at a particular development is the number of visitors and employees that arrive by automobile. The alternatives tested in the analysis account for the effects of pedestrian, bicycle, and transit access to the site.
- Auto Occupancy – This shared parking analysis used the national averages for auto occupancy (number of people in each vehicle) for all land uses. No changes were made to the ULI average rates.
- Captive Market – Based on data from empirical studies through sources such as ULI, it is known that a certain percentage of trips in mixed-use developments (depending on the mix of land uses in the project) are trips moving between the land uses on site, i.e., they were internally captured on the site. Adjustments were made to the analysis to account for trip (and parking) internalization.
- Seasonal Variations – The shared parking analysis summarized in this report includes the month-to-month variations in parking demand for the land uses to account for seasonal variations, such as the holiday shopping season and peak vacation times for office employees.

Table 2 provides a summary of base weekday parking demand rates recommended by ULI as part of the *Shared Parking* report. ULI also provides weekend parking demand rates, but these are not shown since peak demand at the Sites 5/6 TOD will occur during weekdays.

TABLE 2. ULI SHARED PARKING BASE PARKING DEMAND RATES

Land Use	Weekday Parking Demand Rate[1]	
	Visitor/Guest	Employee/Resident
Retail	2.90	0.70
Restaurant (family restaurant)	9.00	1.50
Office[2]	0.24	3.07
Hotel	1.00	0.25
Residential	0.15	1.50

1. Recommended parking rates are per 1,000 sq. ft. for commercial uses, per dwelling unit for residential uses, and per room for hotel uses.
2. Office base rate was estimated using recommended linear equation for office size between 100,000 sf and 500,000 sf.

Shared Parking Model Adjustments for Sites 5/6

Base Rates

Two adjustments were made to the ULI base parking rates (summarized in **Table 2**):

1. Our analysis assumes that 367 spaces (equating to 0.98 per unit and proposed for unbundling) are reserved for residential units. These spaces would not be available for other site parkers.
2. The residential visitor rate was adjusted from 0.15 to 0.22 spaces per unit based on the developer's proposed parking ratios.

Mode Split and Internal Capture

The shared parking analysis use assumptions for mode share and internal capture are presented in **Table 3.** These mode share estimates were based on literature on travel behavior of TOD residents, workers and visitors.[2] Research shows that trips to and from TODs have higher transit mode shares than for locations not located near transit stations. Due to its proximity to two regional rail systems (BART and Caltrain) the Sites 5/6 TOD is expected to have a high transit mode share.

Internal capture for each of the uses in the Sites 5/6 TOD were estimated using Fehr & Peers' MDX+ Tool. This tool uses general site information, including intensity and size of land uses, as inputs and produces trip generation estimates that take into account reductions in trips due to internal capture

[2] *Travel Characteristics of Transit-Oriented Development in California*, Hollie Lund, Robert Cervero and Richard Willson, 2004

of trips among mixed uses. Internalization is based on national research by the US EPA on the impact of smart growth factors such as development density, scale, design, accessibility, transit proximity, demographics and mix of uses on site trip generation. The MXD+ tool has been validated for sites within California.

TABLE 3. SHARED PARKING MODEL ASSUMPTIONS

Land Use	Transit/Walk-ins/Bike Mode Share	Internal Capture
Retail		
- Visitors	25% / 15%[1]	20% / 10%[2]
- Employees	25%	0%
Restaurant		
- Guests	25% / 15%[1]	20% / 10%[2]
- Employees	25%	0%
Office		
- Visitors	35%	0%
- Employees	35%	4%
Hotel		
- Guests	38%	4%
- Employees	38%	0%
Residential		
- Visitors	28%	0%
- Residents	0%	0%

1. First value is daytime mode share / second value is evening mode share
2. First value is daytime internal capture / second value is evening internal capture
3. 3. Mode split data derived from https://www.bart.gov/sites/default/files/docs/Travel_of_TOD.pdf

Peak Parking Demand Analysis

This methodology measures the effects of hourly, daily, and seasonal variations in parking demand among the project's land uses. **Tables 4** and **5** present the results of the shared parking analysis. **Table 4** summarizes peak weekday demand using ULI shared parking rates with the residential rate, mode split, and internal capture adjustments. Peak parking demand is estimated at 914 spaces and would theoretically occur on a weekday in June at 10 AM. Weekend peak demand is estimated at 697 parking spaces (weekend demand is not discussed further due to the significantly lower peak demand compared to the weekday). **Table 5** presents the parking demand by use and time of day.

TABLE 4: SHARED PARKING DEMAND SUMMARY

PEAK MONTH: JUNE -- PEAK PERIOD: 10 AM, WEEKDAY

Projected Parking Supply:			Weekday					Weekend					Weekday			Weekend		
Land Use	Project Data Quantity	Unit	Base Rate	Mode Adj	Non-Captive Ratio	Project Rate	Unit	Base Rate	Mode Adj	Non-Captive Ratio	Project Rate	Unit	Peak Hr Adj 10 AM	Peak Mo Adj June	Estimated Parking Demand	Peak Hr Adj 12 PM	Peak Mo Adj June	Estimated Parking Demand
Community Shopping Center (<400 ksf)	27,660	sf GLA	2.90	0.75	0.80	1.74	/ksf GLA	3.20	0.75	0.90	2.16	/ksf GLA	0.65	0.67	21	0.80	0.67	32
Employee			0.70	0.75	1.00	0.53	/ksf GLA	0.80	0.75	1.00	0.60	/ksf GLA	0.85	0.80	10	1.00	0.80	13
Family Restaurant	18,440	sf GLA	9.00	0.75	0.80	5.40	/ksf GLA	12.75	0.75	0.90	8.61	/ksf GLA	0.85	0.95	81	1.00	0.95	151
Employee			1.50	0.75	1.00	1.13	/ksf GLA	2.25	0.75	1.00	1.69	/ksf GLA	1.00	1.00	21	1.00	1.00	31
Hotel-Business	126	rooms	1.00	0.62	0.96	0.60	/rooms	0.90	0.62	0.96	0.54	/rooms	0.60	1.00	45	0.55	1.00	37
Employee			0.25	0.62	1.00	0.16	/rooms	0.18	0.62	1.00	0.11	/rooms	1.00	1.00	20	1.00	1.00	14
Residential, Rental, Shared Spaces	376	units	0.00	1.00	1.00	0.00	/unit	0.00	1.00	1.00	0.00	/unit	0.75	1.00	0	0.65	1.00	0
Reserved	1	sp/unit	1	1.00	1.00	1	/unit	1	1.00	1.00	1	/unit	1.00	1.00	376	1.00	1.00	376
Guest	376	units	0.22	0.72	1.00	0.16	/unit	0	0.72	1.00	0	/unit	0.20	1.00	12	0.20	1.00	12
Office 100 to 500 ksf	157,900	sf GLA	0.24	0.65	1.00	0.16	/ksf GLA	0.03	0.65	1.00	0.02	/ksf GLA	1.00	1.00	25	0.90	1.00	3
Employee			3.07	0.65	0.96	1.92	/ksf GLA	0.31	0.65	0.96	0.19	/ksf GLA	1.00	1.00	303	0.90	1.00	28
														Customer	184		Customer	235
														Employee	354		Employee	86
														Reserved	376		Reserved	376
														Total	914		Total	697

ULI base data have been modified from default values.

June

TABLE 5: Weekday Estimated Peak-Hour Parking Demand

Projected Parking Supply:	Monthly Adj.	6 AM	7 AM	8 AM	9 AM	10 AM	11 AM	12 PM	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM	7 PM	8 PM	9 PM	10 PM	11 PM	12 AM
Community Shopping Center (<400 ksf)	67%	-	2	5	11	21	28	31	32	31	29	29	31	39	39	33	21	12	4	-
Employee	80%	1	2	5	9	10	11	11	11	11	11	11	11	11	11	10	9	5	2	-
Family Restaurant	95%	24	47	57	71	81	85	95	85	47	43	43	71	97	97	97	73	67	60	30
Employee	100%	11	16	19	19	21	21	21	21	21	16	16	20	20	20	20	17	14	14	7
Hotel-Business	100%	71	67	60	53	45	45	41	41	45	45	49	52	56	56	60	64	71	75	75
Employee	100%	1	6	18	18	20	20	20	20	20	20	18	14	8	4	4	4	4	2	1
Residential, Rental, Shared Spaces	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reserved	100%	376	376	376	376	376	376	376	376	376	376	376	376	376	376	376	376	376	376	376
Guest	100%	-	6	12	12	12	12	12	12	12	12	12	24	36	60	60	60	60	48	30
Office 100 to 500 ksf	100%	-	-	5	15	25	11	4	11	25	11	4	2	1	-	-	-	-	-	-
Employee	100%	9	91	227	288	303	303	272	272	303	303	272	151	76	30	21	9	3	-	-
TOTAL DEMAND	Customer	95	122	139	162	184	181	183	181	160	140	137	180	229	252	250	218	210	187	135
	Employee	22	115	269	334	354	355	324	324	355	350	317	196	115	65	55	39	26	18	8
	Reserved	376	376	376	376	376	376	376	376	376	376	376	376	376	376	376	376	376	376	376
		493	613	784	872	914	912	883	881	891	866	830	752	720	693	681	633	612	581	519

ULI base data have been modified from default values.

Because the ULI model assumes sharing would occur among all uses (with the exception of the reserved spaces) it can understate total demand when sharing is undesirable or impractical. For example, within the context of the Sites 5/6 TOD, the model shares spaces designated for office use with other uses when office demand is predicted to fall, such as midday for lunch or outside of normal work hours.

In practice, however, it is unlikely that the office-designated parking spaces that open up during the lunch hour would be available to restaurant/retail patrons. Consider a restaurant customer searching for an open space on the top floors of the office garage. In the evening however, when demand for office parking decreases significantly and rapidly following the end of the workday, restaurant/retail patrons could easily utilize the office supply

The next section accounts for the need to have the Sites 5/6 TOD parked appropriately during the weekday daytime period by considering when sharing would or would not occur. The potential parking program prepared for this development focuses on shared parking during the evening and nighttime periods.

PEAK PARKING DEMAND, ADJUSTED

In the ULI model, peak demand by land use in the midday period varies by hour with office demand dipping (as employees leave for lunch) and restaurant and retail patrons increase their demand. Instead of interpreting the ULI model results literally (precise hour-by-hour forecasts), we considered the peak demand over the entire midday period (**Table 6**), which is the single period of the day when demand is highest. The most significant difference between the ULI model output and our interpretation is that we assumed no sharing occurs during this time period. This revision estimates peak demand at 940 spaces (a slight increase when compared to 914 predicted by the ULI model).

TABLE 6. PEAK PARKING DEMAND BETWEEN 10AM AND 2PM BY USE

Land Use	Peak Parking Demand (between 10 AM and 2 PM)	Hours of Peak 10AM-2PM Demand
Retail	43	1 PM
Restaurant	116	12 PM
Office	328	10-11 AM
Hotel	65	10 AM – 12 PM
Residential	388	10 AM – 2 PM
TOTAL	**940**	

SHARED PARKING POTENTIAL

The tangible shared parking potential for the Sites 5/6 TOD occurs in the evening/nighttime hours when restaurant, retail, hotel, and residential visitor demand exceeds their daytime demand and that net increase could easily be accommodated in both the office garage and BART garage.

After 4:00 PM, office parking demand decreases considerably to near zero in the late night hours. Similar to office space, since BART ridership is commute-focused, demand for BART parking spaces decreases in the afternoon and does not rise again until the early morning commute period.

Table 7 considers those Sites 5/6 uses that have an evening/nighttime demand that exceeds their daytime demand and shows the net difference, which is the shared parking potential for the development. Approximately 75 spaces that would be needed for restaurant, retail, hotel, and residential visitors in the evening/nighttime hours could be accommodated in the office garage and BART garage without needing to provide parking solely for those uses.

TABLE 7 PEAK PARKING DEMAND BY USE

Land Use	Peak Parking Demand	Hours of Peak Demand	Peak Demand 10 AM – 2 PM	Shared Parking Potential
Retail - Customer	39	6-8 PM	32	7
Restaurant - Customer	97	6-7 PM	95	2
Hotel – Guests	75	11 PM – 1 AM	45	30
Residential - Visitor	60	7-11 PM	12	48
Total	**271**		**184**	**87**

SITES 5/6 PARKING PROGRAM RECOMMENDATION

The Sites 5/6 developer is proposing 804 spaces. This analysis, using the ULI methodology and adjusted for the local context estimates a peak parking demand of 914 spaces. In practice, parking supply should be higher than the peak demand calculation to account for daily fluctuations and ensure that a space is reasonably available without undue burden to the user (no one wants to search for one open space in a garage of 300 spaces). For this reason are suggesting a parking supply which is 5-10% higher than the peak demand calculated.

- 914 spaces + 5% contingency = **960 spaces**
- 914 spaces + 10% contingency = **1,005 spaces**

With the lower contingency, the project should provide approximately 156 additional spaces than proposed by the developer. Similarly, with the lower contingency, the project should provide approximately 201 more spaces than proposed.

APPENDIX B: EFFECTS OF MILLBRAE STATION AREA SPECIFIC PLAN ON BART RIDERSHIP AND PARKING

FEHR PEERS

MEMORANDUM

Date: January 27th, 2015

To: Ellen Smith and Jeff Ordway, BART

From: Jerry Walters, Nikki Foletta and Steve Crosley, Fehr & Peers

Subject: Effects of Millbrae Station Area Specific Plan on BART Ridership and Parking

SF14-0730

This memorandum examines the impact of the proposed Millbrae Station Area Specific Plan (MSASP) transit oriented development (TOD) on BART and Caltrain ridership, mode of access and parking demand in 2040[1]. Land use scenarios analyzed as part of the MSASP include a standalone Sites 5/6 TOD on areas presently devoted to surface parking; a standalone Site 1 TOD a site presently devoted to a restaurant, auto and tire repair, miscellaneous retail, a dormant senior housing facility and one residential dwelling unit; and full buildout of the Specific Plan area. The Sites 5/6 TOD would reduce the net parking supply at the station by 566 spaces. These land use and parking supply changes would result in an increase in ridership, shifts in mode of access, and an increase in parking demand at the station which are detailed in the technical sections below.

[1] 2040 represents the horizon year for the MSASP and the Bay Area regional transportation plan (RTP) and Sustainable Communities Strategy (SCS) and includes transportation system improvements, jobs, housing units, and population growth throughout the Bay Area consistent with Plan Bay Area, which was jointly approved by the Association of Bay Area Governments (ABAG) and the Metropolitan Transportation Commission (MTC) in 2013.

SUMMARY OF FINDINGS

RIDERSHIP

Daily BART and Caltrain boardings at the Millbrae Station combined are projected to increase 47 percent, from 9,685 in 2013 to 14,200 by 2040 under 2040 Baseline conditions without the MSASP TOD. Of the total increase, BART ridership is projected to increase by 18 percent (1,130 daily boardings). Caltrain will experience most of the net increase in ridership for reasons that include increasing Caltrain speeds and frequencies through electrification, extending Caltrain to the Transbay Terminal Station for direct access to the financial district. In 2040, travel times from Millbrae to the financial district will be 24 minutes on Caltrain and 31 minutes on BART. In addition, there will be substantial growth and development in areas near the existing Caltrain station at 4th and King Streets; including significant amounts of new employment and housing in the south-of-market (SOMA) and Mission Bay areas of San Francisco well served by Caltrain. BART will retain several advantages, including direct service to other areas of San Francisco and the East Bay and seat availability for passengers boarding or considering a transfer from Caltrain in Millbrae. However, the Caltrain improvements listed above will mean that 48 percent of those boarding a San Francisco bound train at Millbrae in 2040 will board Caltrain while 52 percent will board BART (compared to 21 percent and 79 percent today).

The 566 parking space reduction in the BART parking supply caused by the TOD will dampen BART ridership growth by 2040 by approximately 337 daily BART boardings at the station when parking is at capacity, which is projected to occur on most weekdays before 2040. Lost riders would represent those who could not or would not shift to alternative modes of access such as kiss-ride, transit, walking or bicycling. However, the uses at the TOD will generate boardings which will more than offset these reductions. Site 1 will generate approximately 582 daily BART boardings, Site 5-6 will generate 659 daily boardings and the full Buildout will generate 1,863 daily boardings.

MODE OF ACCESS

Independent of train-to-train transfers, the majority of those boarding BART in Millbrae (67%) drive to and park at the station while only 28% of those boarding Caltrain park-and-ride. As an end-of-line station, BART passengers come from a large area in the north and central Peninsula

where park-ride drive access is the most convenient approach. Caltrain offers opportunities for system access along the full length of the Peninsula, so that most riders access Caltrain at the most convenient station rather than driving to Millbrae. The MSASP TOD will shift BART's access profile from predominantly auto-oriented to more balanced use of walking, bicycle, bus and driving to reach the station.

PARKING DEMAND

Due to parking turnover rates, the peak demand for parking spaces at the station is less than the total number of daily park-and-riders. BART generates one parking space of demand in Millbrae for each 3 daily boardings while Caltrain generates one space per 10 daily boardings. Because of the higher growth in Millbrae Caltrain use than BART use by 2040, demand for parking at Millbrae by those boarding Caltrain will increase from 335 to 940 parking spaces, while the parking demand by those boarding BART will decrease from 2,280 to 2,180 under 2040 Baseline conditions. This reduction is due to changes in land use and connecting transit in the future which would shift travel patterns of BART riders accessing the Millbrae station from park-and-ride access to transit access. The peak daily demand for parking for BART and Caltrain riders combined will increase to 3,120 spaces under 2040 Baseline conditions, five percent more than the existing supply.

While the development of the proposed MSASP TOD will increase overall BART and Caltrain ridership at the station, it will reduce the demand for park-and-riders from 2040 Baseline due to the parking spaces it removes. Therefore with the TOD, parking demand at the station will be reduced to 1,940 spaces for BART riders and 910 spaces for Caltrain riders. The existing parking supply, excluding spaces reserved for station agents, is 2,928. With the removal of 566 parking spaces by the TOD, the effective parking supply will be 2,362 spaces. This assumes that current auxiliary uses of BART parking will discontinue; no spaces will be reserved for airport passengers or other entities such as Google. This parking supply would be able to accommodate the future BART parking demand with the TOD. However, if Caltrain riders are able to park in the BART facilities, as they are today, the combined parking demand from BART and Caltrain riders will exceed the supply. Options to balance the parking supply and demand include: 1) reclaim the airport and Google designated spaces, and/or 2) prevent Caltrain riders from parking in the BART parking areas.

SCENARIOS ANALYZED

Three land use scenarios were analyzed for ridership (BART/Caltrain), mode of access, and parking demand in year 2040. These scenarios are being considered as part of the Millbrae Station Area Specific Plan update. The first two scenarios are project-specific: transit-oriented development (TOD) on the BART property in the northeast quadrant of the Station Area Specific Plan area (herein known as Sites 5/6 TOD) and TOD in the northwest quadrant (herein known as Site 1 TOD). The third scenario is a program level analysis of buildout of the entire Station Area Specific Plan, which includes Sites 5/6 TOD, Site 1 TOD, and development of the southeast and southwest quadrants of the Specific Plan area. **Table 1** details the land use for each scenario.

TABLE 1. LAND USE SCENARIOS ANALYZED

Scenario	**Residential** (dwelling units)	**Office** (ksf)	**Retail** (ksf)	**Hotel** (rooms)
Site 1 TOD	500	267	32	0
Sites 5/6 TOD[1]	321	165	47	116
Specific Plan Buildout	1,437	1,577	143	325

[1]Currently proposed Site 5/6 project has 5% lower land use totals than shown above.

SITE 5/6 TOD PARKING SUPPLY CHANGES

The Sites 5/6 TOD developer proposes to eliminate all 883 surface level BART parking lot stalls and provide 317 replacement BART parking spaces, for a total net reduction of 566 parking spaces. All current 2,096 BART parking garage spaces would remain.

MILLBRAE STATION RAIL RIDERSHIP

This section describes existing BART and Caltrain ridership at the Millbrae Station and develops ridership forecasts for the 2040 baseline and the three MSASP land use scenarios.

