City of Mountain View

Shoreline Transportation Study

Submitted to:

City of Mountain View, CA

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Study Purpose

The Shoreline Regional Park Community/North Bayshore area of the City of Mountain View is an area of opportunity and change in the City and is expected to be the focus of long-term growth with expansion and development of the high-technology campuses and other mixed-use land uses. Guidelines for growth, land use policies and a vision of change for North Bayshore are included in the new General Plan 2030, adopted by the City in July 2012.

It is clear that the current transportation infrastructure is not sufficient to support the planned potential of growth. The solution to this challenge will be the implementation of transportation measures and strategies designed to reduce reliance on the single occupancy vehicle (SOV), encourage use of alternative travel modes, and manage the total demand for travel. The purpose of the Shoreline Regional Park Community Transportation Study (Shoreline Transportation Study) is to develop this transportation strategy through a collaborative process that includes the key stakeholders and community interests.

Existing Conditions

The existing transportation characteristics of the North Bayshore were documented through information gathered from the City, the major employers and the various providers of transportation services.

- There are currently about 7.3 million square feet of development and an estimated 17,100 employees in North Bayshore according to data provided by the City.
- North Bayshore currently generates about 70,600 weekday vehicle trips through the three interchanges that serve the area.
- Commute trips are equally divided among short (0 to 5 miles), medium (5 to 30 miles) and long (30+ miles) travel markets.
- North Bayshore employers already have innovative and highly effective programs to promote the use of alternatives to the single occupant automobile.
- The regional freeway network serving the area is currently operating in excess of capacity during the peak commute periods.
- Shoreline Boulevard north of U.S. Route 101 is also operating in excess of capacity in the peak periods.
- The regional public transit network (Caltrain/VTA light rail (LRT) and bus) does not directly serve North Bayshore and connectivity needs improvement.
- The U.S. Route 101 freeway and Stevens Creek/wetlands form physical barriers which limit transportation access, particularly for bicyclists and pedestrians.
- The internal roadway network serving North Bayshore has missing links and other deficiencies so that it does not effectively meet the needs of motorists, transit, bicyclists, and pedestrians.

Based on information provided the employers and actual counts of traffic, the following modal profile was developed for North Bayshore (see Table E-1).

Table E-1: Estimated Shoreline 2012 AM Commute Period Person Trips by Mode

	Auto	Carpool	Transit	Walk/Bicycle	Total
Mode Share	61.3%	6.4%	25.4%	7.0%	100%
Peak Period Commute Trips	13,800	1,400	5,900	1,600	22,700

Growth Projections

The City has developed the following growth projections consistent with the adopted General Plan for the North Bayshore (see Table E-2). The 2030 scenario involves a total of 10.7 million square feet of development representing a 61 percent increase in commute trips over existing levels. The Mid-Growth and High Growth scenarios would involve substantial additional increases (approaching build-out with the High Scenario), but would be consistent with General Plan policies.

Table E-2 North Bayshore Growth Projections

Projection Scenario	Development Sq. Ft. (Millions)	Estimated AM Period Commute Trips
Existing - 2012	7.3	22,700
General Plan - 2030	10.7	36,400
General Plan - Mid-Growth	14.3	50,000
General Plan - High-Growth	17.3	63,000

Transportation Strategies

The development of the improvement strategies was based upon the following key principles which were identified as part of the community outreach activities.

- The strategies would involve a combination of public and private roles and responsibilities.
- There would be multiple strategies which would work together to provide a multifaceted approach.
- The North Bayshore companies (potentially through a Transportation Management Association) would have an essential role.
- The selected infrastructure investments should be able to support the strategies, serve future growth and adapt to changing technology.

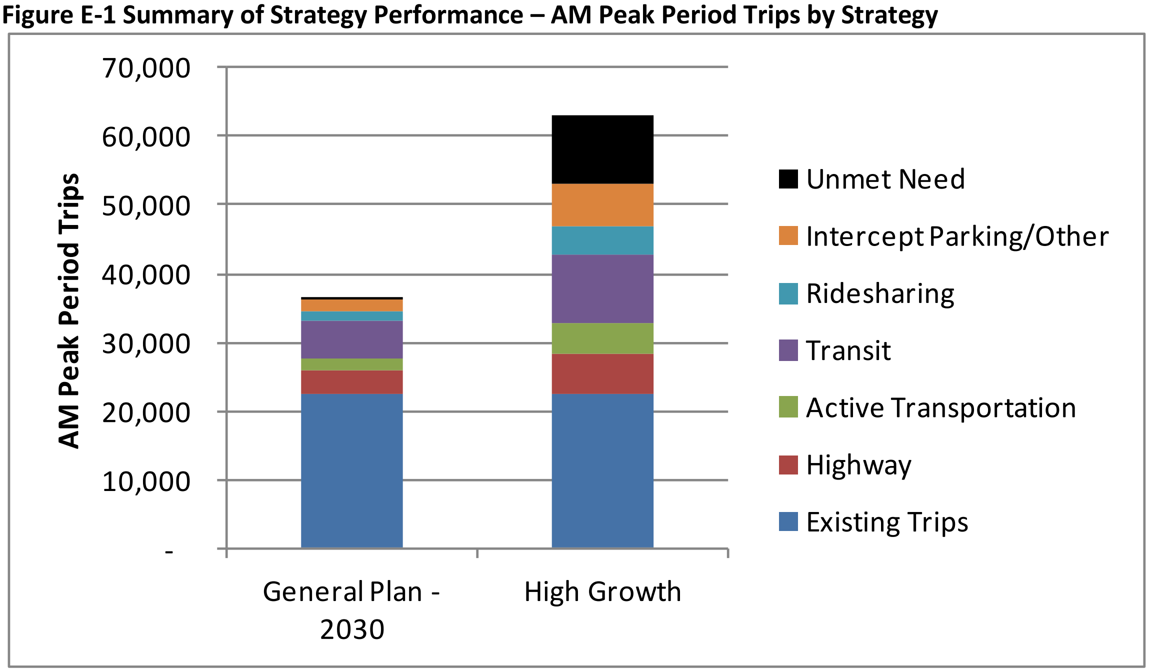
The result of these considerations was the development of the five strategies shown in Table E-3. Each strategy is targeted on specific modal and trip distance markets in order to maximize the effectiveness of the overall program.