EXISTING RIDERSHIP

According to existing ridership data provided by BART and Caltrain, there are approximately 6,430 daily BART boardings at the Millbrae Station and 3,255 daily Caltrain boardings. These include boardings (largely in the morning) for trips originating in Millbrae, boardings (largely in the afternoon) by Millbrae visitors and nearby employees, and transfers between BART and Caltrain. In 2013 Fehr & Peers conducted an intercept survey of Caltrain riders which asked questions about trip origin, destination, and mode of access. Through analysis of these responses it was estimated that approximately 1,600 riders transfer between BART and Caltrain daily. Each passenger would make two transfers per day: one transfer during the initial trip and one transfer in the opposite direction for the return trip. This estimate was validated by BART who estimated a similar number of daily transferring riders. Subtracting transfer trips, approximately 4,830 daily BART boardings and approximately 1,655 daily Caltrain boardings have an origin or destination at the Millbrae Station. **Table 2** details existing ridership for BART and Caltrain at the Millbrae Station.

TABLE 2. EXISTING MILLBRAE STATION DAILY BOARDINGS

	Non-Transfer	Transfer	Total
BART	4,830	1,600	6,430
Caltrain	1,655	1,600	3,255

BASELINE 2040 RIDERSHIP FORECASTS

Methodology

To produce future baseline 2040 ridership forecasts for BART and Caltrain at the Millbrae station, Fehr & Peers used ridership forecasts produced by the C/CAG Peninsula Corridor model operated by Santa Clara Valley Transportation Authority (VTA). These C/CAG model forecasts take into account a wide array of regional and corridor factors influencing transit ridership including population and employment densities, auto ownership rates, demographics, transit and highway travel conditions and other factors. The 2040 forecast takes into account the effects of service improvements of the Caltrain Electrification project as reported in that project's EIR, including the extension of Caltrain to the Transbay Terminal. Fehr & Peers also checked these forecasts against

forecasts of Caltrain and BART ridership produced by the Metropolitan Transportation Commission (MTC) travel model for the agency's most recent Regional Transportation Plan and found the C/CAG model forecasts to more specifically represent the planned land use and transportation changes anticipated in the corridor.

Ridership

Table 3 summarizes daily BART and Caltrain boardings for both Existing and 2040 Baseline conditions. Daily ridership on BART and Caltrain combined is projected to increase 47 percent from 9,685 to 14,200 by 2040. BART ridership is projected to increase by 18 percent, while Caltrain ridership (including transfers) is expected to double.

TABLE 3. MILLBRAE STATION DAILY BOARDINGS

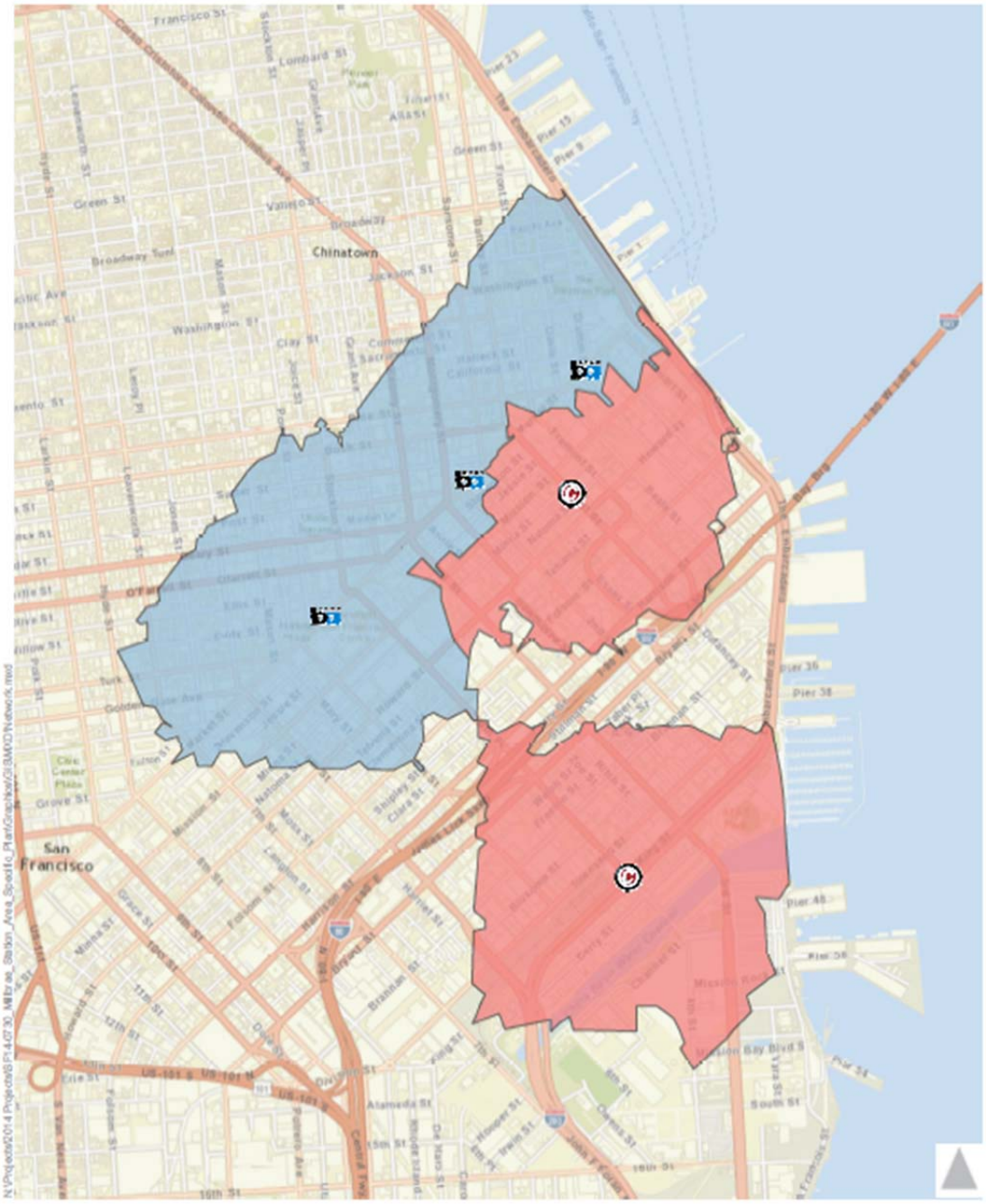
	Existing Conditions	2040 Baseline
BART		
Daily	6,430	7,560
Daily without Caltrain Transfers	4,830	5,720
Caltrain		
Daily	3,255	6,640
Daily without BART Transfers	1,655	4,800
TOTAL		
Daily	9,685	14,200
Daily without Transfers	6,485	10,520

The Millbrae station is the sole transfer hub between BART and Caltrain. Daily boardings excluding the 1,600 transfers are shown in Table 3. According to the C/CAG model, the number of daily transfers is expected to increase by 2040. However, this increase is expected to be lower than the percentage increase in ridership on BART and Caltrain. This is primarily due to the opening of the Transbay Terminal in San Francisco, which would allow passengers to commute directly from Caltrain stations along the Peninsula and South Bay into San Francisco without transferring to BART.

Caltrain vs. BART Ridership Differences Explained

Since in 2040 Caltrain will provide service to the Transbay Terminal, a walk shed analysis was conducted to help understand the shift in ridership from BART to Caltrain for riders with an origin or destination in the Financial District in San Francisco. This analysis looked at the walk shed around the downtown BART and Caltrain stations, using the sum of on-board transit times plus walk-to-destination times for trips between Millbrae and locations near downtown San Francisco. In 2040 the travel time on Caltrain between Millbrae and the Transbay Terminal will be approximately 24 minutes while the travel time on BART between Millbrae and the Montgomery Station will be about 31 minutes. This travel time savings gives Caltrain an advantage in serving certain destinations in the downtown area. However, seat availability will be much higher on BART than on Caltrain at the Millbrae Station since it is the end of the line station for BART but not for Caltrain. Using information from *TCRP Report 166: Characteristics of Premium Transit Services that Affect Choice of Mode*, this seating availability advantage was converted into equivalent in vehicle travel time to adjust the BART travel time to downtown San Francisco in order to make BART service more competitive with Caltrain. The ability to find a seat on BART was measured to be worth four minutes of in vehicle travel time. The resulting walk sheds for BART (blue) and Caltrain (red) are shown in **Figure 1**. As a result, trips between Millbrae and certain areas of the south-of-market (SOMA) area which would currently be served by BART would be served more quickly by Caltrain with the opening of the Transbay Terminal Station. Furthermore, a high percentage of employment and residential growth in San Francisco will occur in the SOMA and Mission Bay areas, both well served by Caltrain's 4th and King Station and Transbay Terminal Station. Between 2012 and 2040, 71 percent of the employment and population growth in the Financial District, SOMA and Mission Bay areas occur at locations closer to Caltrain stations than to BART stations. BART will retain several advantages, including direct service to other areas of San Francisco and the East Bay and seat availability for passengers boarding or considering a transfer from Caltrain in Millbrae. However, the Caltrain improvements listed above will mean that 48 percent of those boarding a San Francisco bound train at Millbrae in 2040 will board Caltrain while 52 percent will board BART (compared to 21 percent and 79 percent today).

FIGURE 1: Caltrain and BART Walksheds for Trips from Millbrae Station



2040 MSASP LAND USE SCENARIOS RIDERSHIP FORECASTS

Methodology

In order to estimate daily BART and Caltrain boardings at the Millbrae Station under the three 2040 MSASP land use scenarios summarized in Table 1, 2040 Baseline ridership, shown in Table 3, was used as a base and then ridership reductions due to parking removal and ridership generated by the TOD scenarios were incorporated into the forecasts.

MSASP Parking Reduction Impact on Ridership

The MSASP Site 5/6 TOD developer proposes to eliminate all 883 surface level BART parking lot stalls located at the Millbrae Station and provide 317 replacement BART parking spaces, for a total net reduction of 566 parking spaces from the current BART station parking supply. All current 2,096 BART parking garage spaces would remain. The resulting reduction in supply would reduce potential future ridership for BART, by 337 daily boardings and for Caltrain by 37 daily boardings when parking reaches capacity (projected to occur on most weekdays well before 2040). These potential riders could or would not shift to alternative modes of access such as kiss-ride, transit, walking or bicycling.

Ridership Generated by the MSASP

While some ridership would be lost due to elimination of parking spaces, this loss would be more than offset by the increase in BART and Caltrain riders generated by the MSASP TOD. Ridership generated by the three land use scenarios in 2040 (see Table 1) was forecast using a four-step modeling process including: 1) trip generation, 2) mode choice, 3) trip distribution, 4) trip assignment.

Trip Generation

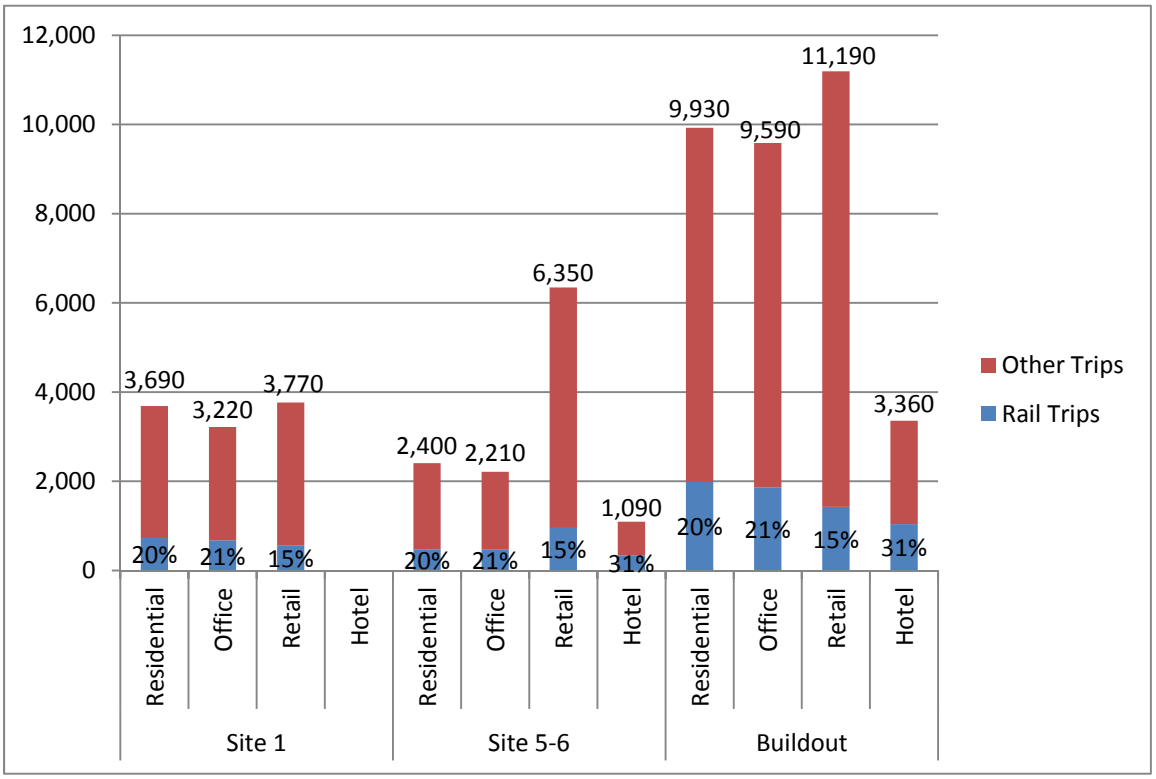
First, total daily trips generated were estimated using Fehr & Peers' MXD+ tool. This tool uses general site information, including intensity and size of land uses, as inputs and produces trip generation estimates that take into account reductions in trips due to internal capture of trips among mixed uses. Initial vehicle trip generation estimates are derived from standard ITE trip generation rates; the MXD+ tool then estimates internalization based on national research by the US EPA on the impact of smart growth factors such as development density, scale, design, accessibility, transit proximity, demographics and mix of uses on site trip generation. The MXD+

tool has been validated for sites within California. Output of the tool includes trips generated by each land use and by trip purpose.

Mode Share

Literature on travel behavior of TOD residents and workers was reviewed to develop mode share estimates of trips generated by the TOD. Research shows that trips to and from TODs have higher transit mode shares than for locations not located near transit stations.[2] Due to its proximity to two rail lines, the TOD is expected to have a high transit mode share. This mode share was applied to the trip generation results to estimate total daily rail boardings generated by the TOD. **Figure 2** shows the total daily person trips generated by each project scenario by land use (trips generated are listed at the top of each bar) and the percent of trips for each land use which are by rail, including both BART and Caltrain (rail share shown as percent on each bar).

FIGURE 2: Daily Person Trips Generated by each Scenario by Land Use



[2] Hollie Lund, Robert Cervero, and Richard Willson, "Travel Characteristics of Transit-Oriented Development in California," January 2004.

Trip Distribution and Assignment

Rail trip distribution and assignment of trips to either BART or Caltrain were determined using existing BART and Caltrain ridership data paired with intercept survey results. Those transferring at Millbrae were excluded from the analysis. Trips between Millbrae and downtown San Francisco in 2040 would not match existing trip assignment due to changes to the transit system by 2040 such as the opening of the Caltrain Transbay Terminal Station. In order to determine future assignment of these trips, the ratio of total households and jobs located in each walk shed shown in Figure 1 was used to assign the share of rail trips between Millbrae and downtown San Francisco which would use BART and Caltrain.

The daily BART and Caltrain boardings at the Millbrae Station generated by each land use scenario are summarized in **Table 4**.

TABLE 4. MILLBRAE STATION BOARDINGS GENERATED BY MSASP LAND USE SCENARIOS

Scenario	Daily BART Boardings	Daily Caltrain Boardings
Site 1	582	403
Sites 5/6	659	456
Buildout	1,863	1,290

Ridership Forecasts

Table 5 shows the total daily BART and Caltrain boardings forecasts at the Millbrae Station in 2040 under baseline conditions and with the three land use scenarios (excluding transfers between BART and Caltrain). These forecasts consider both riders lost due to reduction in parking supply on BART property and riders gained through the TOD, as described above.

TABLE 5. MILLBRAE STATION BOARDINGS WITH MSASP LAND USE SCENARIOS (TRANSFERS REMOVED)

	2040 Future Baseline	2040 with Site 1	2040 with Sites 5-6	2040 Buildout
Daily BART Boardings (Caltrain transfers removed)	5,720	5,960	6,040	7,250
Daily Caltrain Boardings (BART Transfers removed)	4,800	5,170	5,220	6,060
TOTAL Daily Boardings (transfers removed)	10,520	11,130	11,260	13,310

In terms of net ridership effects, daily BART boardings at Millbrae are forecast to increase by 240 boardings above 2040 Baseline with Site 1, 320 boardings above 2040 Baseline with Sites 5-6, and 1,530 boardings above 2040 Baseline with full Specific Plan Buildout.

MODE OF ACCESS

Changes to the transit system and station area will not only impact the number of riders in the future but also how these riders access the Millbrae Station. This section looks at how mode of access changes between existing and 2040 baseline conditions, as well as for each MSASP land use scenario.

METHODOLOGY

Existing

BART existing mode of access estimates were obtained through BART's 2008 on-board survey results. Caltrain existing mode of access estimates were obtained through a rider intercept survey conducted by Fehr & Peers in 2013 as part of the Caltrain Electrification EIR. Independent of train-to-train transfers, the majority of those boarding BART in Millbrae (67 percent) drive to the station while only 28 percent of those boarding Caltrain drive. As an end-of-line station, Millbrae's BART passengers come from a large area in the north and central Peninsula where park-ride drive access is the most convenient approach. Caltrain offers opportunities for system access along the full length of the Peninsula, so that most riders access Caltrain at the most convenient station rather than driving to Millbrae.

2040 Baseline

The 2040 Baseline mode of access forecasts for both BART and Caltrain are based on shifts in mode of access forecast by the C/CAG model. Due to changes in the transit system by 2040 (e.g. the opening of the Transbay Terminal Caltrain Station) and changes in regional land use, the origins and destinations of those using BART and Caltrain will shift in the future. This will impact how and where riders access each transit system. As a result, the forecasts show a reduction in the number of riders accessing BART at Millbrae by driving (PNR or KNR) and an increase in the number accessing the station by bus or shuttle. Caltrain will see the number of its riders accessing by all modes of access increase. While the number of riders accessing Caltrain by driving will increase, the percent of daily riders accessing by these modes will remain similar to existing conditions. However, excluding BART transfers, the number accessing Caltrain by bus or shuttle is expected to increase at a faster rate than the number accessing by walking or biking. A component of these shifts can be attributed to improved transit service to the station through SamTrans El Camino Real BRT service as well as to an increase in the number of both public and private shuttles serving the station. Another factor is projected major development occurring in Burlingame east of US 101 with access primarily via local bus and shuttle.

2040 with MSASP Land Use Scenarios

2040 with TOD (Site 1, Sites 5/6, and Specific Plan buildout) mode of access forecasts for each of the scenarios were forecast by assuming a reduction of 337 PNR daily BART boardings and 37 daily Caltrain boardings due to the reduction in parking at the station and an increase in the number of walk/bike boardings according to the daily boardings generated by the TOD for each scenario, summarized in **Table 4**. These changes demonstrate a further reduction in driving access to the station as a share of total boardings and an increase in the walk/bike access mode share to the station for both BART and Caltrain.

MODE OF ACCESS FORECASTS

Figures 3 and **4** show the daily modes of access for BART and Caltrain, respectively, for riders originating at Millbrae (excluding pass-through trips transferring between BART and Caltrain). The breakdown includes the percent that access the station by walk/bike, transit (bus or shuttle), kiss-and-ride (KNR), and park-and-ride (PNR). Since these percentages are based on total daily boardings, they include the mode of access for both those boarding at Millbrae for their initial

trip (Millbrae is the home or origin station) and those boarding at Millbrae for their return trip (Millbrae is the destination station).

FIGURE 3: BART Daily Mode of Access
(Caltrain transfers removed)

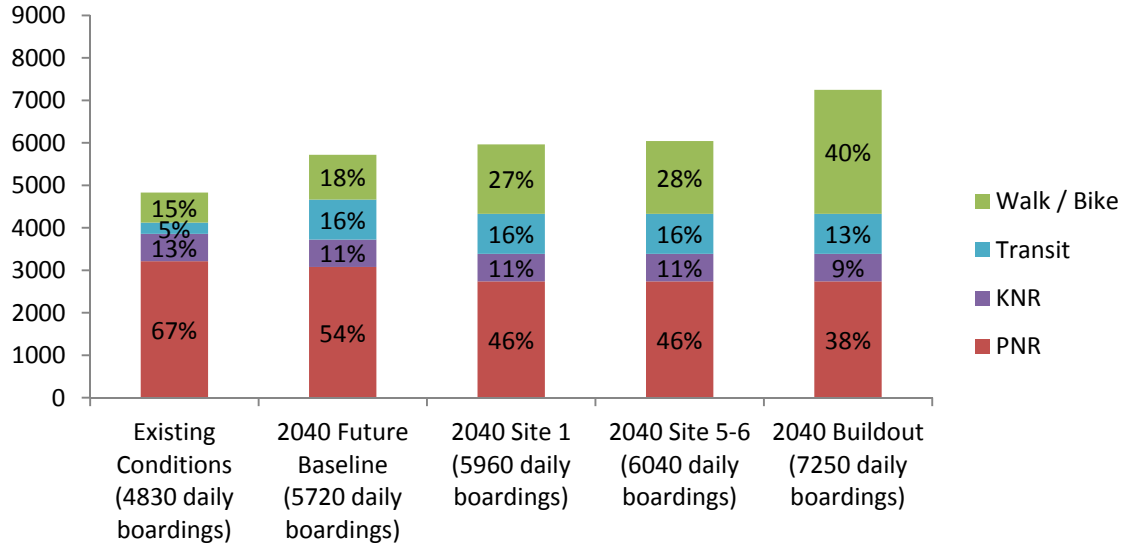
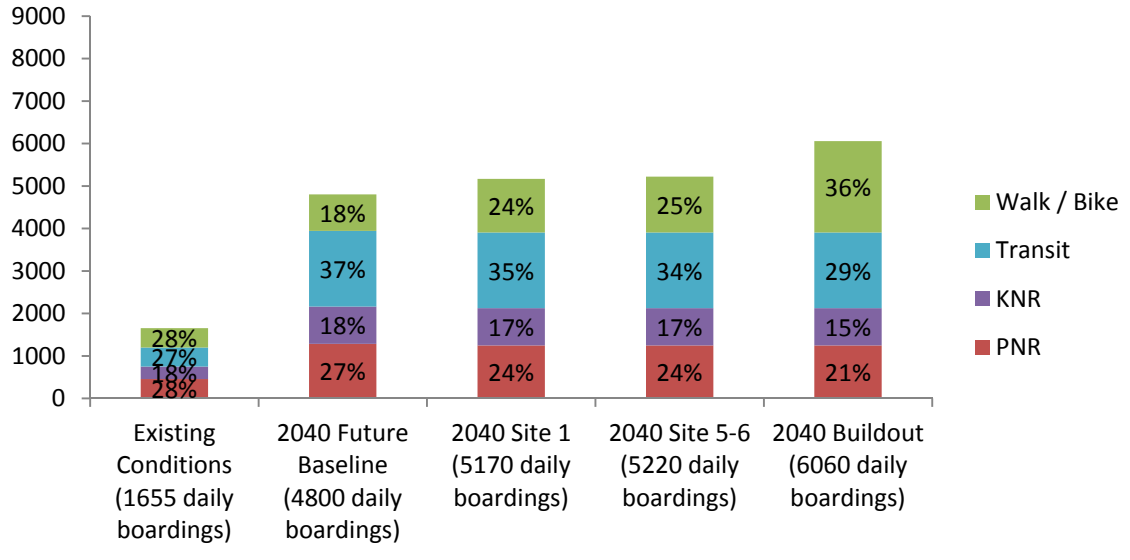


FIGURE 4: Caltrain Daily Mode of Access
(BART transfers removed)



The only difference between the 2040 Site 1, 2040 Sites 5/6 and 2040 Buildout scenarios is the number of residents in the TOD walking or biking to BART and Caltrain. For both BART and Caltrain, the absolute number of riders using Transit, KNR or PNR to access the station remain the same between the three scenarios. However, under the Sites 5/6 scenario, there are more residents than under the Site 1 scenario and therefore more residents walking or biking to BART and Caltrain. Under the Buildout scenario there are more residents than under the Sites 5/6 scenario. Due to the increase in TOD residents, the mode shares shift towards a higher walk/bike mode share under the Buildout scenario, while the mode share for the other modes decreases, even though the absolute number using each of these modes (transit, PNR, KNR) remains the same.

TRANSIT STATION PARKING DEMAND

The demand for parking spaces at the Millbrae Station varies throughout the day as vehicles come and go. Together the ridership and PNR mode of access values provide information about the number of vehicles parking at the station throughout the day; however, not all of these vehicles will be parked at the station at the same time. The parking demand is defined as the peak number of vehicles wanting to park in the parking facilities at any given time. If the parking facilities are under capacity, the parking demand can be estimated as the peak parking occupancy. However, if the facilities are over capacity, the demand will be higher than supply.

EXISTING PARKING DEMAND

The Millbrae BART station currently has a parking garage for BART patrons with a total of 2,096 parking spaces and four parking lots with a total of 883 parking spaces, for a total parking supply of 2,979 spaces. However, 30 of these spaces are leased to Google as a park-ride location, and 42 spaces are reserved for station agents, reducing the total supply available to the public to 2,907 spaces. On weekdays, 357 of these spaces are reserved for permit holders and 230 are reserved for airport/long-term parkers until 10:00 AM when these spaces become publicly available.[1] The Caltrain parking lot at the station has a total of 185 parking spaces. However, Caltrain riders are also allowed to park in the BART parking facilities.

On a typical weekday, the BART parking reaches peak occupancy of around 90 - 95 percent.[3] According to data provided by BART, the typical occupancy of the reserved airport spaces on a weekday at 10:00 AM is 74 percent, at which point the remaining spaces open up to general BART and Caltrain riders. Subtracting out the station agent, Google, and airport parking, the estimated daily parking demand for general BART and Caltrain riders at the BART parking facilities is approximately 2,440.

Through analysis of 2013 Caltrain rider intercept surveys, which asked riders questions about how they got to the station and where they parked, the estimated parking demand by Caltrain riders at the Millbrae Station is 335. Since the Caltrain parking lot has 185 spaces, up to 185 vehicles park in this lot and the remaining 150 vehicles park in the BART parking facilities (BART does not track the number of Caltrain riders using these facilities). In sum, about 150 Caltrain riders presently park in the BART parking facilities along with approximately 2,290 BART riders.

PARKING DEMAND FORECASTS

By 2040 the daily number of BART riders accessing the Millbrae Station by PNR will decrease while the number of Caltrain riders accessing the station by PNR will increase, as described in the Mode of Access section. According to the existing conditions analysis, both Caltrain and BART parking spaces turn over during the course of the day, so that the peak accumulations are less than 100 percent of all vehicles that park at the station. The current Caltrain peak parking demand is approximately 73 percent of daily Caltrain PNR access, and BART's peak parking demand is approximately 71 percent of daily PNR access. These rates were assumed to remain constant in 2040. The existing and 2040 parking demand generated by BART and Caltrain riders is summarized in **Table 6**.

[3] Information provided by Robert Franklin, BART, in August 2014

TABLE 6. MILLBRAE STATION PARKING DEMAND

	BART	Caltrain	Total
Existing	2,280	335	2,615
2040 Baseline	2,180	940	3,120
2040 Site 1 TOD	1,940	910	2,850
2040 Site 5-6 TOD	1,940	910	2,850
2040 Buildout	1,940	910	2,850

BART and Caltrain Parking Demand Changes Explained

As shown in **Table 6**, parking demand by BART patrons is expected to decline from existing to 2040 Baseline conditions. This is primarily due to changes in land use and transit provision in the future, impacting travel patterns across the region resulting in a shift in how riders will access BART away from PNR access and towards bus and shuttle access. Caltrain ridership (excluding passthrough trips) will nearly triple between Existing and 2040 Baseline conditions and as a result parking demand by Caltrain ridership at the Millbrae Station will increase significantly.

If Caltrain riders are allowed to park in the BART parking facilities in 2040, the combined demand for BART and Caltrain riders who park will exceed the parking supply with the buildout of the TOD and the related net reduction of 566 spaces even if BART reclaims the 230 parking spaces it currently leases to the airport and 30 to Google. As a result, some BART ridership will be lost (approximately 337 daily riders) unless they can find parking at other Peninsula stations. However, this lost ridership will be more than replaced by ridership generated by the TOD.

BART Parking Strategies for Maximizing Ridership

Fehr & Peers has identified two simple-in-concept options BART could pursue to minimize the loss of BART patron park-and-riders at the Millbrae Station:

A. Reclaim the airport and Google designated spaces. If BART were to reclaim all 230 airport and 30 Google spaces and allowed Caltrain riders to park in the BART parking facilities, parking demand would still exceed supply by 13 percent in 2040 with any of the three MSASP land use scenarios.

B. Prevent Caltrain riders from parking in the BART parking areas. If BART develops the means through which to completely prevent Caltrain riders from parking in the BART garage and lots, the BART parking supply will exceed the BART parking demand, even with the reduced parking supply due to the Sites 5/6 TOD, and no BART park-and-riders will be lost. However, Caltrain may lose riders and generate spillover parking and traffic impacts on surrounding streets.

The effective BART parking supply and utilization rates for these scenarios are shown in **Table 7**.

TABLE 7. MILLBRAE STATION PARKING DEMAND WITH NO RESERVED SPACES FOR AIRPORT OR GOOGLE

	Utilization of Effective Supply (both BART and Caltrain parkers)	**Utilization of Effective Supply** (Caltrain parkers excluded)	**Effective BART Parking Supply[1]**
2040 Future Baseline	100%	74%	2,928
2040 Site 1 TOD	113%	92%	2,362
2040 Site 5-6 TOD	113%	92%	2,362
2040 Buildout	113%	92%	2,362

1. Assumes 42 spaces reserved for station agents, no spaces reserved for airport or Google

If BART retains 185 spaces for the airport and/or Google, and excludes Caltrain riders from parking in the BART parking facilities, the BART parking facilities will be at capacity with the TOD in 2040. However, if Caltrain riders are allowed to park in the BART facilities, the demand will exceed the supply be 23 percent, as shown in **Table 8**.

TABLE 8. MILLBRAE STATION PARKING DEMAND WITH 185 SPACES RESERVED FOR AIRPORT AND GOOGLE

	Utilization of Effective Supply (both BART and Caltrain parkers)	**Utilization of Effective Supply** (Caltrain parkers excluded)	**BART Parking Supply[1]**
2040 Future Baseline	107%	79%	2,743
2040 Site 1 TOD	123%	100%	2,177
2040 Site 5-6 TOD	123%	100%	2,177
2040 Buildout	123%	100%	2,177

1. Assumes 42 spaces reserved for station agents, 185 spaces reserved for airport and/or Google

APPENDIX C: ROLLINS ROAD MICROSIMULATION – ALTERNATIVES ANALYSIS RESULTS & RECOMMENDATIONS

FEHR PEERS

MEMORANDUM

Date: May 26, 2015

To: Chip Taylor, City of Millbrae

From: Steve Crosley, Dan Hennessey, and Matthew Crane

Subject: Rollins Road Microsimulation – Alternatives Analysis Results & Recommendations

SF14-0730

Fehr & Peers has prepared AM and PM peak hour models using the microsimulation modeling platform VISSIM to analyze the operations of Rollins Road from Millbrae Avenue to the BART parking structure entrance under five different circulation alternatives. This memorandum:

- Provides the City of Millbrae with the results of the microsimulation analysis for Year 2040 projected traffic volumes;
- Discusses the operational differences between the alternatives; and
- Recommends an optimal configuration for Rollins Road.

The microsimulation model simulated the operation of all internal intersections in the station area along Rollins Road, although the analysis results are focused on the operations of three key intersections: Millbrae Avenue and Rollins Road, Garden Lane and Rollins Road, and "Multimodal Station Access Road" and Rollins Road.

The initial site plans provided to Fehr & Peers (prepared by Republic Urban) include a reconfigured Rollins Road with these new/redesigned intersections and a reduced roadway width (fewer travel lanes compared to existing conditions). Currently, Rollins Road has two to three travel lanes in each direction within the station area, with three inbound lanes and four outbound lanes at the entrance to the station area. The proposed site plan reduces the Rollins Road profile by one to two lanes in each direction, with an additional, outbound right-turn lane at Millbrae Avenue. The microsimulation analysis found that the reduced width of Rollins Road does not adversely affect traffic operations with the proposed roadway network.

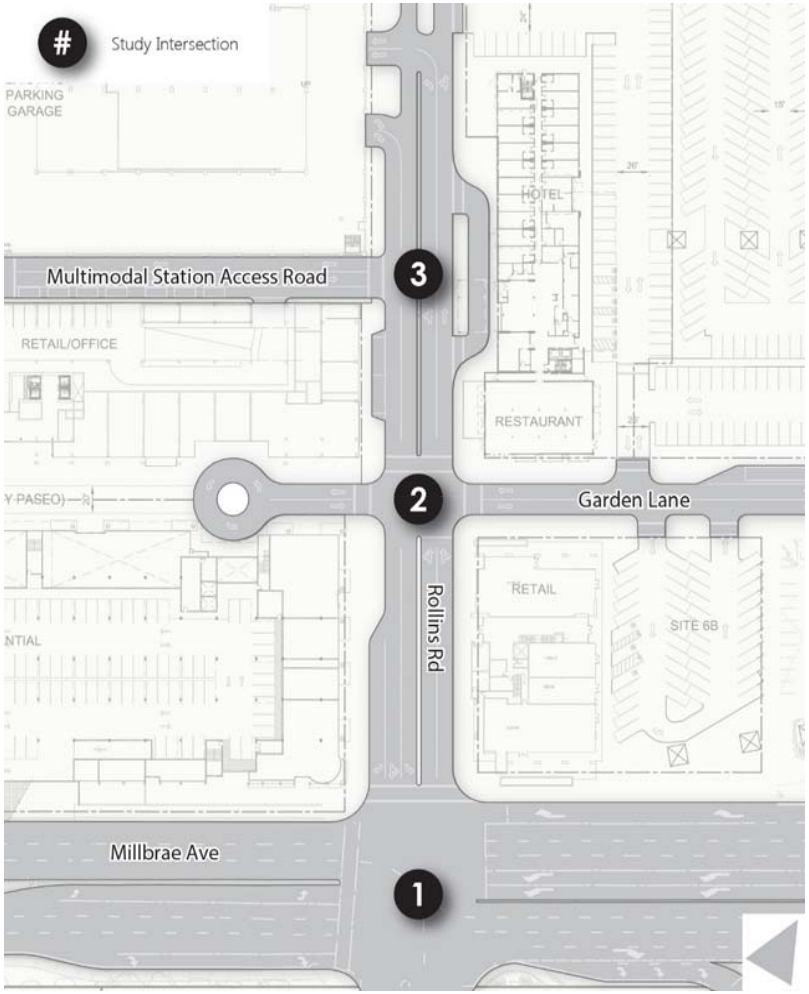
Summary of Findings

Based on the results of the alternatives analysis, the ultimate configuration for the Rollins Road corridor would be:

- Side-street stop control at Garden Lane
- Crossing treatments to increase pedestrian and bicycle crossing visibility and comfort on Rollins Road
- All shuttles/buses utilizing the Multimodal Station Access Road
- A connection to Station Access Road

GENERAL ASSUMPTIONS AND ALTERNATIVES

The vehicle, shuttle, pedestrian, and bicycle volumes and other factors that were assumed as part of this analysis are detailed in our prior memorandum *Rollins Road Microsimulation – Alternatives Selection and Assumptions* dated April 1, 2015 and included in Appendix A. **Figure 1** shows the AM and PM peak period Year 2040 traffic volumes that were used for all of the alternatives.



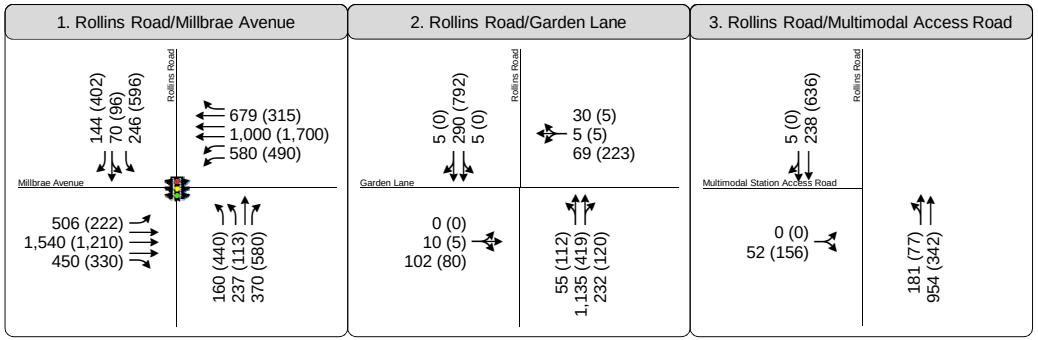


Figure 1
Peak Hour Traffic Volumes and Lane Configurations
Year 2040 Conditions

The following five circulation alternatives and their variations were simulated under 2040 conditions:

1) **Side-street stop control** at Rollins Road & Garden Lane and Rollins Road & Multimodal Station Access Road. All shuttles and over-the-road (OTR) coaches use Multimodal Station Access Road and kiss-and-ride activity occurs inside the BART parking garage.
    a. **All-way stop control** at Rollins Road & Garden Lane. All shuttles and OTR coaches use Multimodal Station Access Road. Assume kiss-and-ride activity occurs inside the BART parking garage.
2) **Signal control** at Rollins Road & Garden Lane and side-street stop control at Rollins Road & Multimodal Station Access Road. All shuttles and OTR coaches use Multimodal Station Access Road and kiss-and-ride activity occurs inside the BART parking garage.
3) **BART Proposed Alternative** with side-street stop control at Rollins Road & Garden Lane and Rollins Road & Multimodal Station Access Road. Assume 50% of shuttles (<35') use Multimodal Station Access Road and 50% of shuttles (OTR coaches (>35')) use Rollins Road and Garden Lane (Note: length of Rollins Road between Multimodal Station Access Road and Garden Lane is approximately 130'; curb cut is approximately 60' as shown in Republic Urban site plan. Curb cut cannot accommodate 45' OTR coaches. We assumed up to two 45' OTR coaches can load in the curb lane; the remaining demand will use east Garden Lane. No loading will be permitted on Rollins Road south of Garden Lane). Kiss-and-ride activity occurs inside the BART parking garage. No access from BART parking garage to South Station Road (residential egress south of Garden Lane from Parcel 5B is allowed).
4) **Raised median along the entirety of Rollins Road** which prevents left turns to or from all roadways/driveways (all access is right in/right out). All vehicles, shuttles, and OTR coaches accessing the BART Garage, Multimodal Station Access Road, or Garden Lane west of Rollins Road must travel through the turnaround at the north end of Rollins Road. All shuttles go to Multimodal Station Access Road and kiss-and-ride activity occurs inside the BART parking garage.
5) **Multimodal Station Access Road** southbound connection to South Station Road, which allows shuttles, OTR coaches, and kiss-and-ride to exit the station area via Adrian Road to Rollins Road/Millbrae Ave. A raised median along the entirety of Rollins Road identical to Alternative #4, all shuttles and OTR coaches utilize Multimodal Station Access Road, and kiss-and-ride activity occurs on South Station Road.

A base VISSIM model was prepared with vehicle volume inputs based on counts taken at the site. The model was properly calibrated to existing conditions, with 99-101% of vehicle demand volume served at each intersection. Queue lengths in the model were also observed to reflect field conditions.

SIMULATION OPERATIONS AND RESULTS

Under all alternatives, inbound vehicles queue at the three Rollins Road intersections in the morning, while in the afternoon outbound vehicles form queues on southbound Rollins Road at Millbrae Avenue, as shown in **Figure 2**. Because of this, the Rollins Road corridor operates more efficiently in the AM peak period than the PM peak period. During the AM peak period, the vehicle demand entering the station area in the morning is spread across three approaches and metered into the station area by the signal at Millbrae Avenue. In the PM peak period, the vehicle demand is concentrated solely on the Rollins Road corridor, which results in significant queuing and delay for the internal station intersections.

Tables 1 and **2** present the simulation performance results for each intersection for each circulation alternative during the AM and PM peak periods, respectively. Performance metrics include percentage of demand volume served at each intersection (as well as for the corridor as a whole) and vehicular level of service by intersection. Detailed VISSIM output sheets are provided in Appendix B.