Table E-3: Transportation Improvement Strategies

Strategy	Modal Target	Primary Travel Market
Roadway Efficiency & Capacity	Single-Occupant Vehicles / Ridesharing	All markets
Active Transportation	Pedestrian & Bicycle	Short Trips
Transit Connections	Transit	Medium Trips
Commuter Bus / Ridesharing	Transit / Ridesharing	Long Trips
Intercept Parking/Other	Single-Occupant Vehicles / Ridesharing	Short and Medium Trips

Each of these strategies was developed in detail in terms of the definition of the improvements that would be most effective in serving the forecast future travel demand. The strategies were then evaluated to determine their performance versus preliminary modal goals that were established for each future growth scenario. Figure E-1 shows how the strategies performed for the 2030 and High Growth scenarios. The strategies would be effective in serving the travel needs related to the General Plan – 2030 scenario. However, they would not fully serve the 63,000 AM peak hour trips associated with the General Plan – High Growth Scenario. There would be a shortfall or unmet need of about 10,000 trips. As a result, further consideration was given to the Medium Growth Scenario in terms of feasible transportation strategies.

Figure E-1 Summary of Strategy Performance – AM Peak Period Trips by Strategy



Key Findings

The following conclusions provide a summary of the results of this evaluation (as presented to the Mountain View City Council on February 5, 2013):

- Serving the planned employment growth in North Bayshore is challenging because the transportation facilities (especially roadways) were designed for the existing, lower level of development.
- A significant increase in commute trips can only be accommodated through a substantial shift to alternative commute modes.
- Recent changes by employers and employees alike provide an opportunity for a significant shift in commute behavior. These changes include greater personal support for transit and other modes by young people and greater active responsibility for commute services by companies.
- Regional agencies' current plans for South Bay transportation improvements (e.g., express lanes on U.S. Route 101 and State Route 85, Caltrain electrification and other upgrades, BART extension, and improved connecting light rail service) provide unique opportunities for expanded use of alternative transportation modes.
- There are, however, limitations to the capacity and capability for serving North Bayshore commuters of the Caltrain, VTA Light Rail and Express Lane systems.
- North Bayshore is an ideal location for the implementation of new and innovative transportation technology, including the use of electric vehicles and advanced transit and ridesharing information applications.
- There is a feasible set of strategies, with moderate new services and improvements, which can serve the transportation demand associated with the General Plan Growth Scenario which represents 10.7 million square feet of development.
- A medium level of growth (estimated at an additional 7 million square feet of development compared with existing development) can be served, but will require substantial new transportation investments.
- An effective transportation program for the High Growth Scenario (a total of 17.3 million square feet of development which is approaching build-out) will be difficult to achieve due to the limits of alternative commute modes. Significant, but likely unreachable, shifts of commute trips outside of the peak period or to intercept parking facilities would be needed.

Mode Share Targets

Table E-4 below provides a summary of the various growth scenarios and the mode share targets that resulted from the evaluation process. As noted previously, there is a shortfall in serving trips with the High Growth Scenario. Implementation of the transportation strategies proposed in this study is designed to meet these mode share targets, although it will be important to monitor the performance over time and adjust the strategies as needed.

Table E-4 Summary of Growth Scenarios and Mode Share Targets

	Growth Scenarios			
	Existing	General Plan	Medium	High
Development (million sq. ft.)	7.3	10.7	14.3	17.3
Est. Time Frame (Years)		10	20	30+
AM Commute Trips (estimated)				
Single-Occupant Vehicle	13,800	17,200	19,200	19,600
Rideshare Vehicle	1,400	2,800	4,800	5,400
Transit - Company Commuter Bus	4,700	7,700	9,000	9,400
Transit - Caltrain/LRT/Bus	1,200	3,900	6,000	6,400
Active Transportation	1,600	3,100	5,500	6,000
Intercept Parking / Other	0	1,700	5,500	6,300
Shortfall	0	0	0	9,900
Total	*22,700*	*36,400*	*50,000*	*63,000*
Proposed Commute Mode Share Targets				
Single-Occupant Vehicle	61%	47%	38%	31%
Rideshare Vehicle	6%	8%	10%	9%
Transit	26%	32%	30%	25%
Active Transportation	7%	8%	11%	9%
Intercept Parking / Other	0%	5%	11%	10%
Shortfall	0%			16%

Priority Improvements

For the General Plan Growth Scenario (an additional 3.4 million square feet), the proposed strategy includes a number of near term improvements to the transit and bicycle/pedestrian systems combined with some modest roadway upgrades. Of equal importance will be expanded employer programs, individually and through a TMA, which will increase the use of commute alternatives by employees. These strategies include:

- Modification to the Shoreline Boulevard off-ramp from U.S. Route 101, combined with a more complete and connected roadway system in North Bayshore.
- A substantial expansion and consolidation of the shuttle system connecting transit stations to North Bayshore. Ideally the numerous employer specific shuttles operated today would be consolidated into a single unified shuttle system with a few routes serving the various subareas of North Bayshore. These improvements would include higher capacity shuttles on new routes, dedicated transit lanes along Shoreline Boulevard and new transit bridges across U.S. Route 101 near Shoreline Boulevard and across Stevens Creek. The shuttle system would connect to and serve both Caltrain and light rail stations.

- Improvements to the downtown Mountain View Caltrain Station and Transit Center that will support the expanded shuttle program as well as addressing the impacts and needs of the Caltrain electrification plan.
- Comprehensive bicycle commuting improvements (developed through a new Bicycle Plan), including a Shoreline Boulevard cycletrack and use of the new bridges across U.S. Route 101 and Stevens Creek.
- Establishment of a Transportation Management Association that can play a significant role in increasing the use of commute alternatives coordinating the operation of shuttle services, bike sharing and other critical programs.

For the Medium Growth Scenario, the transportation program will build on, and expand, the above strategies, supplemented by more substantial improvements that will add capacity needed to serve the higher trip demand. These additional improvement strategies include:

- Reconstruction of the U.S. Route 101/San Antonio Road interchange and construction of the new Charleston Boulevard connection into North Bayshore.
- Full development of the U.S. Route 101 Express Lanes and construction of Direct Access Ramps.
- Additional improvements to and expansion of the downtown Mountain View Caltrain Station and Transit Center.
- Development of a higher-capacity transit connection between downtown and North Bayshore, potentially a rail or automated transit system.

While the above improvement strategies may not be needed, or fully implemented, for ten to twenty years, initial feasibility studies are warranted in the near term to confirm their viability and to enter the often extended process for project development and funding.

Costs and Funding

Preliminary costs were identified for these strategies and improvements. In the immediate short term (1-2 years) approximately $17.0 million will be needed to implement projects and initiate planning, feasibility and design efforts to support future projects. Over the 3-6 year time period about $110.0 million in additional project expenditures was identified and another $66.0 million over the 7-10 year period.

Several of these strategies directly benefit and serve North Bayshore travel demand. Others, however, have broader City of Mountain View and regional benefits, in addition to North Bayshore benefits. These improvements with regional benefits would be candidates for additional regional funding and partnerships. Funding for these improvements can potentially come from a variety of sources. Direct North Bayshore contributions could be provided from the Shoreline Community Fund, from direct developer contributions and through Traffic Mitigation Fees. Other sources for regional funding participation include:

- Roadway projects could be candidates for State Transportation Improvement Program (STIP) funds along with some other federal funds that are administered by VTA.

- The OneBayArea grant program, administered by MTC, could potentially support bicycle and pedestrian improvements.
- Some transit elements may be eligible for the federal Small Starts program, which includes funds for "core capacity" improvements such as the Caltrain Station upgrades.

City Council Direction and Additional Evaluation – Future Growth Scenarios and Vehicle/Trip Limits

At the February 5, 2013 Study Session when the key findings of the Shoreline Transportation Study were presented to the Mountain View City Council, several Councilmembers indicated concern about allowing future development in the North Bayshore Area beyond the 10.7 million square feet (3.4 million square feet of new development) envisioned in the 2030 General Plan. At a subsequent Study Session held on March 26, 2013, the City Council directed staff not to include either the Mid- or High-Growth Scenarios in either the North Bayshore Precise Plan process or the identification and implementation of strategies to respond to future transportation demands into and out of the North Bayshore Area.

The recommended transportation strategies presented to the Mountain View City Council in February assumed ambitious, but achievable, shifts in commute transportation modes, including increased transit trips (company shuttle and local bus) and a greater reliance on active commute modes (i.e., bicycling). Even with these anticipated mode shifts, some increase in SOV trips was anticipated.

The City Council was generally supportive of the commute mode shifts presented on February 5, but requested than an option which would involve a zero growth of SOV trips be explored for the General Plan Growth Scenario.

Two approaches to achieving the zero SOV increase goal were explored:

1. Evaluate an upward revision of the mode share targets that could serve the forecast future travel demand without increasing SOV use.
2. Determine the square footage reduction of development in the General Plan – 2030 growth scenario that could be accommodated without requiring commute mode shifts beyond what has already been presented for the 2030 General Plan Growth Scenario (Original Scenario).

The results of this evaluation are shown in Table E-5. Significant increases in the modes shares for transit, ridesharing, and active transportation would be necessary to keep SOV commute trips at the current levels. Comparison with transit intensive downtowns and urban centers indicate that the mode shares the result would be very difficult to achieve. The second approach involved reducing the amount of development. It was determined that 9.7 million sq. ft. of development could be accommodated if no growth in SOV trips is allowed and the non-SOV trips are not allowed to increase beyond the values that were identified for the Original Scenario. In this case the amount of allowable new development would be reduced from 3.4 million sq. ft. in the Original Scenario to 2.4 million sq. ft.

Table E-5 Alternative Zero SOV Growth and Mode Share Scenarios

	Scenarios			
	Existing	General Plan - 2030 Original Scenario	General Plan - 2030 No SOV Increase - High Transit	General Plan No SOV Increase - Reduced Growth
Development (million sq. ft.)	7.3	10.7	10.7	9.7
Increase (million sq. ft.)		3.4	3.4	2.4
Estimated Time Frame (years)		10	10	10
AM Commute Trips (Estimated)				
Single Occupant Vehicle	13,800	17,200	13,800	13,800
Rideshare Vehicle	1,450	2,900	3,500	2,800
Transit - Company Bus	4,700	7,700	8,400	7,700
Transit - Caltrain	900	2,500	3,000	2,400
Transit - Light Rail	150	1,100	1,400	900
Transit - Local Bus	100	200	1,100	600
Active Transportation	1,600	3,100	3,500	3,100
Intercept Parking/Other	-	1,700	1,700	1,700
Total	*22,700*[1]	*36,400*	*36,400*	*33,000*
Commute Mode Share Targets				
Single Occupant Vehicle	61%	47%	38%	42%
Rideshare Vehicle	6%	8%	10%	8%
Transit	26%	32%	38%	35%
Active Transportation	7%	9%	10%	9%
Intercept Parking/Other	0%	5%	5%	5%
Total	*100%*	*100%*	*100%*	*100%*

1: Existing trip estimates are slightly revised from information presented to the Mountain View City Council on March 26, 2013 to reflect the most current estimated and for consistency with prior information.