TABLE 1 SIMULATION PERFORMANCE RESULTS – AM PEAK HOUR

Intersection	Demand Volume (veh/hr)	Alternative 1		Alternative 1a		Alternative 2		Alternative 3		Alternative 4		Alternative 5	
		Percent Served	LOS	Percent Served	LOS	Percent Served	LOS	Percent Served	LOS	Percent Served	LOS	Percent Served	LOS
1. Rollins Road / Millbrae Avenue	*5,982 (5,982)[1] [5,873][1]*	95.6%	E	70.1%	F	86.9%	F	95.6%	E	90.9%[2]	F	90.8%[2]	F
2. Rollins Road / Garden Lane	*1,938 (2,062)[1] [1,953][1]*	98.9%	A	74.8%	C	91.3%	B	98.9%	A	93.0%[2]	C	91.6%[2]	B
3. Rollins Road / Multimodal Station Access Road	*1,430 (1,929)[1] [1,820][1]*	102.1%	A	75.4%	A	93.8%	A	102.1%	A	93.1%[2]	A	91.5%[2]	A
Total	***9,350 (9,973)[1] [9,646][1]***	***97.3%***	***-***	***71.9%***	***-***	***88.9%***	***-***	***97.3%***	***-***	***91.7%[2]***	***-***	***91.1%[2]***	***-***

Notes:

1. Demand volume for Rollins Road / Garden Lane and Rollins Road / Multimodal Station Access Road is different under Alternatives 4 and 5 due to the prohibition of left turns across Rollins Road. Parentheses indicate the demand volume under Alternative 4, while brackets indicate the demand volume under Alternative 5.
2. Percent served is calculated based on unique demand volume for Alternatives 4 and 5.

Source: Fehr & Peers, 2015

TABLE 2 SIMULATION PERFORMANCE RESULTS – PM PEAK HOUR

Intersection	Demand Volume (veh/hr)	Alternative 1		Alternative 1a		Alternative 2		Alternative 3		Alternative 4		Alternative 5	
		Percent Served	LOS	Percent Served	LOS	Percent Served	LOS	Percent Served	LOS	Percent Served	LOS	Percent Served	LOS
1. Rollins Road / Millbrae Avenue	*6,494 (6,494)[1] [6,356][1]*	94.1%	D	92.2%	D	82.1%	F	94.1%	D	95.9%	D	97.6%	D
2. Rollins Road / Garden Lane	*1,761 (2,101)[1] [1,964][1]*	82.4%	F	78.3%	F	68.6%	E	82.4%	F	86.5%[2]	E	94.4%[2]	C
3. Rollins Road / Multimodal Station Access Road	*1,211 (1,978)[1] [1,841][1]*	89.2%	F	74.0%	E	64.6%	F	89.2%	F	86.1%[2]	E	94.2%[2]	C
Total	***9,466 (10,573)[1] [10,161][1]***	***92.4%***	***-***	***87.3%***	***-***	***77.4%***	***-***	***92.4%***	***-***	***92.2%[2]***	***-***	***96.4%[2]***	***-***

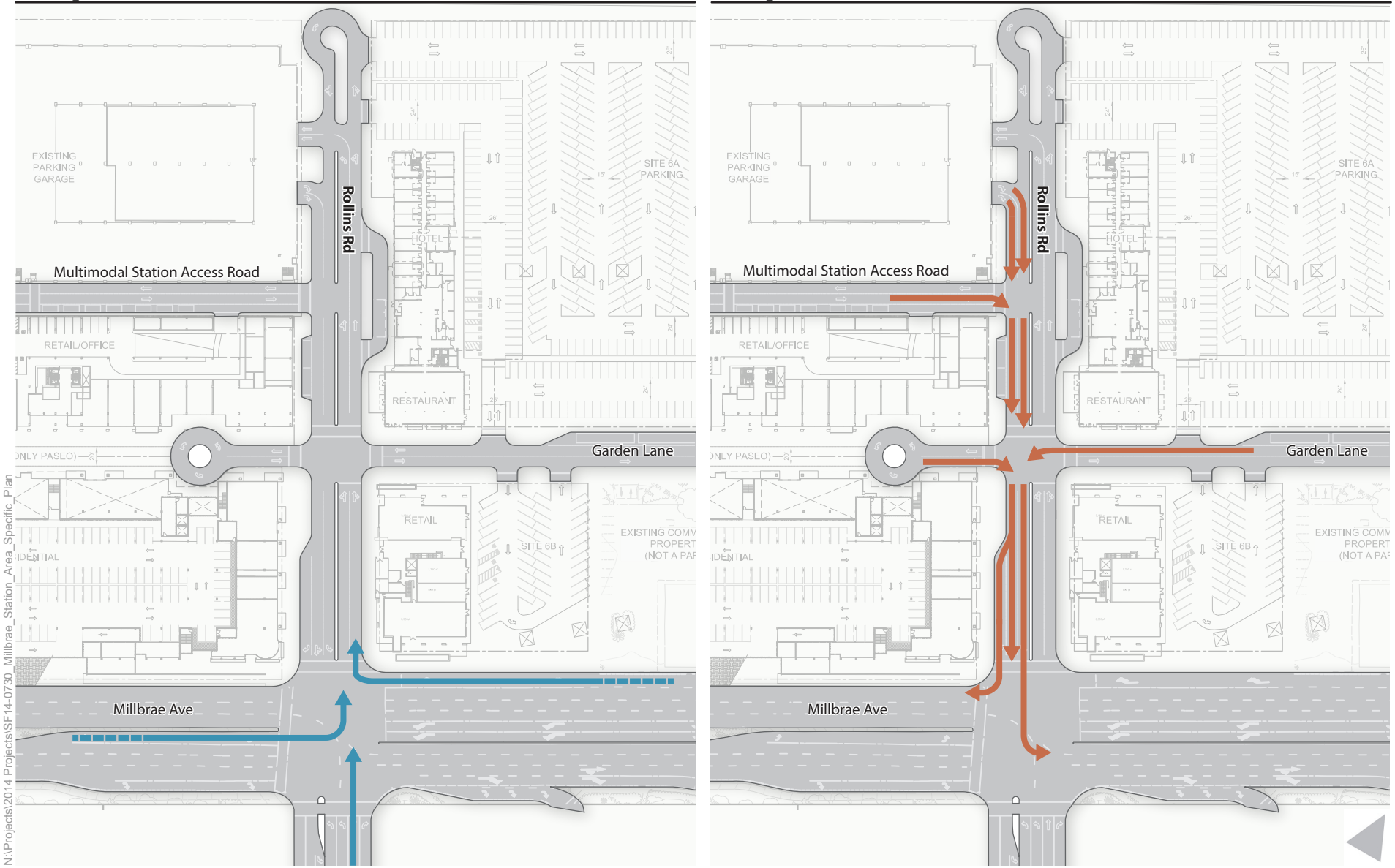
Notes:

1. Demand volume for Rollins Road / Garden Lane and Rollins Road / Multimodal Station Access Road is different under Alternatives 4 and 5 due to the prohibition of left turns across Rollins Road. Parentheses indicate the demand volume under Alternative 4, while brackets indicate the demand volume under Alternative 5.
2. Percent served is calculated based on unique demand volume for Alternatives 4 and 5.

Source: Fehr & Peers, 2015

AM QUEUING

PM QUEUING



AM Queuing

PM Queuing

Figure 2

Rollins Road

Table 3 summarizes the advantages and disadvantages of each circulation alternative, which are discussed in detail below.

TABLE 3 ADVANTAGES AND DISADVANTAGES OF CIRCULATION ALTERNATIVES

Alternative	Advantages	Disadvantages
Alternative 1 – Side Street Stop (No control on Rollins Road at Garden Lane)	• Efficient vehicle flow into and out of station area	• Pedestrian and bike crossing of Rollins is uncomfortable and potentially hazardous • Queue on eastbound left turn on Millbrae into the station area exceeds storage length in AM and PM peak period
Alternative 1a – All-Way Stop	• Provides improved operations for traffic on Garden Lane • Provides controlled crossing for pedestrians and bicyclists to cross Rollins Road	• Creates bottleneck at Garden Lane degrading vehicular flow into and out of the station area, • Increased queuing on all Millbrae approaches to the station area during the AM and PM than Alternative 1
Alternative 2 – Signal	• Provides more efficient operation of Garden Lane than Alternative 1a. • Further enhances comfort and safety for pedestrians and bicyclists since movements are signalized	• While more efficient than Alternative 1a, the Garden Lane intersection continues to be a bottleneck, degrading vehicular flow along the corridor • Queuing on all Millbrae approaches to the station area is more severe in the PM peak than Alternative 1a, but less severe than Alternative 1a in the AM peak
Alternative 3 – BART-proposed Side-Street Stop	• Efficient vehicle flow into and out of station area as in Alternative 1	• Increase in pedestrian volume crossing Rollins Road due to shuttle stops on Garden Lane at an uncontrolled location presents an increased discomfort and safety risk • Locating shuttle stops far from the main station entrance increases walking distance from 240 to 1,000 feet for shuttle riders

Alternative 4 – Median	• Provides for more efficient outbound traffic flow in the PM peak period than Alternatives 1, 1a, 2, and 3	• Inbound traffic in the AM peak period causes congestion at the turnaround, which results in queue spillback at all Millbrae approaches, which are more severe than Alternative 1, but not as severe as Alternative 1a • Increased through traffic volume along Rollins Road increases discomfort and safety risk for pedestrians and bicycles wishing to cross
Alternative 5 – Station Access Road	• Secondary egress provided by Station Access Road improves outbound traffic flow along Rollins Road compared Alternative 4	• Inbound traffic in the AM peak period continues to cause congestion at the turnaround • Queuing at all Millbrae approaches similar to Alternative 4

Side-Street Stop Control Alternatives

Alternative 1 (side-street stop) and Alternative 3 (BART-proposed side-street stop) operate similarly, as both provide side-street stop control at Garden Lane; however, in Alternative 3, larger buses (over 35 feet long) would use a bus loop on Garden Lane and two on-street bus bays along Rollins Road for loading and unloading passengers, while smaller shuttles (35 feet and shorter) would continue to use the Mulitmodal Station Access Road bus bays. While the on-street bus bays on Rollins Road restrict traffic flow temporarily in the southbound/outbound direction when a bus is stopped, over the course of each peak hour the operation of the corridor is not significantly affected.

Signal/All-Way Stop Control Alternatives

Compared to the other circulation alternatives, Alternative 1a (all-way stop control) and Alternative 2 (signal control) are unique in that both implement traffic control at Garden Lane for vehicles traveling along Rollins Road. The full traffic control provides side-street traffic on Garden Lane with a better level of service, but at the expense of the overall traffic flow on Rollins Road. The result is that the intersection of Rollins Road and Garden Lane becomes a bottleneck, which causes inbound vehicles in the morning to queue onto the Millbrae Avenue approaches and outbound vehicles in the afternoon to queue into the upstream internal intersections and side streets at a greater level than the other alternatives. Alternative 2 implements a signal at Garden Lane, which provides more

efficient traffic control than all-way stop (as under Alternative 1a); however, these alternatives serve fewer vehicles at the intersection and through the Rollins Road corridor than other alternatives with side-street stop at Garden Lane.

Center Median Alternatives

Alternatives 4 and 5 operate similarly to one another in that left turns along Rollins Road are prohibited through the installation of a center median, which directs nearly all inbound traffic to travel through the turnaround located at the northern end of Rollins Road. Since the turnaround is only one lane wide, it acts as a bottleneck during the AM peak period and results in significant vehicle queuing that degrades intersection operations at Garden Lane and at Millbrae Avenue (compared to operations under Alternatives 1 and 3). However, in the PM peak period this configuration significantly improves intersection operations and percentage of vehicles served compared to Alternatives 1 and 3, because there is no left-turning traffic to conflict with southbound/outbound traffic flow along Rollins Road.

Alternative 5 differs from Alternative 4 in that a southbound/outbound connection to Station Access Road is provided for outbound Kiss-and-Ride vehicles and shuttles/buses to exit the station area instead of using Rollins Road. The corresponding reduction in traffic improves intersection performance during both peak periods compared to Alternative 4, but more greatly during the PM peak period when outbound vehicle demand is highest. The percentage of vehicles served by Alternative 5 is lower than Alternative 4 in the AM peak. This is because the number of vehicles exiting the site, which are typically served near or at 100 percent of the demand volume, has decreased from Alternative 4. While the number of vehicles exiting has decreased, the number of entering vehicles remains the same as Alternative 4, and these vehicles are typically served at about 90 percent of the demand volume. Therefore, the overall percentage of vehicles served decreases since a larger portion of all vehicles are less than 100 percent served. In the PM peak, the diversion of a portion of the outbound vehicle trips to Station Access Road helps reduce outbound congestion along Rollins Road, which allows a higher percentage of vehicles to be served.

In general, implementing a median along Rollins Road provides an operational benefit to the corridor in the PM peak period, but the significant inbound queuing during the AM peak period, which is a result of nearly all inbound traffic needing to travel through the turnaround, deteriorates operations along Rollins Road. Therefore, it is recommended that should an alternative with a median be pursued, the northern turnaround be redesigned to be two lanes wide, which would facilitate easier traffic flow through the turnaround and into the adjacent BART parking garage.

In addition, similar to implementing side-street stop control at Garden Lane, implementing the median presents an even more uncomfortable condition for pedestrians and bicyclists due to the increased through volume along Rollins Road. Design measures to improve the crossings would need to be installed along Rollins Road to aid pedestrian visibility and comfort.

RECOMMENDATIONS

Based on the microsimulation alternatives analysis, we are providing four key roadway configuration recommendations for consideration in the final design of Rollins Road. Additionally, the analysis found that the reduced width of Rollins Road, as proposed by Republic Urban, is sufficient to handle the traffic volumes projected to 2040.

Recommendation #1

Traffic control at Rollins Road and Garden Lane should be side-street stop controlled (with stop signs on the Garden Lane approaches). Implementing traffic control on Rollins Road creates a bottleneck which causes inbound vehicles in the morning to queue onto the Millbrae Avenue approaches and outbound vehicles in the afternoon to queue into the upstream internal intersections and side streets.

Recommendation #2

A secondary egress route from the station area via Station Access Road (as under Alternative 5) provides a measurable benefit to the overall operation of the Rollins Road corridor. This is because some of the outbound vehicles that would otherwise exit via Rollins Road would be able to exit via an alternate route, which results in lower outbound congestion, allowing vehicles to more easily exit the station area. This benefit is most apparent during the PM peak period when outbound vehicle demand is the highest.

Recommendation #3

Focusing transit service along the Multimodal Station Access Road allows for shuttles to continue to have access close to the main entrance to the station (similar to existing conditions). In turn, this allows shuttles to remain attractive to patrons, since the distance they must travel to and from the station to the shuttle stop is relatively short and does not require any roadway crossings. Locating shuttles stops in areas far away from the main station entrance may make the shuttle service less attractive and either increase private vehicle use or decrease the number of BART riders. In addition,

the number of pedestrians needing to cross Rollins Road to access the shuttle stops would increase, thereby increasing the safety risk for those pedestrians. Therefore, it is recommended that all shuttle service be able to access the Multimodal Station Access Road.

Recommendation #4

While the recommended configuration for side-street stop control at Garden Lane would benefit vehicular traffic flow, it presents an uncomfortable and potentially hazardous condition for pedestrians and bicyclists wishing to cross Rollins Road due to the high volume of traffic. Therefore, it is recommended that measures such as rectangular rapid flashing beacons, enhanced crosswalks, signage, and/or other treatments should be implemented to make pedestrian and bicyclist crossings highly visible to drivers on Rollins Road.

RECOMMENDED CONFIGURATION PLAN

Based on the results of the alternatives analysis and the recommendations above, the initial configuration for the Rollins Road corridor would be:

Side-street stop control at Garden Lane (phased approach)
Crossing treatments to increase pedestrian and bicycle crossing visibility and comfort on Rollins Road
All shuttles/buses utilizing the Multimodal Station Access Road
A connection to Station Access Road

Garden Lane Control Phasing

The side-street stop control at Garden Lane would be the first step of a phased approach to maintain optimal circulation along Rollins Road. The subsequent steps are described in **Table 4** below and would occur only when monitoring of circulation conditions by a traffic engineer determines that the next step should be taken to maintain optimal circulation conditions along the road.

TABLE 4 PHASED INTERSECTION CONTROL AT GARDEN LANE

Initial Control Configuration	Secondary Control Configuration	Final Control Configuration
• Side-street stop control at Garden Lane; all turns permitted	• Side-street stop control at Garden Lane • Left-turn prohibition from Rollins Road during PM peak period (4:00 to 6:00 PM)	• Side-street stop control at Garden Lane • Physical median implemented that prohibits left turns (right in, right out only)

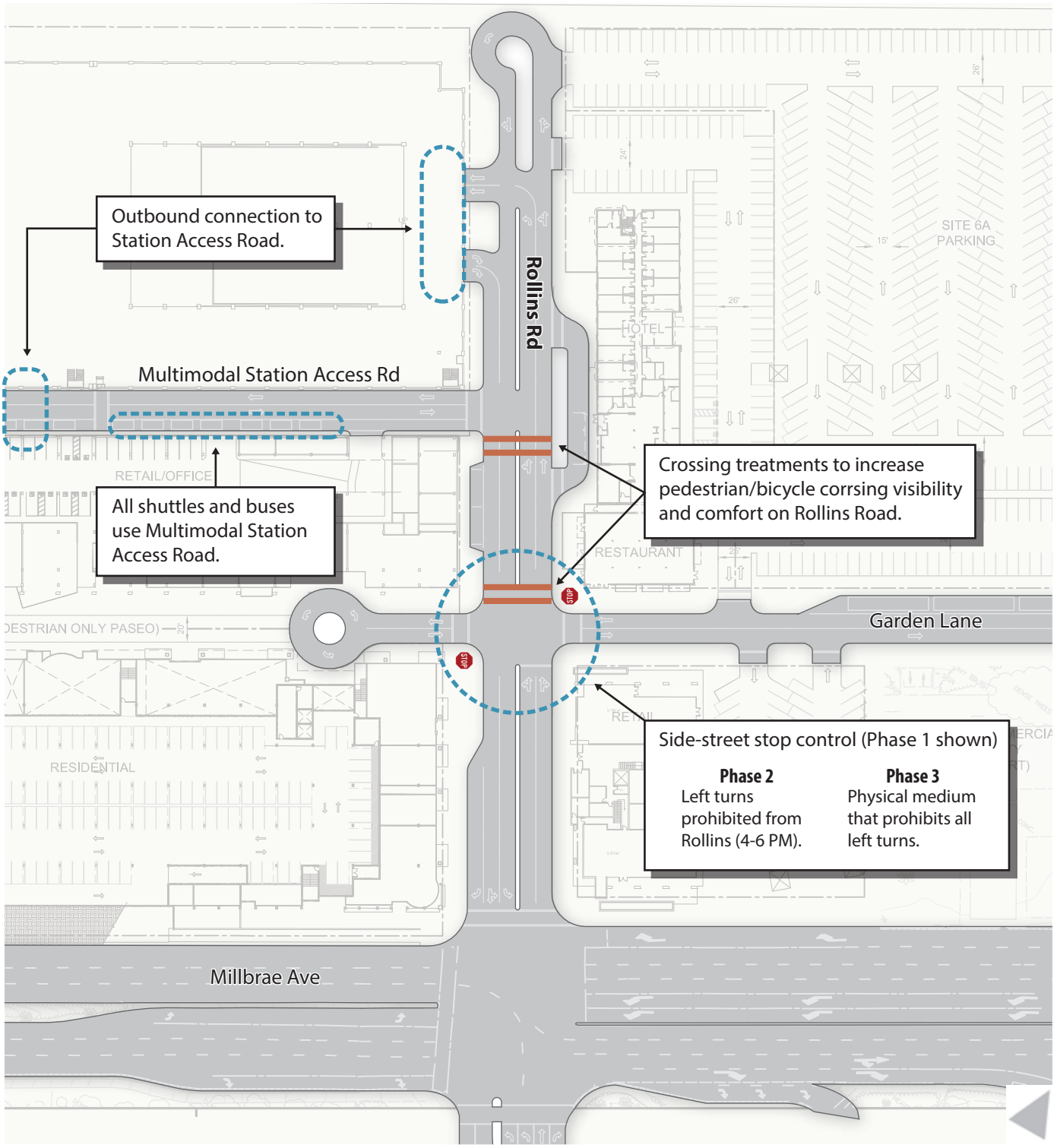


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Figure 3

Recommended Configuration Plan

FEHR PEERS

APPENDIX A – MICROSIMULATION ASSUMPTIONS MEMORANDUM

FEHR PEERS

MEMORANDUM

Date: April 1, 2015

To: Chip Taylor, City of Millbrae

From: Steve Crosley, Dan Hennessey, and Matthew Crane

Subject: [Revised] Rollins Road Microsimulation – Alternatives Selection and Assumptions

SF14-0730

Fehr & Peers is preparing five AM and PM peak hour 2040 microsimulation models using VISSIM software to analyze the operations of Rollins Road from Millbrae Avenue to the BART parking structure entrance. The outcome of this analysis will be recommended configurations that facilitate acceptable traffic operations as well as safe and convenient non-motorized access.