Given that the goal of zero SOV trip growth would be difficult to achieve but would definitely be a desirable objective, the mode share goals shown in Table E-6 were developed. These mode share targets allow a relatively small amount of SOV trip growth and require increases in the mode shares for transit, ridesharing and active transportation that are aggressive, but based on the analyses performed in this study are achievable.

Table E-6 Mode Share Targets

Travel Mode	2030 General Plan Growth Scenario
Ridesharing (Carpools and Vanpools)	10%
Transit (Public and Private)[1]	35%
Active Transportation	10%
Single-Occupant Vehicle	45%

The potential change in commute trips by mode, with these mode share targets, is shown in Table E-7 and Figure E-2 below. These estimates represent one scenario for achieving the goals. As development proceeds and infrastructure and service improvements are provided, the actual mix could change over time. Ideally, even greater shifts to alternative modes could be achieved, resulting in less growth in SOV trips.

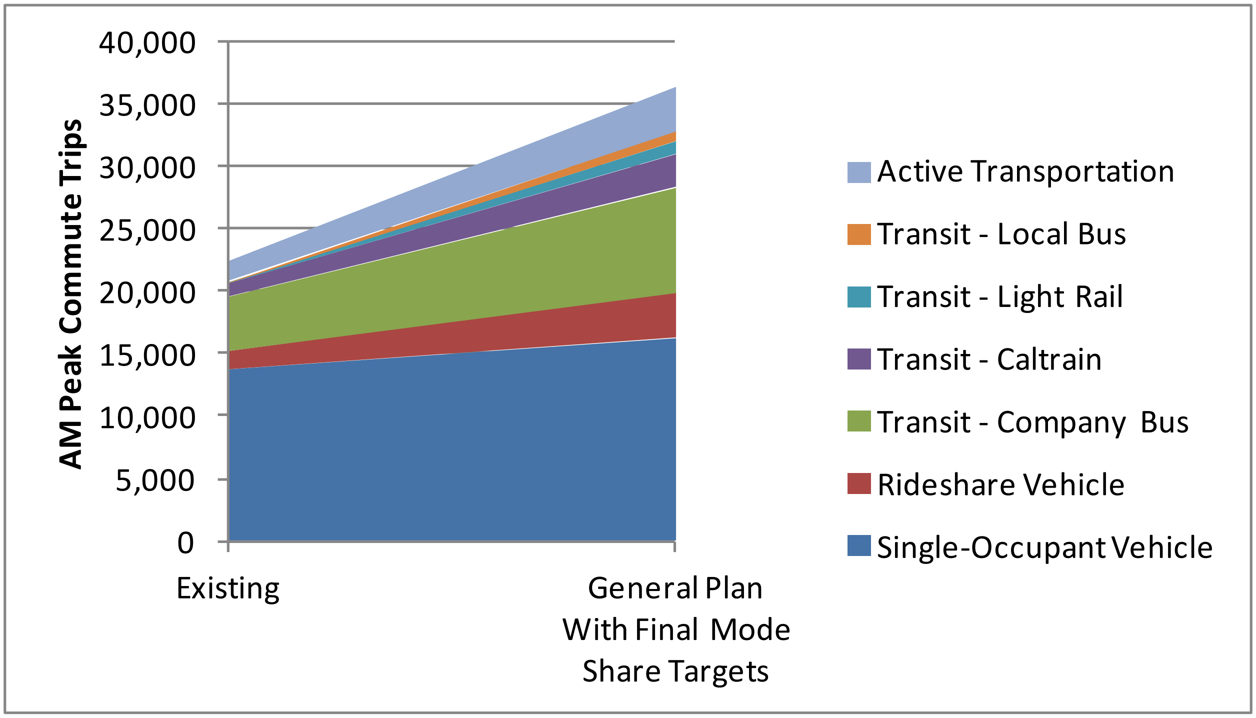
Table E-7 Potential Change in Commute Trips by Mode

	Existing	General Plan With Final Mode Share Targets
Development (million sq. ft.)	7.3	10.7
Est. Time Frame (Years)		10
AM Commute Trips (estimated)		
Single-Occupant Vehicle	13,800	16,300
Rideshare Vehicle	1,450	3,600
Transit - Company Bus	4,700	8,500
Transit - Caltrain	900	2,600
Transit - Light Rail	150	1,000
Transit - Local Bus	100	800
Active Transportation	1,600	3,600
Total	*22,700*	*36,400*
Commute Mode Share Targets		
Single-Occupant Vehicle	61%	45%
Rideshare Vehicle	6%	10%
Transit	26%	35%
Active Transportation	7%	10%

Under this growth and transportation scenario, the total number of commute person trips would increase by 63% while SOV trips would rise less than 20%. To offset, transit, ridesharing and active transportation trips would increase by 130-150%.

[1] Transit use split equally between private commute service and public transit.