Included in the simulations are three key intersections: Millbrae Avenue and Rollins Road, Garden Lane and Rollins Road, and "Multimodal Station Access Road" and Rollins Road. The initial site plans provided to Fehr & Peers (prepared by Republic Urban) include a reconfigured Rollins Road with these new/redesigned intersections and a reduced roadway width (fewer travel lanes compared to today's conditions).

The purpose of this memo is to provide the City of Millbrae with detail on our understanding of the simulation alternatives and their assumptions; and offer the City a chance to review and provide comment/changes prior to preparing the models and running the simulations.

GENERAL ASSUMPTIONS

Private vehicle, shuttle, pedestrian, and bicycle movements will be consistent with the Draft EIR for the 2040 Specific Plan scenario.

TOD #2 Trips

Private vehicle, pedestrian, and bicycle trips will be assigned through intersections and to destinations within TOD #2 based on the land use program and associated parking entrances/exits provided by Republic Urban.

BART/Caltrain Trips

Private vehicle (park-and-ride, kiss-and-ride, taxi), shuttle, pedestrian, and bicycle volumes were counted at Millbrae Ave. & Rollins Rd., Garden Lane & Rollins Rd., and Service Rd. & Rollins Rd. in February 2015. These existing counts will be compared to 2040 BART/Caltrain trip generation estimates in order to determine localized trip assignment by mode through the future intersections and along Rollins Road. Shuttle trip ends will be increased by 50% over existing conditions to accommodate future growth in shuttle activity.

Crosswalks

For all scenarios we will model two crosswalks across Rollins Road: one at Garden Lane and one at the Multimodal Station Access Road across from the proposed hotel use.

Bicycles

Bicycle access will be consistent with the Specific Plan. From the east bicycles will access TOD #2 and the Millbrae Station via Garden Lane and the planned Bay Trail overpass. From the south, bicycles will access TOD #2 and the Millbrae Station via South Station Road. From the north bicycles will access TOD #2 and the Millbrae Station via Garden Lane and the planned Bay Trail.

SIMULATION ALTERNATIVES

We will model five infrastructure alternatives under 2040 conditions and include analysis, writeup, and video simulation in the final deliverable.

1. **Side-street stop control** at Rollins Road & Garden Lane and Rollins Road & Multimodal Station Access Road. Assume all shuttles and OTR coaches use Multimodal Station Access Road. Assume kiss-and-ride activity occurs inside the BART parking garage.
    a. Test all-way stop control at Rollins Road/Garden Lane. Assume all shuttles and OTR coaches use Multimodal Station Access Road. We are assuming, based on professional engineering experience that all-way stop control will not result in

feasible operations – only a basic assessment of feasibility will be determined in this sub-alternative (i.e. deliverable will not include full assessment of this sub-alternative). Assume kiss-and-ride activity occurs inside the BART parking garage.

2. **Signal control** at Rollins Road & Garden Lane and side-street stop control at Rollins Road & Multimodal Station Access Road. Assume all shuttles and OTR coaches use Multimodal Station Access Road. Assume kiss-and-ride activity occurs inside the BART parking garage.
3. **[*BART Proposed Alternative*] Side-street stop control** at Rollins Road & Garden Lane and Rollins Road & Multimodal Station Access Road. Assume 50% of shuttles (<35') utilize use Multimodal Station Access Road and 50% of shuttles (OTR coaches (>35')) utilize Rollins Road and Garden Lane (Note: length of Rollins Road between Multimodal Station Access Road and Garden Lane is approximately 130'; curb cut is approximately 60' as shown in Republic Urban site plan. Curb cut cannot accommodate 45' OTR coaches. We will assume up to two 45' OTR coaches can load in the curb lane; the remaining demand will use east Garden Lane. No loading will be permitted on Rollins Road south of Garden Lane). Assume kiss-and-ride activity occurs inside the BART parking garage. Assume no access from BART parking garage to South Station Road (residential egress south of Garden Lane from Parcel 5B is allowed).
4. **Raised median along the entirety of Rollins Road** which prevents left turns from being made to or from all roadways/driveways (all access is right in/right out). Assume all vehicles, shuttles, and OTR coaches accessing the BART Garage, Multimodal Station Access Road, or Garden Lane west of Rollins must travel through the turnaround at the north end of Rollins Road. Assume all shuttles go to Multimodal Station Access Road. Assume kiss-and-ride activity occurs inside the BART parking garage.
5. **Multimodal Station Access Road southbound connection to South Station Road**, which allows shuttles, OTR coaches, and kiss-and-ride to exit the station area via Adrian Road to Rollins Road/Millbrae Ave. Assume a raised median along the entirety of Rollins Road identical to Alternative #4, Assume all shuttles and OTR coaches utilize Multimodal Station Access Road. Assume kiss-and-ride activity occurs on South Station Road.

SCHEDULE

The final deliverable will be a memorandum that summarizes the methodology used for the analysis, provides Level of Service and queuing results for each of the alternatives for the three study intersections and qualitative discussion of those results, and offers a recommendation on which alternative(s) would be best suited to meet the needs of all users at the Millbrae Station. We will prepare a video of each of the simulation models using the VISSIM 3D animation function for use at project team meetings. The final deliverable can be provided within three weeks of agreement on the above assumptions and alternatives.

FEHR PEERS

APPENDIX B VISSIM RESULTS

Alternative 1

Vissim Post-Processor | **Rollins Road Micro-Simulation**
Average Results from 10 Runs | **Alternative 1 - Side-Street Stop**
Volume and Delay by Movement | **AM Peak Hour**

Intersection 1 **Rollins Road/Millbrae Avenue** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Percent	Std. Dev.	Minimum	Maximum	GEH	Total Delay (sec/veh) Average	Std. Dev.	Minimum	Maximum	LOS
NB	U Turn												
	Second Left												
	Left Turn	160	160	99.9%	13.6	142	185	0.0	65.0	9.8	55.4	87.9	E
	Through	237	234	98.6%	19.8	204	264	0.2	95.0	21.1	70.1	126.2	F
	Right Turn	370	370	100.1%	27.2	325	406	0.0	38.8	16.7	18.6	63.4	D
	Second Right												
	Subtotal	767	764	99.6%	36.5	717	807	0.1	61.5	17.1	41.1	86.0	E
SB	U Turn												
	Second Left												
	Left Turn	246	218	88.7%	13.4	205	250	1.8	57.5	3.1	53.1	64.2	E
	Through	70	58	83.0%	6.1	49	67	1.5	56.5	5.7	45.1	64.1	E
	Right Turn	144	79	55.1%	7.4	73	97	6.1	9.4	0.9	8.1	10.9	A
	Second Right												
	Subtotal	460	356	77.3%	16.3	330	392	5.2	46.6	2.7	42.8	52.5	D
EB	U Turn												
	Second Left												
	Left Turn	506	453	89.6%	14.6	431	475	2.4	156.4	9.3	137.1	168.9	F
	Through	1,540	1,410	91.6%	38.6	1,359	1,476	3.4	95.9	3.4	89.6	100.5	F
	Right Turn	450	405	90.0%	27.8	341	438	2.2	62.1	4.3	57.2	69.0	E
	Second Right												
	Subtotal	2,496	2,269	90.9%	56.5	2,199	2,375	4.7	102.0	3.1	96.5	106.5	F
WB	U Turn												
	Second Left												
	Left Turn	580	591	101.8%	21.0	561	623	0.4	55.6	2.1	51.1	59.1	E
	Through	1,000	1,025	102.5%	29.2	975	1,056	0.8	44.4	1.9	42.6	48.0	D
	Right Turn	679	714	105.2%	24.7	679	748	1.3	40.2	10.2	28.6	64.6	D
	Second Right												
	Subtotal	2,259	2,330	103.1%	37.6	2,276	2,381	1.5	46.0	3.6	41.6	54.6	D
Total		5,982	5,718	95.6%	45.1	5,644	5,787	3.5	70.3	3.0	65.1	74.9	E

Vissim Post-Processor **Rollins Road Micro-Simulation**
Average Results from 10 Runs **Alternative 1 - Side-Street Stop**
Volume and Delay by Movement **AM Peak Hour**

Intersection 2 **Rollins Road/Garden Lane** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Percent	Std. Dev.	Minimum	Maximum	GEH	Total Delay (sec/veh) Average	Std. Dev.	Minimum	Maximum	LOS
NB	U Turn												
	Second Left												
	Left Turn	55	54	98.0%	6.3	42	63	0.1	3.3	0.6	2.3	4.1	A
	Through	1,135	1,121	98.7%	34.1	1,047	1,172	0.4	2.0	0.3	1.6	2.4	A
	Right Turn	232	228	98.3%	19.3	207	266	0.3	2.5	0.4	1.8	3.2	A
	Second Right												
	Subtotal	1,422	1,403	98.6%	35.8	1,335	1,453	0.5	2.1	0.3	1.7	2.6	A
SB	U Turn												
	Second Left												
	Left Turn	5	12	232.0%	3.3	7	18	2.3	10.5	3.1	5.8	15.3	B
	Through	290	237	81.9%	10.6	215	252	3.2	1.2	0.4	0.7	2.0	A
	Right Turn	5	52	1036.0%	7.1	40	61	8.8	3.6	0.7	2.3	4.4	A
	Second Right												
	Subtotal	300	301	100.3%	15.0	274	316	0.0	2.0	0.5	1.2	2.9	A
EB	U Turn												
	Second Left												
	Left Turn												
	Through	10	11	109.0%	4.8	4	19	0.3	25.3	3.3	19.9	31.7	D
	Right Turn	102	97	94.8%	8.0	84	109	0.5	11.5	0.9	10.3	13.2	B
	Second Right												
	Subtotal	112	108	96.1%	7.9	96	117	0.4	12.8	1.2	11.1	15.5	B
WB	U Turn												
	Second Left												
	Left Turn	69	67	96.8%	8.7	59	82	0.3	28.6	4.8	22.8	37.1	D
	Through	5	5	100.0%	2.3	1	9	0.0	30.7	10.5	15.6	50.9	D
	Right Turn	30	34	114.3%	4.5	31	45	0.8	31.3	7.6	21.7	44.2	D
	Second Right												
	Subtotal	104	106	102.0%	9.4	96	123	0.2	29.6	5.1	24.4	38.9	D
Total		1,938	1,917	98.9%	44.2	1,849	1,979	0.5	4.2	0.5	3.5	5.1	A

Vissim Post-Processor | **Rollins Road Micro-Simulation**
Average Results from 10 Runs | **Alternative 1 - Side-Street Stop**
Volume and Delay by Movement | **AM Peak Hour**

Intersection 3 **Rollins Road/Multi-Modal Station Access Road** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Percent	Std. Dev.	Minimum	Maximum	GEH	Total Delay (sec/veh) Average	Std. Dev.	Minimum	Maximum	LOS
NB	U Turn												
	Second Left												
	Left Turn	181	194	107.4%	8.8	183	209	1.0	4.1	0.5	3.3	4.9	A
	Through	954	960	100.6%	35.3	901	1,011	0.2	1.6	0.1	1.5	1.8	A
	Right Turn												
	Second Right												
	Subtotal	1,135	1,155	101.7%	33.8	1,084	1,206	0.6	2.0	0.2	1.8	2.3	A
SB	U Turn												
	Second Left												
	Left Turn												
	Through	238	237	99.4%	11.9	214	252	0.1	1.4	0.2	1.1	1.9	A
	Right Turn	5	5	98.0%	2.8	1	9	0.0	2.3	1.2	1.1	5.1	A
	Second Right												
	Subtotal	243	242	99.4%	12.1	217	257	0.1	1.4	0.2	1.1	1.9	A
EB	U Turn												
	Second Left												
	Left Turn												
	Through												
	Right Turn	52	64	123.5%	8.3	51	78	1.6	10.6	0.4	9.9	11.1	B
	Second Right												
	Subtotal	52	64	123.5%	8.3	51	78	1.6	10.6	0.4	9.9	11.1	B
WB	U Turn												
	Second Left												
	Left Turn												
	Through												
	Right Turn												
	Second Right												
	Subtotal												
Total		1,430	1,460	102.1%	39.0	1,376	1,521	0.8	2.3	0.1	2.1	2.5	A

Vissim Post-Processor **Rollins Road Microsimulation**
Average Results from 10 Runs **Alternative 1 - Side-Street Stop**
Volume and Delay by Movement **PM Peak Hour**

Intersection 1 **Rollins Road/Millbrae Avenue** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Percent	Std. Dev.	Minimum	Maximum	GEH	Total Delay (sec/veh) Average	Std. Dev.	Minimum	Maximum	LOS
NB	U Turn												
	Second Left												
	Left Turn	440	448	101.9%	16.1	405	460	0.4	64.4	12.6	51.5	86.8	E
	Through	113	115	101.7%	9.5	95	130	0.2	62.2	16.7	46.2	91.9	E
	Right Turn	580	572	98.7%	20.3	534	598	0.3	17.7	4.0	12.9	27.3	B
	Second Right												
	Subtotal	1,133	1,136	100.2%	19.0	1,098	1,159	0.1	40.6	7.9	33.3	57.1	D
SB	U Turn												
	Second Left												
	Left Turn	596	440	73.8%	13.1	422	464	6.9	65.6	3.1	60.3	70.2	E
	Through	96	73	76.0%	7.5	59	83	2.5	65.1	8.0	54.7	85.0	E
	Right Turn	402	233	57.9%	14.9	203	256	9.5	29.7	2.0	27.0	32.7	C
	Second Right												
	Subtotal	1,094	746	68.2%	18.1	722	779	11.5	54.4	2.4	50.6	58.7	D
EB	U Turn												
	Second Left												
	Left Turn	222	217	97.7%	15.7	192	241	0.3	187.7	93.2	76.9	315.8	F
	Through	1,210	1,207	99.8%	30.7	1,153	1,248	0.1	52.6	9.9	42.3	67.8	D
	Right Turn	330	328	99.3%	20.6	289	372	0.1	20.7	7.8	12.6	31.9	C
	Second Right												
	Subtotal	1,762	1,752	99.4%	43.9	1,697	1,832	0.2	63.6	19.1	41.0	87.7	E
WB	U Turn												
	Second Left												
	Left Turn	490	481	98.2%	19.1	455	508	0.4	55.3	12.0	42.8	71.8	E
	Through	1,700	1,681	98.9%	58.9	1,611	1,801	0.5	56.5	15.9	37.5	81.6	E
	Right Turn	315	318	101.0%	19.2	286	348	0.2	35.5	23.6	11.4	88.4	D
	Second Right												
	Subtotal	2,505	2,480	99.0%	65.7	2,384	2,593	0.5	53.5	15.2	35.7	80.7	D
Total		6,494	6,113	94.1%	107.4	5,974	6,281	4.8	54.2	11.4	39.1	72.9	D

Vissim Post-Processor **Rollins Road Microsimulation**
Average Results from 10 Runs **Alternative 1 - Side-Street Stop**
Volume and Delay by Movement **PM Peak Hour**

Intersection 2 **Rollins Road/Garden Lane** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Percent	Std. Dev.	Minimum	Maximum	GEH	Total Delay (sec/veh) Average	Std. Dev.	Minimum	Maximum	LOS
NB	U Turn												
	Second Left												
	Left Turn	112	102	91.3%	14.7	68	123	0.9	71.6	17.5	51.3	106.4	F
	Through	419	419	100.1%	17.5	395	445	0.0	16.4	4.1	11.9	24.2	C
	Right Turn	120	119	99.5%	10.1	101	132	0.1	12.0	3.4	7.3	17.1	B
	Second Right												
	Subtotal	651	641	98.4%	28.2	610	686	0.4	24.2	4.6	18.5	33.2	C
SB	U Turn												
	Second Left												
	Left Turn												
	Through	792	655	82.8%	24.2	614	691	5.1	26.1	1.6	23.8	28.7	D
	Right Turn												
	Second Right												
	Subtotal	792	655	82.8%	24.2	614	691	5.1	26.1	1.6	23.8	28.7	D
EB	U Turn												
	Second Left												
	Left Turn												
	Through	5	4	84.0%	1.5	2	8	0.4	117.6	53.3	48.8	186.6	F
	Right Turn	80	78	97.6%	8.4	67	92	0.2	81.0	31.3	45.1	124.5	F
	Second Right												
	Subtotal	85	82	96.8%	7.9	71	96	0.3	82.9	32.3	47.5	129.0	F
WB	U Turn												
	Second Left												
	Left Turn	223	69	31.0%	4.5	62	76	12.7	767.9	44.7	694.9	828.5	F
	Through	5	2	34.0%	1.2	0	4	1.8	681.9	259.9	0.0	940.2	F
	Right Turn	5	2	32.0%	1.1	0	3	1.9	607.9	339.9	0.0	897.0	F
	Second Right												
	Subtotal	233	73	31.1%	3.9	66	79	13.0	763.5	44.8	682.0	823.2	F
Total		1,761	1,451	82.4%	45.7	1,405	1,526	7.7	65.4	4.3	60.7	73.9	F

Vissim Post-Processor **Rollins Road Microsimulation**
Average Results from 10 Runs **Alternative 1 - Side-Street Stop**
Volume and Delay by Movement **PM Peak Hour**

Intersection 3 **Rollins Road/Kiss-N-Ride** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Percent	Std. Dev.	Minimum	Maximum	GEH	Total Delay (sec/veh) Average	Std. Dev.	Minimum	Maximum	LOS
NB	U Turn												
	Second Left												
	Left Turn	77	81	105.5%	8.2	68	94	0.5	24.7	5.1	18.2	31.1	C
	Through	342	338	98.9%	15.9	313	359	0.2	4.1	1.2	2.2	6.6	A
	Right Turn												
	Second Right												
	Subtotal	419	419	100.1%	16.9	395	443	0.0	8.1	2.0	5.9	12.2	A
SB	U Turn												
	Second Left												
	Left Turn												
	Through	636	602	94.6%	22.3	571	639	1.4	32.0	2.1	29.2	35.9	D
	Right Turn												
	Second Right												
	Subtotal	636	602	94.6%	22.3	571	639	1.4	32.0	2.1	29.2	35.9	D
EB	U Turn												
	Second Left												
	Left Turn												
	Through												
	Right Turn	156	59	37.6%	11.8	44	77	9.4	699.2	121.1	543.7	899.4	F
	Second Right												
	Subtotal	156	59	37.6%	11.8	44	77	9.4	699.2	121.1	543.7	899.4	F
WB	U Turn												
	Second Left												
	Left Turn												
	Through												
	Right Turn												
	Second Right												
	Subtotal												
Total		1,211	1,080	89.2%	35.4	1,018	1,136	3.9	57.9	3.2	54.2	63.7	F

Alternative 2

Vissim Post-Processor **Rollins Road Micro-Simulation**
Average Results from 10 Runs **Alternative 2 - Signal**
Volume and Delay by Movement **AM Peak Hour**