Figure E-2 Growth in AM Peak Commute Trips by Mode for Final Mode Share Targets



The results of this additional analysis were presented to the Mountain View City Council on March 26, 2013. At that meeting, the City Council endorsed the proposed mode share targets for the 2030 General Plan Growth Scenario and directed staff to incorporate the targets into the North Bayshore Precise Plan effort.

Section 1

Introduction

1.1 Plan Purpose

The Shoreline Regional Park Community/North Bayshore area of the City of Mountain View faces a fundamental challenge of transportation and land use. North Bayshore is an area of opportunity and change in the City and is expected to be the focus of long-term growth with expansion and development of the high-technology campuses and other mixed-use land uses. Guidelines for growth, land use policies and a vision of change for North Bayshore are included in the new General Plan 2030, adopted by the City in July 2012.

It is also clear that the current transportation infrastructure is not sufficient to support the planned potential of growth, and that a significant expansion of the roadway network is not practical or desirable. The solution to this challenge will be the implementation of transportation measures and strategies designed to reduce reliance on the single occupancy vehicle (SOV), encourage use of alternative travel modes, and manage the total demand for travel. The purpose of the Shoreline Regional Park Community Transportation Study (Shoreline Transportation Study) is to develop this transportation strategy through a collaborative process that includes the key stakeholders and community interests.

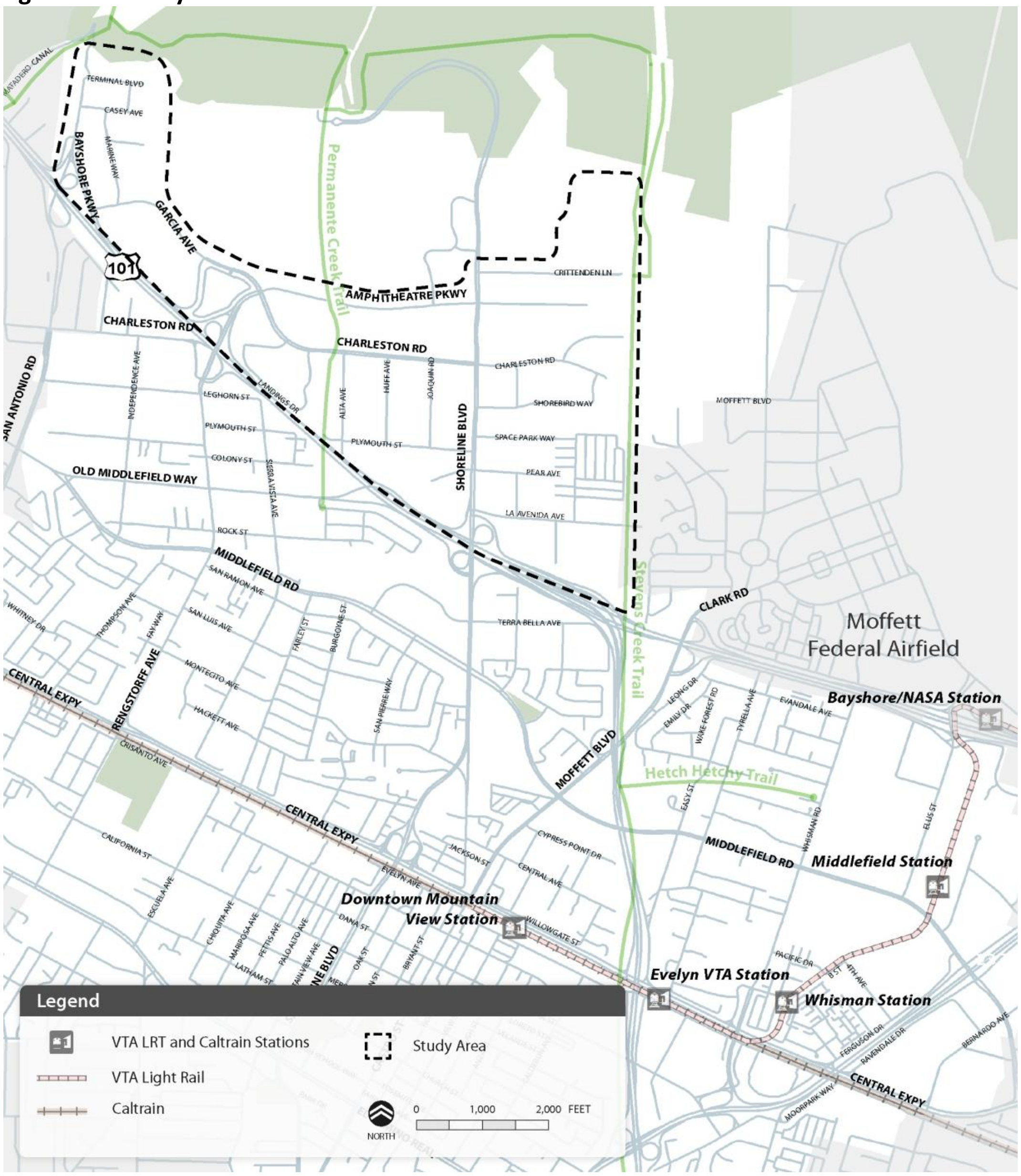
1.2 Study Area

The primary Study area is North Bayshore as defined in the General Plan 2030 and the North Bayshore Precise Plan, and is illustrated in Figure 1-1 on the following page. The North Bayshore study area is constrained geographically and physically by natural and man-made boundaries surrounding it. In particular, Shoreline Park and the San Francisco Bay lie to the north, Adobe Creek and the Palo Alto Baylands Park bound the western side, while Stevens Creek makes up a physical boundary of the study area on the east. U.S. Route 101 bounds the southern and western sides of the Shoreline area.

It is important to note that the study efforts extend beyond the boundaries of North Bayshore in order to help define and improve the existing and future transportation connections between North Bayshore and the core economic and employment centers in Mountain View (the Mountain View Transit Center in Downtown and the Ames/NASA research area).

Vision for North Bayshore – The new General Plan provides a vision for the employment area that would create a new type of business district, a hybrid of the typical Silicon Valley industrial park and a traditional central business district (CBD). Powered by strong sustainability measures, this new district would retain an openness and connection to the natural surroundings, while adding CBD-like densities and transit services. A key change is the reduction of surface parking and the development of more “people” spaces. The district would be more walkable with new uses, remaining primarily an employment area but with increased vitality.

Figure 1-1: Study Area



1.3 Community Outreach

Outreach has included meetings with several North Bayshore employers and interest groups, community surveys, workshops and meetings, as well as discussions with City advisory bodies and the City Council. Key outreach activities included:

Employer/Developer/Property Owner Meetings

The project team met with transportation and development representatives of Google, Intuit, Microsoft, and LinkedIn, all major employers in North Bayshore. The employers provided detailed information about their travel demand management (TDM) plans, employee travel patterns, and their firm's near term expansion plans for their North Bayshore campus and beyond.

Additional discussions regarding existing Shoreline transportation issues and visions for the future were held with area employers, developers, property owners, government, non-profit agencies and interest groups. The project team also participated in two half day sessions - North Bayshore Transportation Charrettes – conducted by Sustainable Silicon Valley in late September and early October 2012.

B/PAC Meeting

The project team facilitated a discussion on July 25, 2012 with the City of Mountain View Bicycle and Pedestrian Advisory Committee (B/PAC) to get input on the pedestrian and bicycle facilities that serve the study area. Topics discussed included facilities likes and dislikes, amenities to improve the pedestrian experience, barriers to alternative transportation for existing recreation and entertainment centers, and last-mile connections.

Parks and Recreation Commission Meeting

Project team members attended a Parks and Recreation Commission Meeting on September 12, 2012 to brief the commission on the study and gather input on issues and potential strategies.

Platform and Shuttle Survey

The project team conducted surveys of Caltrain riders and shuttle drivers at the Downtown Mountain View Caltrain Station during the evening and morning commutes. The goal of the surveys was to better understand the travel habits of people commuting to and from the Shoreline area and to identify issues with respect to shuttle operations into and out of the study area including preferred and alternate routes, peak services times, etc.

City Council Study Session

The project team presented potential transportation strategies for North Bayshore to the City Council during a study session on October 16, 2012.

Public Meetings

The project team held a public meeting on December 5, 2012 to present proposed strategies and methodologies. The audience consisted of area employees, residents and employers.

1.4 Existing Conditions

The documentation of existing conditions in North Bayshore and Shoreline Community[2] involved the gathering of information from a variety of sources including work already performed as part of the General Plan and North Bayshore Precise Plan. In addition, there were meetings and interviews with the four largest employers, the transit and transportation agencies, and other key stakeholders to learn about current transportation programs and future plans. The following is a summary of some of the key findings:

- There is currently about 7.3 million square feet of development with an estimated 17,100 employees in North Bayshore according to data provided by the City

[2] North Bayshore refers to the employment area while the Shoreline Community or Shoreline area encompasses everything, including Shoreline Regional Park, the Shoreline Amphitheatre and immediate surroundings.

- North Bayshore currently generates about 70,600 weekday vehicle trips through the three interchanges that serve the area.
- Over 50% of the traffic enters the area via the Shoreline Boulevard Interchange.
- North Bayshore employers already have innovative and highly effective programs to promote the use of alternatives to the single occupant automobile (e.g. Google shuttle, employee and visitor bicycle sharing programs and car sharing).

1.5 Employee Travel Characteristics

Based on the information obtained from the four largest employers, the following table provides the percentage of the employees that use each travel mode.

Table 1-1: Employee Travel Mode Share

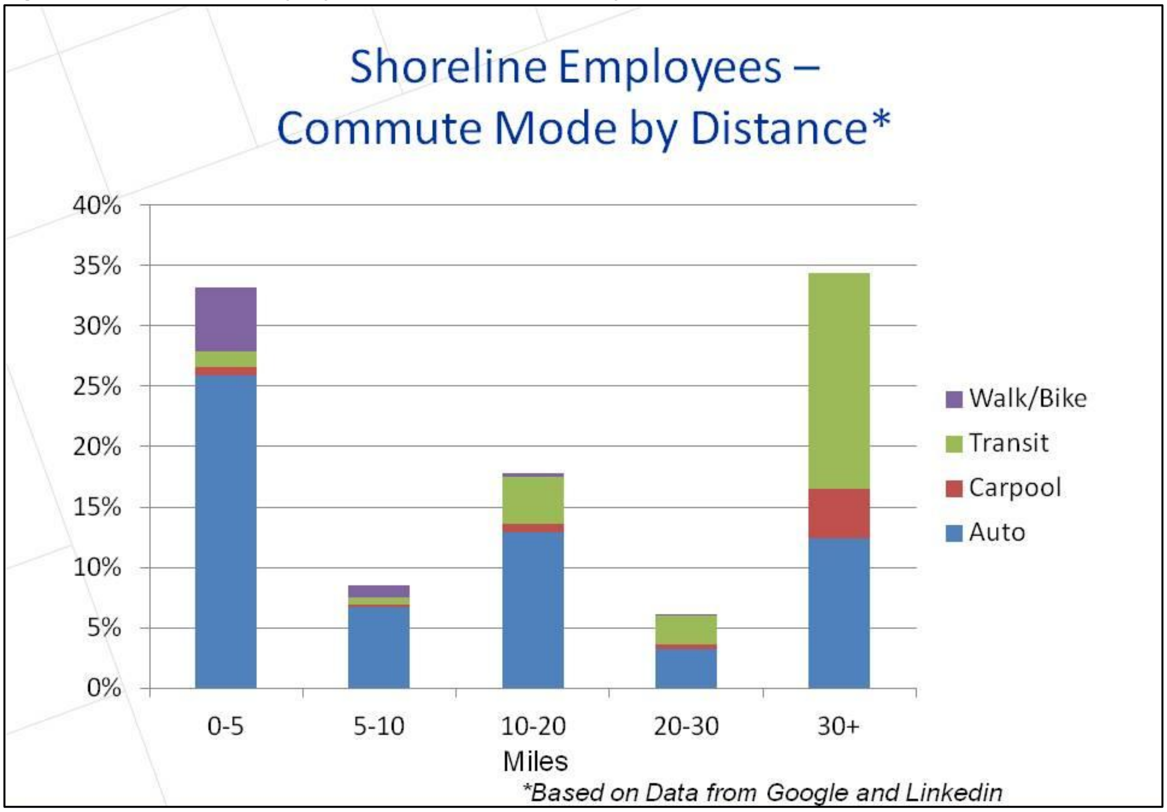
Travel Mode	Percent of the Employees
Auto (Single Occupant Vehicle)	61.3%
Carpool/Vanpool	6.4%
Transit/Employer Shuttle	25.4%
Bicycle	5.6%
Pedestrian/Other	1.4%
Total	*100.0%*