Intersection 1 **Rollins Road/Millbrae Avenue** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Percent	Std. Dev.	Minimum	Maximum	GEH	Total Delay (sec/veh) Average	Std. Dev.	Minimum	Maximum	LOS
NB	U Turn												
	Second Left												
	Left Turn	160	158	98.6%	10.1	141	171	0.2	105.7	22.1	65.3	147.1	F
	Through	237	225	94.9%	13.7	198	242	0.8	161.5	31.8	104.7	220.0	F
	Right Turn	370	360	97.3%	31.9	311	397	0.5	86.9	22.4	41.8	129.1	F
	Second Right												
	Subtotal	767	743	96.8%	33.8	690	788	0.9	113.7	25.9	64.9	163.5	F
SB	U Turn												
	Second Left												
	Left Turn	246	210	85.4%	16.7	182	241	2.4	62.5	2.0	59.8	65.9	E
	Through	70	57	82.0%	7.6	48	75	1.6	61.4	6.4	53.3	73.1	E
	Right Turn	144	80	55.3%	10.4	68	105	6.1	10.1	0.8	8.7	11.4	B
	Second Right												
	Subtotal	460	347	75.4%	22.3	307	380	5.6	50.3	2.1	46.9	53.4	D
EB	U Turn												
	Second Left												
	Left Turn	506	429	84.9%	16.7	400	453	3.5	187.6	14.3	166.0	208.9	F
	Through	1,540	1,310	85.0%	55.5	1,226	1,393	6.1	101.1	2.4	96.1	105.0	F
	Right Turn	450	385	85.5%	25.6	339	417	3.2	61.0	3.5	54.6	64.5	E
	Second Right												
	Subtotal	2,496	2,124	85.1%	80.6	2,018	2,263	7.7	111.4	4.0	104.2	116.3	F
WB	U Turn												
	Second Left												
	Left Turn	580	507	87.3%	22.8	455	531	3.2	96.5	7.5	88.1	112.3	F
	Through	1,000	870	87.0%	44.3	811	937	4.2	102.5	10.5	89.9	119.4	F
	Right Turn	679	609	89.6%	21.9	574	646	2.8	187.5	13.8	163.6	207.9	F
	Second Right												
	Subtotal	2,259	1,986	87.9%	72.6	1,876	2,087	5.9	127.0	9.3	112.6	141.7	F
Total		5,982	5,199	86.9%	75.5	5,045	5,316	10.5	113.4	5.7	101.2	120.7	F

Vissim Post-Processor **Rollins Road Micro-Simulation**
Average Results from 10 Runs **Alternative 2 - Signal**
Volume and Delay by Movement **AM Peak Hour**

Intersection 2 **Rollins Road/Garden Lane** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Percent	Std. Dev.	Minimum	Maximum	GEH	Total Delay (sec/veh) Average	Std. Dev.	Minimum	Maximum	LOS
NB	U Turn												
	Second Left												
	Left Turn	55	50	90.9%	7.6	41	68	0.7	14.2	2.9	10.2	20.8	B
	Through	1,135	1,011	89.1%	24.0	976	1,046	3.8	11.9	1.1	10.2	13.9	B
	Right Turn	232	201	86.4%	13.8	179	220	2.1	13.2	1.3	10.8	15.0	B
	Second Right												
	Subtotal	1,422	1,262	88.7%	26.7	1,223	1,287	4.4	12.2	1.2	10.3	14.0	B
SB	U Turn												
	Second Left												
	Left Turn	5	16	326.0%	2.6	13	20	3.5	24.9	7.4	15.3	40.3	C
	Through	290	230	79.3%	19.8	181	254	3.7	8.2	1.3	6.1	10.9	A
	Right Turn	5	48	968.0%	9.7	31	59	8.4	14.2	2.2	10.1	17.2	B
	Second Right												
	Subtotal	300	295	98.3%	26.7	235	316	0.3	10.1	1.4	8.2	12.4	B
EB	U Turn												
	Second Left												
	Left Turn												
	Through	10	12	120.0%	4.6	7	19	0.6	16.5	3.4	10.1	20.7	B
	Right Turn	102	96	93.6%	9.1	84	113	0.7	8.6	2.6	4.8	13.7	A
	Second Right												
	Subtotal	112	108	96.0%	11.5	94	131	0.4	9.5	2.7	5.6	14.3	A
WB	U Turn												
	Second Left												
	Left Turn	69	68	98.7%	7.9	59	78	0.1	22.2	3.3	16.9	28.0	C
	Through	5	5	108.0%	2.1	3	9	0.2	20.3	6.8	9.2	31.4	C
	Right Turn	30	32	105.7%	4.1	23	38	0.3	21.9	2.9	18.3	27.1	C
	Second Right												
	Subtotal	104	105	101.2%	7.8	96	117	0.1	22.1	2.1	18.2	24.5	C
Total		1,938	1,769	91.3%	39.4	1,704	1,821	3.9	12.3	1.1	10.6	14.0	B

Vissim Post-Processor **Rollins Road Micro-Simulation**
Average Results from 10 Runs **Alternative 2 - Signal**
Volume and Delay by Movement **AM Peak Hour**

Intersection 3 **Rollins Road/Multimodal Station Access Road** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Percent	Std. Dev.	Minimum	Maximum	GEH	Total Delay (sec/veh) Average	Std. Dev.	Minimum	Maximum	LOS
NB	U Turn												
	Second Left												
	Left Turn	181	179	98.7%	7.7	169	192	0.2	5.0	0.5	4.3	5.7	A
	Through	954	863	90.5%	29.9	821	909	3.0	1.7	0.2	1.5	2.2	A
	Right Turn												
	Second Right												
	Subtotal	1,135	1,042	91.8%	23.8	1,010	1,082	2.8	2.3	0.3	2.0	2.8	A
SB	U Turn												
	Second Left												
	Left Turn												
	Through	238	229	96.3%	21.0	178	251	0.6	2.1	0.3	1.5	2.5	A
	Right Turn	5	5	96.0%	2.4	1	9	0.1	3.4	2.0	0.6	7.8	A
	Second Right												
	Subtotal	243	234	96.3%	21.6	182	256	0.6	2.1	0.3	1.5	2.6	A
EB	U Turn												
	Second Left												
	Left Turn												
	Through												
	Right Turn	52	65	125.4%	9.7	51	78	1.7	11.1	1.3	9.4	13.4	B
	Second Right												
	Subtotal	52	65	125.4%	9.7	51	78	1.7	11.1	1.3	9.4	13.4	B
WB	U Turn												
	Second Left												
	Left Turn												
	Through												
	Right Turn												
	Second Right												
	Subtotal												
Total		1,430	1,341	93.8%	35.7	1,286	1,396	2.4	2.7	0.2	2.3	3.1	A

Vissim Post-Processor **Rollins Road Microsimulation**
Average Results from 10 Runs **Alternative 2 - Signal**
Volume and Delay by Movement **PM Peak Hour**

Intersection 1 **Rollins Road/Millbrae Avenue** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Percent	Std. Dev.	Minimum	Maximum	GEH	Total Delay (sec/veh) Average	Std. Dev.	Minimum	Maximum	LOS
NB	U Turn												
	Second Left												
	Left Turn	440	418	95.1%	48.1	315	472	1.0	79.7	15.1	52.4	105.9	E
	Through	113	99	87.6%	18.1	66	121	1.4	118.1	24.2	68.6	147.6	F
	Right Turn	580	558	96.3%	59.5	420	631	0.9	23.6	7.0	14.1	35.6	C
	Second Right												
	Subtotal	1,133	1,076	94.9%	118.0	801	1,177	1.7	54.1	11.5	34.8	74.0	D
SB	U Turn												
	Second Left												
	Left Turn	596	387	64.9%	35.8	302	425	9.4	69.1	5.2	59.9	78.5	E
	Through	96	63	65.3%	6.9	51	70	3.7	69.8	6.8	58.1	85.5	E
	Right Turn	402	224	55.6%	28.9	163	253	10.1	26.0	1.1	24.3	27.7	C
	Second Right												
	Subtotal	1,094	673	61.5%	65.9	522	744	14.2	54.9	3.8	49.6	62.9	D
EB	U Turn												
	Second Left												
	Left Turn	222	131	59.1%	20.0	99	163	6.8	660.4	159.4	347.2	904.1	F
	Through	1,210	935	77.3%	135.7	718	1,149	8.4	72.9	10.9	61.8	100.1	E
	Right Turn	330	259	78.5%	42.1	193	326	4.1	28.8	4.0	24.5	37.2	C
	Second Right												
	Subtotal	1,762	1,325	75.2%	192.2	1,010	1,607	11.1	122.5	18.5	81.5	142.8	F
WB	U Turn												
	Second Left												
	Left Turn	490	442	90.1%	36.8	373	497	2.2	81.6	9.7	64.7	95.9	F
	Through	1,700	1,556	91.5%	90.2	1,454	1,699	3.6	103.6	14.3	79.8	116.3	F
	Right Turn	315	262	83.1%	38.7	182	304	3.1	241.8	70.5	125.1	353.2	F
	Second Right												
	Subtotal	2,505	2,259	90.2%	140.4	2,046	2,470	5.0	115.1	16.7	93.4	141.7	F
Total		6,494	5,333	82.1%	397.8	4,595	5,757	15.1	96.7	9.1	81.1	107.6	F

Vissim Post-Processor **Rollins Road Microsimulation**
Average Results from 10 Runs **Alternative 2 - Signal**
Volume and Delay by Movement **PM Peak Hour**

Intersection 2 **Rollins Road/Garden Lane** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Percent	Std. Dev.	Minimum	Maximum	GEH	Total Delay (sec/veh) Average	Std. Dev.	Minimum	Maximum	LOS
NB	U Turn												
	Second Left												
	Left Turn	112	79	70.1%	13.1	59	101	3.4	136.5	21.8	103.2	172.4	F
	Through	419	318	75.8%	53.8	216	391	5.3	58.9	10.2	43.7	72.6	E
	Right Turn	120	86	71.4%	9.1	69	96	3.4	46.1	7.8	34.7	55.5	D
	Second Right												
	Subtotal	651	482	74.0%	72.2	345	559	7.1	69.2	10.8	54.0	85.8	E
SB	U Turn												
	Second Left												
	Left Turn												
	Through	792	444	56.1%	48.9	360	525	14.0	38.5	4.6	31.4	46.6	D
	Right Turn												
	Second Right												
	Subtotal	792	444	56.1%	48.9	360	525	14.0	38.5	4.6	31.4	46.6	D
EB	U Turn												
	Second Left												
	Left Turn												
	Through	5	6	112.0%	2.8	3	9	0.3	27.3	12.9	12.6	47.7	C
	Right Turn	80	73	90.8%	11.6	50	94	0.8	41.4	6.4	34.7	53.1	D
	Second Right												
	Subtotal	85	78	92.0%	12.3	53	98	0.8	40.4	6.6	32.0	51.9	D
WB	U Turn												
	Second Left												
	Left Turn	223	195	87.5%	23.2	142	222	1.9	201.1	74.3	77.4	276.2	F
	Through	5	5	94.0%	1.3	2	6	0.1	204.7	80.3	73.8	293.5	F
	Right Turn	5	5	94.0%	2.1	2	8	0.1	201.9	75.9	72.1	317.6	F
	Second Right												
	Subtotal	233	205	87.8%	23.5	151	231	1.9	201.3	74.2	77.1	275.2	F
Total		1,761	1,209	68.6%	116.8	939	1,365	14.3	78.4	16.6	48.4	96.6	E

Vissim Post-Processor **Rollins Road Microsimulation**
Average Results from 10 Runs **Alternative 2 - Signal**
Volume and Delay by Movement **PM Peak Hour**

Intersection 3 **Rollins Road/Multimodal Station Access Road** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Percent	Std. Dev.	Minimum	Maximum	GEH	Total Delay (sec/veh) Average	Std. Dev.	Minimum	Maximum	LOS
NB	U Turn												
	Second Left												
	Left Turn	77	63	81.2%	12.9	35	78	1.7	33.9	14.2	22.8	70.8	D
	Through	342	257	75.2%	47.7	176	332	4.9	5.6	2.9	3.2	12.6	A
	Right Turn												
	Second Right												
	Subtotal	419	320	76.3%	57.9	211	399	5.2	11.2	5.4	7.3	25.1	B
SB	U Turn												
	Second Left												
	Left Turn												
	Through	636	439	69.0%	46.9	359	517	8.5	53.4	5.9	46.1	63.0	F
	Right Turn												
	Second Right												
	Subtotal	636	439	69.0%	46.9	359	517	8.5	53.4	5.9	46.1	63.0	F
EB	U Turn												
	Second Left												
	Left Turn												
	Through												
	Right Turn	156	24	15.4%	7.9	17	43	13.9	1376.1	339.3	774.7	1880.5	F
	Second Right												
	Subtotal	156	24	15.4%	7.9	17	43	13.9	1376.1	339.3	774.7	1880.5	F
WB	U Turn												
	Second Left												
	Left Turn												
	Through												
	Right Turn												
	Second Right												
	Subtotal												
Total		1,211	783	64.6%	76.7	642	936	13.6	74.5	8.8	58.3	87.7	F

Alternative 3

Vissim Post-Processor **Rollins Road Micro-Simulation**

Average Results from 10 Runs **Alternative 3- BART Proposed Side-Street Stop**

Volume and Delay by Movement **AM Peak Hour**

Intersection 1 **Rollins Road/Millbrae Avenue** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Percent	Std. Dev.	Minimum	Maximum	GEH	Total Delay (sec/veh) Average	Std. Dev.	Minimum	Maximum	LOS
NB	U Turn												
	Second Left												
	Left Turn	160	160	99.9%	13.6	142	185	0.0	65.0	9.8	55.4	87.9	E
	Through	237	234	98.6%	19.8	204	264	0.2	95.0	21.1	70.1	126.2	F
	Right Turn	370	370	100.1%	27.2	325	406	0.0	38.8	16.7	18.6	63.4	D
	Second Right												
	Subtotal	767	764	99.6%	36.5	717	807	0.1	61.5	17.1	41.1	86.0	E
SB	U Turn												
	Second Left												
	Left Turn	246	218	88.7%	13.4	205	250	1.8	57.5	3.1	53.1	64.2	E
	Through	70	58	83.0%	6.1	49	67	1.5	56.5	5.7	45.1	64.1	E
	Right Turn	144	79	55.1%	7.4	73	97	6.1	9.4	0.9	8.1	10.9	A
	Second Right												
	Subtotal	460	356	77.3%	16.3	330	392	5.2	46.6	2.7	42.8	52.5	D
EB	U Turn												
	Second Left												
	Left Turn	506	453	89.6%	14.6	431	475	2.4	156.4	9.3	137.1	168.9	F
	Through	1,540	1,410	91.6%	38.6	1,359	1,476	3.4	95.9	3.4	89.6	100.5	F
	Right Turn	450	405	90.0%	27.8	341	438	2.2	62.1	4.3	57.2	69.0	E
	Second Right												
	Subtotal	2,496	2,269	90.9%	56.5	2,199	2,375	4.7	102.0	3.1	96.5	106.5	F
WB	U Turn												
	Second Left												
	Left Turn	580	591	101.8%	21.0	561	623	0.4	55.6	2.1	51.1	59.1	E
	Through	1,000	1,025	102.5%	29.2	975	1,056	0.8	44.4	1.9	42.6	48.0	D
	Right Turn	679	714	105.2%	24.7	679	748	1.3	40.2	10.2	28.6	64.6	D
	Second Right												
	Subtotal	2,259	2,330	103.1%	37.6	2,276	2,381	1.5	46.0	3.6	41.6	54.6	D
Total		5,982	5,718	95.6%	45.1	5,644	5,787	3.5	70.3	3.0	65.1	74.9	E

Vissim Post-Processor **Rollins Road Micro-Simulation**

Average Results from 10 Runs **Alternative 3- BART Proposed Side-Street Stop**

Volume and Delay by Movement **AM Peak Hour**

Intersection 2 **Rollins Road/Garden Lane** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Percent	Std. Dev.	Minimum	Maximum	GEH	Total Delay (sec/veh) Average	Std. Dev.	Minimum	Maximum	LOS
NB	U Turn												
	Second Left												
	Left Turn	55	54	98.0%	6.3	42	63	0.1	3.3	0.6	2.3	4.1	A
	Through	1,135	1,121	98.7%	34.1	1,047	1,172	0.4	2.0	0.3	1.6	2.4	A
	Right Turn	232	228	98.3%	19.3	207	266	0.3	2.5	0.4	1.8	3.2	A
	Second Right												
	Subtotal	1,422	1,403	98.6%	35.8	1,335	1,453	0.5	2.1	0.3	1.7	2.6	A
SB	U Turn												
	Second Left												
	Left Turn	5	12	232.0%	3.3	7	18	2.3	10.5	3.1	5.8	15.3	B
	Through	290	237	81.9%	10.6	215	252	3.2	1.2	0.4	0.7	2.0	A
	Right Turn	5	52	1036.0%	7.1	40	61	8.8	3.6	0.7	2.3	4.4	A
	Second Right												
	Subtotal	300	301	100.3%	15.0	274	316	0.0	2.0	0.5	1.2	2.9	A
EB	U Turn												
	Second Left												
	Left Turn												
	Through	10	11	109.0%	4.8	4	19	0.3	25.3	3.3	19.9	31.7	D
	Right Turn	102	97	94.8%	8.0	84	109	0.5	11.5	0.9	10.3	13.2	B
	Second Right												
	Subtotal	112	108	96.1%	7.9	96	117	0.4	12.8	1.2	11.1	15.5	B
WB	U Turn												
	Second Left												
	Left Turn	69	67	96.8%	8.7	59	82	0.3	28.6	4.8	22.8	37.1	D
	Through	5	5	100.0%	2.3	1	9	0.0	30.7	10.5	15.6	50.9	D
	Right Turn	30	34	114.3%	4.5	31	45	0.8	31.3	7.6	21.7	44.2	D
	Second Right												
	Subtotal	104	106	102.0%	9.4	96	123	0.2	29.6	5.1	24.4	38.9	D
Total		1,938	1,917	98.9%	44.2	1,849	1,979	0.5	4.2	0.5	3.5	5.1	A

Vissim Post-Processor | **Rollins Road Micro-Simulation**

Average Results from 10 Runs | **Alternative 3- BART Proposed Side-Street Stop**

Volume and Delay by Movement | **AM Peak Hour**

Intersection 3 **Rollins Road/Multi-Modal Station Access Road** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Percent	Std. Dev.	Minimum	Maximum	GEH	Total Delay (sec/veh) Average	Std. Dev.	Minimum	Maximum	LOS
NB	U Turn												
	Second Left												
	Left Turn	181	194	107.4%	8.8	183	209	1.0	4.1	0.5	3.3	4.9	A
	Through	954	960	100.6%	35.3	901	1,011	0.2	1.6	0.1	1.5	1.8	A
	Right Turn												
	Second Right												
	Subtotal	1,135	1,155	101.7%	33.8	1,084	1,206	0.6	2.0	0.2	1.8	2.3	A
SB	U Turn												
	Second Left												
	Left Turn												
	Through	238	237	99.4%	11.9	214	252	0.1	1.4	0.2	1.1	1.9	A
	Right Turn	5	5	98.0%	2.8	1	9	0.0	2.3	1.2	1.1	5.1	A
	Second Right												
	Subtotal	243	242	99.4%	12.1	217	257	0.1	1.4	0.2	1.1	1.9	A
EB	U Turn												
	Second Left												
	Left Turn												
	Through												
	Right Turn	52	64	123.5%	8.3	51	78	1.6	10.6	0.4	9.9	11.1	B
	Second Right												
	Subtotal	52	64	123.5%	8.3	51	78	1.6	10.6	0.4	9.9	11.1	B
WB	U Turn												
	Second Left												
	Left Turn												
	Through												
	Right Turn												
	Second Right												
	Subtotal												
Total		1,430	1,460	102.1%	39.0	1,376	1,521	0.8	2.3	0.1	2.1	2.5	A