Compared to the typical Bay Area business park where 80% or more of the employees drive alone, the current modal share for North Bayshore shows the effectiveness of the programs the existing employers use to encourage use of alternative travel modes. Figure 1-2 on the next page illustrates the commute mode used by the employees based on the distance of their commute. This is based on information provided from Google and LinkedIn employee surveys. This commuter population breaks down into three roughly equal travel markets - short (0-5 miles), medium (5-30miles) and long distance (30+).

Commute Behavior is Changing and Evolving – Part of the success in lowering the current drive-alone rate, and achieving future reductions, is due to the changing attitudes and behavior of young workers (the Millennial Generation). Young people are driving less, using other modes and living in transit-friendly locations. They tend to be environmentally concerned and have led the first drop in vehicle miles traveled in decades. They are embracing company programs (such as Google buses) and are influencing the growth of these programs.

Over forty percent of surveyed employees were found to live within ten miles travel distance from their work site and about three quarters of these commuters travel five miles or less to work. The vast majority of employees within ten miles drive to work, however, employees within ten miles also account for the largest portion of employees who walk or bicycle to work. Finally, few of these employees use transit as the commute distance is too short for transit to be competitive with driving.

Figure 1-2: Shoreline Employees – Commute Mode by Distance

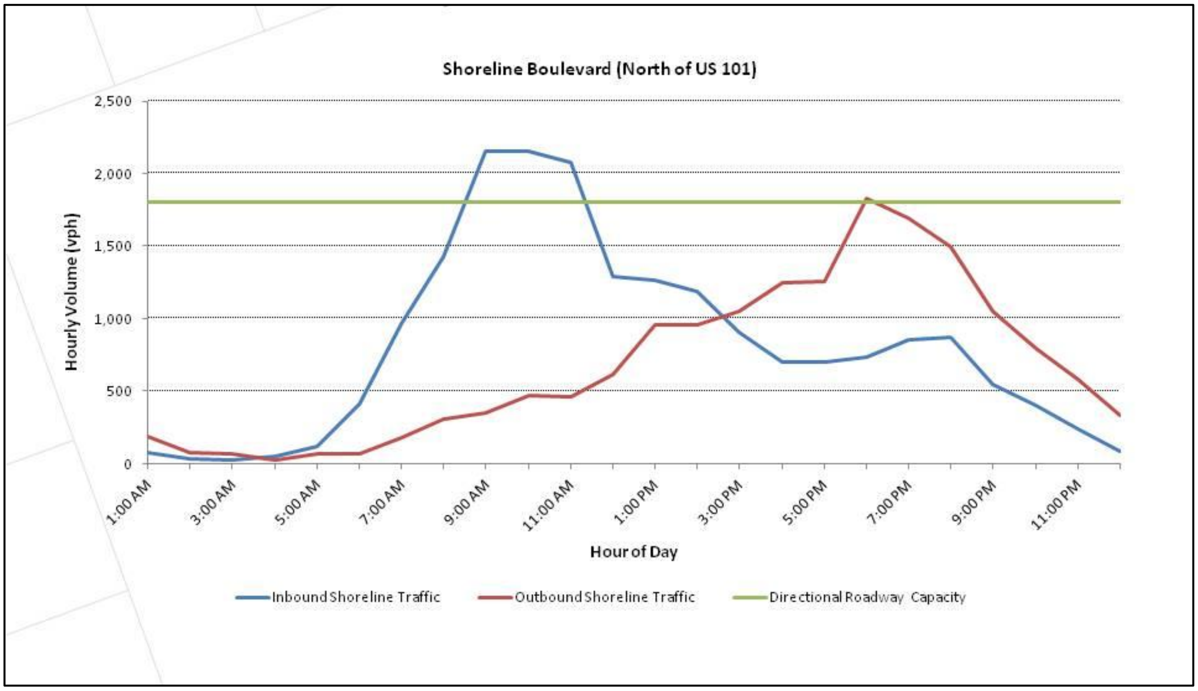


As the distance from work increases, the number of employees drops off significantly, with the exception that a large number of North Bayshore employees live in San Francisco, 30 – 40 miles from work. Many of these employees use transit, either employer shuttles or Caltrain to commute. In this case, transit use increases with distance, as the time savings advantages of transit tends to increase with travel distance as compared to the auto. Accordingly, auto use decreases with distance.