Vissim Post-Processor **Rollins Road Microsimulation**

Average Results from 10 Runs **Alternative 3- BART Proposed Side-Street Stop**

Volume and Delay by Movement **PM Peak Hour**

Intersection 1 **Rollins Road/Millbrae Avenue** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Percent	Std. Dev.	Minimum	Maximum	GEH	Total Delay (sec/veh) Average	Std. Dev.	Minimum	Maximum	LOS
NB	U Turn												
	Second Left												
	Left Turn	440	448	101.9%	16.1	405	460	0.4	64.4	12.6	51.5	86.8	E
	Through	113	115	101.7%	9.5	95	130	0.2	62.2	16.7	46.2	91.9	E
	Right Turn	580	572	98.7%	20.3	534	598	0.3	17.7	4.0	12.9	27.3	B
	Second Right												
	Subtotal	1,133	1,136	100.2%	19.0	1,098	1,159	0.1	40.6	7.9	33.3	57.1	D
SB	U Turn												
	Second Left												
	Left Turn	596	440	73.8%	13.1	422	464	6.9	65.6	3.1	60.3	70.2	E
	Through	96	73	76.0%	7.5	59	83	2.5	65.1	8.0	54.7	85.0	E
	Right Turn	402	233	57.9%	14.9	203	256	9.5	29.7	2.0	27.0	32.7	C
	Second Right												
	Subtotal	1,094	746	68.2%	18.1	722	779	11.5	54.4	2.4	50.6	58.7	D
EB	U Turn												
	Second Left												
	Left Turn	222	217	97.7%	15.7	192	241	0.3	187.7	93.2	76.9	315.8	F
	Through	1,210	1,207	99.8%	30.7	1,153	1,248	0.1	52.6	9.9	42.3	67.8	D
	Right Turn	330	328	99.3%	20.6	289	372	0.1	20.7	7.8	12.6	31.9	C
	Second Right												
	Subtotal	1,762	1,752	99.4%	43.9	1,697	1,832	0.2	63.6	19.1	41.0	87.7	E
WB	U Turn												
	Second Left												
	Left Turn	490	481	98.2%	19.1	455	508	0.4	55.3	12.0	42.8	71.8	E
	Through	1,700	1,681	98.9%	58.9	1,611	1,801	0.5	56.5	15.9	37.5	81.6	E
	Right Turn	315	318	101.0%	19.2	286	348	0.2	35.5	23.6	11.4	88.4	D
	Second Right												
	Subtotal	2,505	2,480	99.0%	65.7	2,384	2,593	0.5	53.5	15.2	35.7	80.7	D
Total		6,494	6,113	94.1%	107.4	5,974	6,281	4.8	54.2	11.4	39.1	72.9	D

Vissim Post-Processor **Rollins Road Microsimulation**

Average Results from 10 Runs **Alternative 3- BART Proposed Side-Street Stop**

Volume and Delay by Movement **PM Peak Hour**

Intersection 2 **Rollins Road/Garden Lane** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Percent	Std. Dev.	Minimum	Maximum	GEH	Total Delay (sec/veh) Average	Std. Dev.	Minimum	Maximum	LOS
NB	U Turn												
	Second Left												
	Left Turn	112	102	91.3%	14.7	68	123	0.9	71.6	17.5	51.3	106.4	F
	Through	419	419	100.1%	17.5	395	445	0.0	16.4	4.1	11.9	24.2	C
	Right Turn	120	119	99.5%	10.1	101	132	0.1	12.0	3.4	7.3	17.1	B
	Second Right												
	Subtotal	651	641	98.4%	28.2	610	686	0.4	24.2	4.6	18.5	33.2	C
SB	U Turn												
	Second Left												
	Left Turn												
	Through	792	655	82.8%	24.2	614	691	5.1	26.1	1.6	23.8	28.7	D
	Right Turn												
	Second Right												
	Subtotal	792	655	82.8%	24.2	614	691	5.1	26.1	1.6	23.8	28.7	D
EB	U Turn												
	Second Left												
	Left Turn												
	Through	5	4	84.0%	1.5	2	8	0.4	117.6	53.3	48.8	186.6	F
	Right Turn	80	78	97.6%	8.4	67	92	0.2	81.0	31.3	45.1	124.5	F
	Second Right												
	Subtotal	85	82	96.8%	7.9	71	96	0.3	82.9	32.3	47.5	129.0	F
WB	U Turn												
	Second Left												
	Left Turn	223	69	31.0%	4.5	62	76	12.7	767.9	44.7	694.9	828.5	F
	Through	5	2	34.0%	1.2	0	4	1.8	681.9	259.9	0.0	940.2	F
	Right Turn	5	2	32.0%	1.1	0	3	1.9	607.9	339.9	0.0	897.0	F
	Second Right												
	Subtotal	233	73	31.1%	3.9	66	79	13.0	763.5	44.8	682.0	823.2	F
Total		1,761	1,451	82.4%	45.7	1,405	1,526	7.7	65.4	4.3	60.7	73.9	F

Vissim Post-Processor **Rollins Road Microsimulation**

Average Results from 10 Runs **Alternative 3- BART Proposed Side-Street Stop**

Volume and Delay by Movement **PM Peak Hour**

Intersection 3 **Rollins Road/Kiss-N-Ride** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Percent	Std. Dev.	Minimum	Maximum	GEH	Total Delay (sec/veh) Average	Std. Dev.	Minimum	Maximum	LOS
NB	U Turn												
	Second Left												
	Left Turn	77	81	105.5%	8.2	68	94	0.5	24.7	5.1	18.2	31.1	C
	Through	342	338	98.9%	15.9	313	359	0.2	4.1	1.2	2.2	6.6	A
	Right Turn												
	Second Right												
	Subtotal	419	419	100.1%	16.9	395	443	0.0	8.1	2.0	5.9	12.2	A
SB	U Turn												
	Second Left												
	Left Turn												
	Through	636	602	94.6%	22.3	571	639	1.4	32.0	2.1	29.2	35.9	D
	Right Turn												
	Second Right												
	Subtotal	636	602	94.6%	22.3	571	639	1.4	32.0	2.1	29.2	35.9	D
EB	U Turn												
	Second Left												
	Left Turn												
	Through												
	Right Turn	156	59	37.6%	11.8	44	77	9.4	699.2	121.1	543.7	899.4	F
	Second Right												
	Subtotal	156	59	37.6%	11.8	44	77	9.4	699.2	121.1	543.7	899.4	F
WB	U Turn												
	Second Left												
	Left Turn												
	Through												
	Right Turn												
	Second Right												
	Subtotal												
Total		1,211	1,080	89.2%	35.4	1,018	1,136	3.9	57.9	3.2	54.2	63.7	F

Alternative 4

Vissim Post-Processor **Rollins Road Micro-Simulation**
Average Results from 10 Runs **Alternative 4 - Median**
Volume and Delay by Movement **AM Peak Hour**

Intersection 1 **Rollins Road/Millbrae Avenue** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Percent	Std. Dev.	Minimum	Maximum	GEH	Total Delay (sec/veh) Average	Std. Dev.	Minimum	Maximum	LOS
NB	U Turn												
	Second Left												
	Left Turn	160	154	96.4%	11.6	138	172	0.5	100.0	21.3	64.9	126.5	F
	Through	237	223	94.1%	15.6	205	256	0.9	158.4	28.9	115.9	199.0	F
	Right Turn	370	368	99.4%	20.0	339	407	0.1	82.7	26.5	42.6	119.3	F
	Second Right												
	Subtotal	767	745	97.1%	24.5	718	780	0.8	108.9	26.2	68.9	140.8	F
SB	U Turn												
	Second Left												
	Left Turn	246	214	86.9%	20.7	186	255	2.1	60.7	3.6	54.6	66.4	E
	Through	70	62	88.3%	8.2	48	76	1.0	59.0	4.4	51.7	65.7	E
	Right Turn	144	78	54.2%	8.9	63	91	6.3	10.1	0.8	8.5	11.6	B
	Second Right												
	Subtotal	460	354	76.9%	27.7	320	404	5.3	49.2	3.1	45.3	53.6	D
EB	U Turn												
	Second Left												
	Left Turn	506	438	86.6%	14.8	416	465	3.1	177.6	10.9	163.7	195.9	F
	Through	1,540	1,337	86.8%	29.6	1,294	1,383	5.4	98.2	3.7	92.8	105.2	F
	Right Turn	450	392	87.1%	21.5	341	417	2.8	59.1	3.1	55.3	63.5	E
	Second Right												
	Subtotal	2,496	2,167	86.8%	45.3	2,107	2,248	6.8	107.2	4.1	101.2	114.1	F
WB	U Turn												
	Second Left												
	Left Turn	580	561	96.8%	19.6	516	586	0.8	77.9	11.1	58.1	97.1	E
	Through	1,000	957	95.7%	44.4	874	1,010	1.4	73.8	11.3	53.5	90.0	E
	Right Turn	679	652	96.0%	21.1	627	699	1.0	149.8	18.2	123.9	169.8	F
	Second Right												
	Subtotal	2,259	2,170	96.1%	60.9	2,022	2,223	1.9	97.7	12.1	76.3	115.5	F
Total		5,982	5,436	90.9%	76.6	5,314	5,578	7.2	99.9	7.0	85.1	109.9	F

Vissim Post-Processor **Rollins Road Micro-Simulation**
Average Results from 10 Runs **Alternative 4 - Median**
Volume and Delay by Movement **AM Peak Hour**

Intersection 2 **Rollins Road/Garden Lane** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Percent	Std. Dev.	Minimum	Maximum	GEH	Total Delay (sec/veh) Average	Std. Dev.	Minimum	Maximum	LOS
NB	U Turn												
	Second Left												
	Left Turn												
	Through	1,190	1,097	92.1%	15.0	1,074	1,116	2.8	8.8	0.5	7.9	9.5	A
	Right Turn	232	215	92.5%	18.8	193	259	1.2	7.5	0.8	6.6	9.5	A
	Second Right												
	Subtotal	1,422	1,311	92.2%	28.8	1,279	1,375	3.0	8.6	0.5	7.7	9.5	A
SB	U Turn												
	Second Left												
	Left Turn												
	Through	359	290	80.8%	19.9	255	324	3.8	1.2	0.5	0.7	2.2	A
	Right Turn	65	104	160.0%	15.6	88	142	4.2	2.8	0.4	2.1	3.4	A
	Second Right												
	Subtotal	424	394	92.9%	27.8	351	446	1.5	1.6	0.4	1.2	2.4	A
EB	U Turn												
	Second Left												
	Left Turn												
	Through												
	Right Turn	112	106	94.7%	8.4	94	117	0.6	10.3	1.3	8.9	12.3	B
	Second Right												
	Subtotal	112	106	94.7%	8.4	94	117	0.6	10.3	1.3	8.9	12.3	B
WB	U Turn												
	Second Left												
	Left Turn												
	Through												
	Right Turn	104	105	101.3%	8.7	94	120	0.1	159.9	63.8	80.6	263.2	F
	Second Right												
	Subtotal	104	105	101.3%	8.7	94	120	0.1	159.9	63.8	80.6	263.2	F
Total		2,062	1,917	93.0%	55.4	1,846	2,018	3.3	15.6	3.6	10.5	20.1	C

Vissim Post-Processor **Rollins Road Micro-Simulation**

Average Results from 10 Runs **Alternative 4 - Median**

Volume and Delay by Movement **AM Peak Hour**

Intersection 3 **Rollins Road/Kiss-N-Ride** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Percent	Std. Dev.	Minimum	Maximum	GEH	Total Delay (sec/veh) Average	Std. Dev.	Minimum	Maximum	LOS
NB	U Turn												
	Second Left												
	Left Turn												
	Through	1,294	1,202	92.9%	19.3	1,174	1,233	2.6	6.8	0.3	6.2	7.3	A
	Right Turn												
	Second Right												
	Subtotal	1,294	1,202	92.9%	19.3	1,174	1,233	2.6	6.8	0.3	6.2	7.3	A
SB	U Turn												
	Second Left												
	Left Turn												
	Through	397	341	86.0%	24.6	300	377	2.9	1.6	0.2	1.3	1.8	A
	Right Turn	186	192	103.0%	14.8	167	212	0.4	2.7	0.3	2.2	3.1	A
	Second Right												
	Subtotal	583	533	91.4%	35.9	480	579	2.1	2.0	0.2	1.6	2.2	A
EB	U Turn												
	Second Left												
	Left Turn												
	Through												
	Right Turn	52	62	119.8%	6.7	52	77	1.4	10.9	0.7	10.1	12.0	B
	Second Right												
	Subtotal	52	62	119.8%	6.7	52	77	1.4	10.9	0.7	10.1	12.0	B
WB	U Turn												
	Second Left												
	Left Turn												
	Through												
	Right Turn												
	Second Right												
	Subtotal												
Total		1,929	1,797	93.1%	55.6	1,717	1,882	3.1	5.5	0.2	5.1	5.9	A

Vissim Post-Processor **Rollins Road Microsimulation**
Average Results from 10 Runs **Alternative 4 - Median**
Volume and Delay by Movement **PM Peak Hour**

Intersection 1 **Rollins Road/Millbrae Avenue** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Percent	Std. Dev.	Minimum	Maximum	GEH	Total Delay (sec/veh) Average	Std. Dev.	Minimum	Maximum	LOS
NB	U Turn												
	Second Left												
	Left Turn	440	449	102.1%	29.7	393	498	0.4	54.0	7.7	45.9	71.3	D
	Through	113	111	98.2%	12.6	91	128	0.2	52.8	5.6	47.0	66.2	D
	Right Turn	580	592	102.0%	21.9	553	627	0.5	15.6	1.3	13.4	17.8	B
	Second Right												
	Subtotal	1,133	1,152	101.7%	39.2	1,080	1,229	0.6	34.2	3.3	30.1	41.6	C
SB	U Turn												
	Second Left												
	Left Turn	596	454	76.1%	19.6	420	484	6.2	62.3	2.9	58.1	67.8	E
	Through	96	71	74.3%	5.4	61	78	2.7	59.6	6.3	51.1	71.0	E
	Right Turn	402	259	64.4%	11.9	242	278	7.9	30.4	2.0	27.8	34.7	C
	Second Right												
	Subtotal	1,094	784	71.7%	20.9	753	819	10.1	51.6	2.5	48.7	56.7	D
EB	U Turn												
	Second Left												
	Left Turn	222	221	99.4%	14.0	200	243	0.1	74.3	9.7	64.8	95.8	E
	Through	1,210	1,199	99.1%	29.1	1,160	1,259	0.3	44.2	3.1	40.4	50.4	D
	Right Turn	330	329	99.8%	24.8	290	375	0.0	15.1	2.1	12.3	19.1	B
	Second Right												
	Subtotal	1,762	1,749	99.3%	49.7	1,691	1,873	0.3	42.5	3.7	38.4	50.7	D
WB	U Turn												
	Second Left												
	Left Turn	490	498	101.6%	29.1	452	535	0.4	46.6	2.4	42.7	49.6	D
	Through	1,700	1,714	100.8%	41.6	1,642	1,778	0.3	39.7	2.8	33.4	42.8	D
	Right Turn	315	333	105.7%	19.9	305	362	1.0	16.9	5.0	9.9	26.2	B
	Second Right												
	Subtotal	2,505	2,545	101.6%	52.1	2,469	2,637	0.8	38.1	2.2	33.9	40.3	D
Total		6,494	6,230	95.9%	67.2	6,144	6,358	3.3	40.3	1.9	37.9	44.3	D

Vissim Post-Processor **Rollins Road Microsimulation**
Average Results from 10 Runs **Alternative 4 - Median**
Volume and Delay by Movement **PM Peak Hour**

Intersection 2 **Rollins Road/Garden Lane** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Percent	Std. Dev.	Minimum	Maximum	GEH	Total Delay (sec/veh) Average	Std. Dev.	Minimum	Maximum	LOS
NB	U Turn												
	Second Left												
	Left Turn												
	Through	531	546	102.8%	30.3	496	588	0.6	15.5	5.1	7.5	22.7	C
	Right Turn	120	119	98.8%	11.2	103	138	0.1	15.8	4.7	9.5	22.1	C
	Second Right												
	Subtotal	651	664	102.0%	37.0	611	710	0.5	15.5	5.0	7.8	22.6	C
SB	U Turn												
	Second Left												
	Left Turn												
	Through	1,015	745	73.4%	19.3	711	779	9.1	15.4	0.7	14.1	16.1	C
	Right Turn	117	119	101.5%	10.8	108	138	0.2	12.0	2.1	8.6	16.2	B
	Second Right												
	Subtotal	1,132	863	76.3%	15.9	843	889	8.5	15.0	0.7	13.7	15.8	B
EB	U Turn												
	Second Left												
	Left Turn												
	Through												
	Right Turn	85	82	96.1%	9.1	68	97	0.4	37.7	7.5	29.6	54.5	E
	Second Right												
	Subtotal	85	82	96.1%	9.1	68	97	0.4	37.7	7.5	29.6	54.5	E
WB	U Turn												
	Second Left												
	Left Turn												
	Through												
	Right Turn	233	208	89.4%	21.5	175	243	1.7	191.4	56.6	105.9	279.2	F
	Second Right												
	Subtotal	233	208	89.4%	21.5	175	243	1.7	191.4	56.6	105.9	279.2	F
Total		2,101	1,818	86.5%	41.0	1,760	1,888	6.4	36.2	7.7	25.4	45.1	E

Vissim Post-Processor **Rollins Road Microsimulation**
Average Results from 10 Runs **Alternative 4 - Median**
Volume and Delay by Movement **PM Peak Hour**

Intersection 3 **Rollins Road/Kiss-N-Ride** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Percent	Std. Dev.	Minimum	Maximum	GEH	Total Delay (sec/veh) Average	Std. Dev.	Minimum	Maximum	LOS
NB	U Turn												
	Second Left												
	Left Turn												
	Through	764	755	98.9%	21.1	718	790	0.3	12.6	1.8	9.9	15.3	B
	Right Turn												
	Second Right												
	Subtotal	764	755	98.9%	21.1	718	790	0.3	12.6	1.8	9.9	15.3	B
SB	U Turn												
	Second Left												
	Left Turn												
	Through	981	744	75.8%	18.2	723	768	8.1	19.3	1.1	17.8	21.6	C
	Right Turn	77	87	112.7%	9.5	71	102	1.1	17.7	2.0	14.7	21.9	C
	Second Right												
	Subtotal	1,058	831	78.5%	18.9	803	853	7.4	19.1	0.9	18.1	21.2	C
EB	U Turn												
	Second Left												
	Left Turn												
	Through												
	Right Turn	156	117	75.0%	12.2	98	133	3.3	416.3	45.3	361.5	476.7	F
	Second Right												
	Subtotal	156	117	75.0%	12.2	98	133	3.3	416.3	45.3	361.5	476.7	F
WB	U Turn												
	Second Left												
	Left Turn												
	Through												
	Right Turn												
	Second Right												
	Subtotal												
Total		1,978	1,703	86.1%	38.7	1,630	1,762	6.4	43.2	1.8	41.6	48.1	E

Alternative 5

Vissim Post-Processor | **Rollins Road Micro-Simulation**
Average Results from 10 Runs | **Alternative 5 - South Station Access**
Volume and Delay by Movement | **AM Peak Hour**

Intersection 1 **Rollins Road/Millbrae Avenue** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Percent	Std. Dev.	Minimum	Maximum	GEH	Total Delay (sec/veh) Average	Std. Dev.	Minimum	Maximum	LOS
NB	U Turn												
	Second Left												
	Left Turn	160	156	97.3%	8.5	143	172	0.3	88.3	28.9	60.5	145.8	F
	Through	237	222	93.7%	11.0	203	239	1.0	142.8	37.1	102.0	205.5	F
	Right Turn	370	358	96.8%	25.5	313	386	0.6	69.9	32.3	38.0	130.1	E
	Second Right												
	Subtotal	767	736	95.9%	21.3	697	763	1.1	95.8	33.2	66.0	156.0	F
SB	U Turn												
	Second Left												
	Left Turn	187	153	81.8%	15.7	137	189	2.6	58.7	3.4	51.4	62.7	E
	Through	54	46	84.8%	6.1	38	57	1.2	62.6	5.4	56.2	71.2	E
	Right Turn	110	62	56.5%	5.8	53	72	5.2	8.9	0.7	7.9	10.0	A
	Second Right												
	Subtotal	351	261	74.3%	20.4	240	309	5.2	47.5	3.3	39.8	51.7	D
EB	U Turn												
	Second Left												
	Left Turn	506	442	87.4%	10.0	427	456	2.9	170.7	11.4	154.8	189.3	F
	Through	1,540	1,356	88.0%	46.8	1,266	1,426	4.8	98.3	3.8	89.6	103.3	F
	Right Turn	450	396	88.1%	23.0	342	421	2.6	61.0	3.5	55.0	66.4	E
	Second Right												
	Subtotal	2,496	2,194	87.9%	61.2	2,080	2,283	6.2	106.2	3.8	98.2	110.5	F
WB	U Turn												
	Second Left												
	Left Turn	580	555	95.7%	20.1	518	584	1.0	78.7	11.2	56.5	94.9	E
	Through	1,000	945	94.5%	41.0	878	990	1.8	75.7	12.1	48.5	86.5	E
	Right Turn	679	643	94.6%	19.0	612	677	1.4	154.4	17.8	122.4	180.8	F
	Second Right												
	Subtotal	2,259	2,143	94.9%	51.9	2,045	2,227	2.5	100.0	12.3	77.0	115.0	F
Total		5,873	5,334	90.8%	65.4	5,244	5,447	7.2	99.4	7.1	86.6	108.8	F

Vissim Post-Processor | **Rollins Road Micro-Simulation**
Average Results from 10 Runs | **Alternative 5 - South Station Access**
Volume and Delay by Movement | **AM Peak Hour**

Intersection 2 **Rollins Road/Garden Lane** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Percent	Std. Dev.	Minimum	Maximum	GEH	Total Delay (sec/veh) Average	Std. Dev.	Minimum	Maximum	LOS
NB	U Turn												
	Second Left												
	Left Turn												
	Through	1,190	1,092	91.8%	12.9	1,078	1,121	2.9	9.1	0.7	8.0	10.0	A
	Right Turn	232	212	91.4%	17.4	192	252	1.3	7.8	0.6	7.2	9.1	A
	Second Right												
	Subtotal	1,422	1,304	91.7%	22.1	1,278	1,351	3.2	8.9	0.7	7.9	9.7	A
SB	U Turn												
	Second Left												
	Left Turn												
	Through	250	174	69.6%	15.4	148	203	5.2	0.5	0.2	0.4	1.1	A
	Right Turn	65	102	156.5%	9.5	89	120	4.0	2.6	0.4	2.0	3.2	A
	Second Right												
	Subtotal	315	276	87.5%	13.0	261	302	2.3	1.3	0.2	0.9	1.6	A
EB	U Turn												
	Second Left												
	Left Turn												
	Through												
	Right Turn	112	107	95.1%	8.3	94	117	0.5	9.0	0.9	7.8	10.7	A
	Second Right												
	Subtotal	112	107	95.1%	8.3	94	117	0.5	9.0	0.9	7.8	10.7	A
WB	U Turn												
	Second Left												
	Left Turn												
	Through												
	Right Turn	104	104	99.5%	7.4	89	114	0.0	128.3	39.2	77.5	206.3	F
	Second Right												
	Subtotal	104	104	99.5%	7.4	89	114	0.0	128.3	39.2	77.5	206.3	F
Total		1,953	1,790	91.6%	35.7	1,751	1,873	3.8	14.7	2.7	11.5	20.1	B

Vissim Post-Processor | **Rollins Road Micro-Simulation**
Average Results from 10 Runs | **Alternative 5 - South Station Access**
Volume and Delay by Movement | **AM Peak Hour**

Intersection 3 **Rollins Road/Multimodal Station Access Road** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Percent	Std. Dev.	Minimum	Maximum	GEH	Total Delay (sec/veh) Average	Std. Dev.	Minimum	Maximum	LOS
NB	U Turn												
	Second Left												
	Left Turn												
	Through	1,294	1,195	92.3%	11.2	1,179	1,211	2.8	7.1	0.3	6.6	7.6	A
	Right Turn												
	Second Right												
	Subtotal	1,294	1,195	92.3%	11.2	1,179	1,211	2.8	7.1	0.3	6.6	7.6	A
SB	U Turn												
	Second Left												
	Left Turn												
	Through	288	230	79.7%	16.2	200	257	3.6	1.3	0.1	1.1	1.5	A
	Right Turn	186	188	101.1%	12.8	170	207	0.1	2.3	0.2	1.9	2.6	A
	Second Right												
	Subtotal	474	418	88.1%	24.8	391	464	2.7	1.7	0.1	1.4	1.9	A
EB	U Turn												
	Second Left												
	Left Turn												
	Through												
	Right Turn	52	53	102.7%	7.0	43	69	0.2	7.9	0.3	7.3	8.3	A
	Second Right												
	Subtotal	52	53	102.7%	7.0	43	69	0.2	7.9	0.3	7.3	8.3	A
WB	U Turn												
	Second Left												
	Left Turn												
	Through												
	Right Turn												
	Second Right												
	Subtotal												
Total		1,820	1,666	91.5%	31.0	1,634	1,727	3.7	5.8	0.2	5.5	6.2	A

Vissim Post-Processor | **Rollins Road Microsimulation**
Average Results from 10 Runs | **Alternative 5 - South Station Access**
Volume and Delay by Movement | **PM Peak Hour**

Intersection 1 **Rollins Road/Millbrae Avenue** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Percent	Std. Dev.	Minimum	Maximum	GEH	Total Delay (sec/veh) Average	Std. Dev.	Minimum	Maximum	LOS
NB	U Turn												
	Second Left												
	Left Turn	440	445	101.0%	30.0	393	494	0.2	54.0	5.7	48.7	67.3	D
	Through	113	112	99.2%	12.2	95	135	0.1	48.0	3.6	44.1	55.4	D
	Right Turn	580	588	101.4%	20.5	561	631	0.3	15.4	1.1	14.0	17.7	B
	Second Right												
	Subtotal	1,133	1,145	101.1%	40.5	1,078	1,219	0.4	33.6	2.8	31.2	39.5	C
SB	U Turn												
	Second Left												
	Left Turn	521	474	90.9%	8.8	460	487	2.1	57.3	2.8	53.2	62.6	E
	Through	83	75	89.9%	6.5	66	86	0.9	58.7	6.0	45.2	68.1	E
	Right Turn	352	280	79.5%	13.5	266	305	4.1	30.0	2.5	24.8	33.5	C
	Second Right												
	Subtotal	956	828	86.6%	19.6	803	861	4.3	48.2	2.3	45.3	52.1	D
EB	U Turn												
	Second Left												
	Left Turn	222	216	97.3%	12.2	198	232	0.4	64.3	5.0	58.5	73.9	E
	Through	1,210	1,186	98.0%	34.4	1,111	1,237	0.7	42.5	1.7	38.9	44.6	D
	Right Turn	330	324	98.2%	18.7	289	345	0.3	13.4	1.4	11.3	15.2	B
	Second Right												
	Subtotal	1,762	1,726	98.0%	32.4	1,656	1,776	0.9	39.8	1.7	36.8	41.8	D
WB	U Turn												
	Second Left												
	Left Turn	490	497	101.3%	22.9	461	533	0.3	46.3	2.5	42.7	49.6	D
	Through	1,700	1,686	99.2%	44.1	1,595	1,738	0.3	38.4	2.5	33.8	41.9	D
	Right Turn	315	320	101.5%	24.4	281	362	0.3	10.0	1.9	8.3	14.8	B
	Second Right												
	Subtotal	2,505	2,502	99.9%	67.6	2,356	2,581	0.1	36.4	2.3	32.1	39.6	D
Total		6,356	6,201	97.6%	66.1	6,094	6,301	2.0	38.4	0.9	37.5	40.2	D

Vissim Post-Processor | **Rollins Road Microsimulation**
Average Results from 10 Runs | **Alternative 5 - South Station Access**
Volume and Delay by Movement | **PM Peak Hour**

Intersection 2 **Rollins Road/Garden Lane** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Percent	Std. Dev.	Minimum	Maximum	GEH	Total Delay (sec/veh) Average	Std. Dev.	Minimum	Maximum	LOS
NB	U Turn												
	Second Left												
	Left Turn												
	Through	531	530	99.8%	27.1	493	588	0.1	4.3	1.6	2.4	7.8	A
	Right Turn	120	118	97.9%	11.0	103	137	0.2	4.6	2.0	2.0	9.0	A
	Second Right												
	Subtotal	651	647	99.4%	30.7	613	704	0.1	4.4	1.6	2.3	8.0	A
SB	U Turn												
	Second Left												
	Left Turn												
	Through	878	780	88.8%	24.0	739	815	3.4	15.3	0.7	14.3	16.3	C
	Right Turn	117	112	95.3%	13.8	83	137	0.5	12.0	2.9	7.2	17.0	B
	Second Right												
	Subtotal	995	892	89.6%	20.3	868	928	3.4	14.9	0.6	14.1	15.7	B
EB	U Turn												
	Second Left												
	Left Turn												
	Through												
	Right Turn	85	84	98.6%	9.3	74	97	0.1	34.2	8.5	25.7	47.9	D
	Second Right												
	Subtotal	85	84	98.6%	9.3	74	97	0.1	34.2	8.5	25.7	47.9	D
WB	U Turn												
	Second Left												
	Left Turn												
	Through												
	Right Turn	233	232	99.7%	15.8	208	260	0.1	65.2	32.5	28.1	134.7	F
	Second Right												
	Subtotal	233	232	99.7%	15.8	208	260	0.1	65.2	32.5	28.1	134.7	F
Total		1,964	1,855	94.4%	28.9	1,813	1,895	2.5	18.3	4.0	13.8	24.9	C

Vissim Post-Processor **Rollins Road Microsimulation**
Average Results from 10 Runs **Alternative 5 - South Station Access**
Volume and Delay by Movement **PM Peak Hour**

Intersection 3 **Rollins Road/Kiss-N-Ride** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Percent	Std. Dev.	Minimum	Maximum	GEH	Total Delay (sec/veh) Average	Std. Dev.	Minimum	Maximum	LOS
NB	U Turn												
	Second Left												
	Left Turn												
	Through	764	760	99.5%	24.5	732	801	0.1	5.5	1.1	4.2	7.4	A
	Right Turn												
	Second Right												
	Subtotal	764	760	99.5%	24.5	732	801	0.1	5.5	1.1	4.2	7.4	A
SB	U Turn												
	Second Left												
	Left Turn												
	Through	844	749	88.8%	19.1	731	790	3.4	17.7	1.4	15.6	19.5	C
	Right Turn	77	81	105.1%	10.4	67	101	0.4	18.4	3.5	13.3	23.4	C
	Second Right												
	Subtotal	921	830	90.1%	18.7	807	865	3.1	17.8	1.4	15.4	19.6	C
EB	U Turn												
	Second Left												
	Left Turn												
	Through												
	Right Turn	156	145	92.6%	10.2	132	165	0.9	155.0	60.4	76.1	257.8	F
	Second Right												
	Subtotal	156	145	92.6%	10.2	132	165	0.9	155.0	60.4	76.1	257.8	F
WB	U Turn												
	Second Left												
	Left Turn												
	Through												
	Right Turn												
	Second Right												
	Subtotal												
Total		1,841	1,735	94.2%	33.0	1,671	1,774	2.5	23.7	5.3	16.6	33.2	C

APPENDIX D: MILLBRAE STATION AREA SPECIFIC PLAN MODE OF ACCESS BY SIDE OF STATION

FEHR PEERS

MEMORANDUM

Date: February 19th, 2015

To: Bruce Brubaker, Placeworks

From: Nikki Foletta and Steve Crosley, Fehr & Peers

Subject: Millbrae Station Area Specific Plan Mode of Access by Side of Station

SF14-0730

This memorandum examines mode of access (auto, transit, kiss-and-ride/taxi, and pedestrian/bicycle) to the Millbrae Station by side of station for existing conditions and provides estimates for year 2040. The two sides of the station are defined as "west side" and "east side".

BART and Caltrain ridership data and future projections are reported in the memorandum *Effects of Millbrae Station Area Specific Plan on BART Ridership and Parking* (Fehr & Peers, January 27th, 2015). This analysis utilizes those ridership and mode of access findings in combination with existing transportation conditions information and future land use projections to estimate mode of access by side of station. Ridership and mode of access at the Millbrae Station were estimated for existing conditions and the following three Millbrae Station Area Specific Plan (MSASP) 2040 scenarios: standalone Site 1 TOD, standalone Sites 5/6 TOD, and full buildout of the Specific Plan Area. This memo begins by detailing the assumptions regarding access by mode, followed by a summary of mode of access by side of the station.

PARK AND RIDE

Currently, a Caltrain parking lot with 185 spaces is located on the west side of the station. A BART parking garage with 2,087 spaces and four BART surface parking lots with 883 spaces are located on the east side of the station. It is assumed that all BART park-and-riders, under both existing conditions and future scenarios, park in the garage and lots on the east side of the station. Caltrain riders may park in either the Caltrain or BART parking facilities. It is estimated that under peak demand there are 185 Caltrain riders parking in the Caltrain facilities and 150 parking in the BART parking facilities. Using this ratio it is estimated that 55 percent of Caltrain park-and-riders use the west entrance (coming from the Caltrain parking lot) and 45 percent of Caltrain park-and-riders use the east entrance (coming from the BART parking facilities).

In 2040, with Site 1, Sites 5/6 and Buildout, the Caltrain peak parking demand is expected to increase to 910, with 185 parking in the Caltrain facilities and 725 parking in the BART facilities. Therefore, for 2040 scenarios it is estimated that 20 percent of Caltrain park-and-riders use the west entrance and 80 percent use the east entrance.

KISS-AND-RIDE/TAXI (RIDESHARING)

Kiss-and-ride facilities are currently located on both sides of the station. Field observations during the AM and PM peak periods found that approximately 52 percent of drop-offs and pick-ups (including both kiss-and-ride and taxi) occur on the west side of the station and 48 percent of drop-offs and pick-ups occur on the east side of the station. It was assumed that these ratios remain the same in 2040.

TRANSIT

Bus and shuttle stops are currently located on both sides of the station. The following buses and shuttles currently serve the Millbrae Station:

Station Side	***Name***	***Type***	***Location***
Westside	SamTrans ECR	Trunk Route	El Camino Real
	Broadway-Millbrae	Caltrain Shuttle	Station Adjacent
	North Burlingame	C/CAG Shuttle	Station Adjacent
	Mercy High School Shuttle	School Shuttle	Station Adjacent
Eastside	SamTrans Route 397	Owl	Transit Center
	Burlingame-Bayside	C/CAG Shuttle	Transit Center
	Broadway Millbrae Shuttle	Caltrain Shuttle	Transit Center
	North Foster City	C/CAG Shuttle	Transit Center
	Genentech	Private Shuttle	Transit Center
	Sierra Point	Private Shuttle	Transit Center
	Cisco	Private Shuttle	Transit Center
	VISA	Private Shuttle	Transit Center
	Google	Private Shuttle	Transit Center
	Go Pro	Private Shuttle	Transit Center
	Solar City	Private Shuttle	Transit Center

Based on analysis of bus and shuttle schedules, approximately 32 buses (SamTrans Route ECR) and 32 shuttles currently stop on the west side of the station during the AM and PM peak hours. Approximately 53 shuttles stop on the east side of the station during the AM and PM peak hours. Average peak period passenger boardings were also estimated based on available data including rider surveys and site visit observations. It was estimated that approximately 115 passengers board buses and 140 passengers board shuttles on the west side of the station during peak hours and it was estimated that approximately 590 passengers board shuttles on the east side of the station during peak hours. The ratio of passengers boarding on the west versus the east side of the station was used to estimate the number of riders entering the Millbrae Station from each side. Since the Broadway-Millbrae Caltrain shuttle only serves Caltrain riders, those 13 peak period shuttles were not considered when determining the BART transit mode of access ratios. Based on these values, it was estimated that 29 percent of BART riders accessing the Millbrae Station by bus or shuttle enter from the west side and 71 percent enter from the east side. For Caltrain riders, it was estimated that 31 percent of riders accessing the Millbrae Station by bus or shuttle enter

from the west side and 69 percent from the east side. For the purpose of this analysis, it was assumed that these ratios remain the same in 2040.

WALK/BIKE

Population and employment within a half mile of the station on the west side versus east side of the rail tracks was used to estimate the ratio of riders who would access the station by foot from each side of the station. Likewise, population and employment within two miles of the station on the west versus east side of the rail tracks was used to estimate the ratio of riders who would access the station by bike from each side. Overall it was estimated that 81 percent of BART and Caltrain riders accessing the station by walking or biking would enter from the west side and 19 percent from the east side.

The daily BART and Caltrain boardings generated by the 2040 MSASP land use scenarios are summarized in **Table 1**. All of these boardings are expected to be walk or bike access. For Site 1, these additional walk/bike boardings are expected to enter from the west side of the station. For Sites 5/6 these boardings are expected to enter from the east side of the station. For SASP buildout, 582 BART boardings and 403 Caltrain boardings are expected to enter from the west side and the remaining are expected to enter from the east side.

TABLE 1. MILLBRAE WALK ACCESS BOARDINGS GENERATED BY MSASP SCENARIOS

Scenario	Daily BART Boardings	Daily Caltrain Boardings
Site 1	582	403
Sites 5/6	659	456
Full Buildout	1,863	1,290

MODE OF ACCESS BY SIDE OF STATION

Tables 2 through **5** show the daily boardings by mode of access for both the west side and east side of the Millbrae Station. Under existing conditions (**Table 2**), 20 percent of daily BART boardings enter from the west side of the station and 80 percent enter from the east side of the station. Fifty-five percent of Caltrain boardings enter from the west side of the station and 45 percent from the east side. The higher number of Caltrain boardings from the west side are mainly due to the location of the Caltrain parking lot on the west side of the station. Among all daily boardings entering the Millbrae Station, 29 percent enter from the west side and 71 from the east side.

TABLE 2. WEST/EAST BOARDINGS BY MODE – EXISTING CONDITIONS

	Daily PNR Boardings	Daily KNR Boardings	Daily Transit Boardings	Daily Walk/Bike Boardings	**TOTAL Daily Boardings**	%
BART						
West Side	0	336	78	573	**987**	20%
East Side	3,215	307	187	134	**3,843**	80%
Caltrain						
West Side	252	153	138	369	**913**	55%
East Side	203	140	313	86	**742**	45%
TOTAL						
West Side	**252**	**489**	**216**	**943**	**1,900**	**29%**
East Side	**3,418**	**447**	**500**	**220**	**4,585**	**71%**

In 2040 with the Site 1 TOD (**Table 3**), 34 percent of daily BART boardings enter from the west side of the station and 66 percent enter from the east side of the station. Forty-six percent of Caltrain boardings enter from the west side of the station and 54 percent from the east side. The higher number of walk/bike boardings on the west side are mainly due to the Site 1 TOD located on the west side of the station. Among all daily boardings entering the Millbrae Station, 40 percent enter from the west side and 60 from the east side.

TABLE 3. WEST/EAST BOARDINGS BY MODE – 2040 SITE 1 TOD

	Daily PNR Boardings	Daily KNR Boardings	Daily Transit Boardings	Daily Walk/Bike Boardings	**TOTAL Daily Boardings**	%
BART						
West Side	0	338	277	1,437	**2,052**	34%
East Side	2,740	308	665	200	**3,913**	66%
Caltrain						
West Side	252	460	543	1,100	**2,356**	46%
East Side	994	420	1,236	163	**2,812**	54%
TOTAL						
West Side	**252**	**798**	**821**	**2,537**	**4,408**	**40%**
East Side	**3,734**	**728**	**1,901**	**362**	**6,725**	**60%**

In 2040 with the Sites 5/6 TOD (**Table 4**), 24 percent of daily BART boardings enter from the west side of the station and 76 percent enter from the east side of the station. Thirty-seven percent of Caltrain boardings enter from the west side of the station and 63 percent from the east side. Among all daily boardings entering the Millbrae Station, 30 percent enter from the west side and 70 from the east side.

TABLE 4. WEST/EAST BOARDINGS BY MODE – 2040 SITES 5/6 TOD

	Daily PNR Boardings	Daily KNR Boardings	Daily Transit Boardings	Daily Walk/Bike Boardings	**TOTAL Daily Boardings**	%
BART						
West Side	0	338	277	855	**1,470**	24%
East Side	2,740	308	665	859	**4,572**	76%
Caltrain						
West Side	252	460	543	697	**1,953**	37%
East Side	994	420	1,236	619	**3,268**	63%
TOTAL						
West Side	**252**	**798**	**821**	**1,552**	**3,423**	**30%**
East Side	**3,734**	**728**	**1,901**	**1,477**	**7,840**	**70%**

In 2040 with Full Buildout (**Table 5**), 28 percent of daily BART boardings enter from the west side of the station and 72 percent enter from the east side of the station. Thirty-nine percent of Caltrain boardings enter from the west side of the station and 61 percent from the east side.

Among all daily boardings entering the Millbrae Station, 33 percent enter from the west side and 67 from the east side.

TABLE 5. WEST/EAST BOARDINGS BY MODE – 2040 FULL BUILDOUT

	Daily PNR Boardings	Daily KNR Boardings	Daily Transit Boardings	Daily Walk/Bike Boardings	**TOTAL Daily Boardings**	%
BART						
West Side	0	338	277	1,437	**2,052**	28%
East Side	2,740	308	665	1,481	**5,194**	72%
Caltrain						
West Side	252	460	543	1,100	**2,356**	39%
East Side	994	420	1,236	1,050	**3,699**	61%
TOTAL						
West Side	**252**	**798**	**821**	**2,537**	**4,408**	**33%**
East Side	**3,734**	**728**	**1,901**	**2,530**	**8,893**	**67%**