The highway network serving the study area currently experiences very high levels of utilization. In the vicinity of North Bayshore, U.S. Route 101 typically experiences severe peak period congestion with traffic demands that exceed the system's capacity. There are three freeway interchanges which provide access to the area and there is also limited access via East Bayshore Road. The Shoreline Boulevard access point or gateway also currently experiences peak demands in excess of capacity during the morning peak period. The other gateways are not used to capacity at present, largely because the congestion on the freeway limits the amount of traffic which can currently use these access points, and the internal circulation network within North Bayshore does not provide good connectivity between the gateways and all the areas of employment. The San Antonio Road gateway is at 85 percent of capacity and the Rengstorff Avenue gateway is only at 65 percent of capacity.

Figure 1-3 shows the actual hourly distribution of weekday traffic on Shoreline Boulevard just north of U.S. Route 101. The traffic demands exceed capacity from about 8 to 11 AM in the morning and for a short period in the afternoon. Due to traffic congestion and employee work schedule preferences, the peak traffic periods cover a greater spread (three hours) than traditional business centers.

Figure 1-3: Hourly Traffic Distribution



1.6 Transportation Constraints

Based on the review of existing traffic conditions the following key constraints have been identified:

- The regional freeway network serving the area is currently operating in excess of capacity during the peak commute periods.
- Shoreline Boulevard north of U.S. Route 101 is also operating in excess of capacity in the peak periods.
- The regional public transit network (Caltrain/VTA light rail (LRT) and bus) does not directly serve North Bayshore and connectivity needs improvement.
- The U.S. Route 101 freeway and Stevens Creek/wetlands form physical barriers which limit transportation access, particularly for bicyclists and pedestrians.
- The internal roadway network serving North Bayshore has missing links and other deficiencies so that it does not effectively meet the needs of motorists, transit, bicyclists, and pedestrians.

1.7 Transportation Opportunities

While transportation access and alternatives for the North Bayshore employment area are constrained today, there are several future opportunities to enhance North Bayshore and overall Shoreline area transportation conditions. These opportunities provide a foundation for a plan that can serve future growth in the area. They include:

- New Auxiliary and High Occupancy Vehicle (HOV) Lanes (and future Express Lanes) on U.S. Route 101 will increase freeway capacity by about 15 -20 percent and provide better travel time for express buses and ridesharing.
- New transit services are being developed that can significantly increase the potential number of transit users, including:
  - The planned BART Extension (Warm Springs and Milpitas/Berryessa) and potential VTA LRT system improvements will enhance connections to the south and east.
  - The Caltrain Electrification program will improve service quality and capacity.
  - Bus Rapid Transit (BRT) services are planned for El Camino Real by VTA and SamTrans.
  - The Dumbarton Express bus service (operated by AC Transit, with support from other transit agencies) is considering a new route from the East Bay to North Bayshore.
- Bicycle commuting has been increasing significantly in the past ten years and, with improved facilities and access points, can play an important role for shorter commute trips.
- Technology advances such as autonomous vehicles, personal rapid transit (PRT), and intelligent transportation systems, promise improved transportation system efficiencies for all types of travel which will allow capacity increases without significant new facility construction.
- The new General Plan creates incentives and requirements for employers and developers that will motivate them to address the commuting needs of their existing and future employees.
- On-site services, such as daycare, cafes, dry cleaning, and the like allow employees to take care of errands that would otherwise require a car, allowing employees to reduce or eliminate trips.
- Improved communications tools and other technologies will likely reduce the need for travel over time as more employees work at home or at satellite locations closer to home and the need to travel for meetings and conferences is reduced.

1.8 Report Overview

This report begins with a description of assumptions related to future growth projections for North Bayshore (Section 2), the identification of transportation strategies by mode and travel market (Section 3), followed by specific strategies and findings in each of these categories:

- **Roadway Access and Efficiency (Section 4)** – Roadway improvements for better access, efficiency and capacity.
- **Active Transportation (Section 5)** – Active transportation improvements, including new connections to access North Bayshore, complete street concepts, new streetscape recommendations for improved bicycle access and safety and expanded bicycle sharing programs.
- **Transit Connections (Section 6)** – Improvements to shuttle routes, new connections, transit priority streets, and other transit related initiatives.
- **Commuter Bus and Ridesharing (Section 7)** – Proposed strategies for express lanes, commuter bus service and ridesharing.
- **Intercept Parking (Section 8)** – Proposed intercept parking locations.
- **Assessment of Strategies (Section 9)** – This section provides a summary of each of the strategies and assesses their performance in terms of serving the estimated future travel demand, costs, markets served and time-frame for implementation. The ability of the strategies to meet the modal share goals defined in Section 2 is also discussed.
- **Summary Conclusions (Section 10) -** This section summarizes the study findings and preferred set of strategies presented to the Mountain View City Council on February 5, 2013. Section 10 also suggests potential next steps and implementation strategies.
- **Zero SOV Trip Growth (Section 11) –** The City Council requested that the transit and other alternative mode improvements required to achieve a goal of no growth in the current number of single occupant vehicle trips be assessed. This final section explores that option and suggests some refined mode share goals. These findings were presented to the City Council on March 26, 2013.

Section 2

Future Growth Projections

2.1 Assumptions and Methodology

The City of Mountain View has developed growth projections for North Bayshore based on recent decisions made regarding the Mountain View 2030 General Plan. The projections are shown in Table 2-1 below. The information from the City was used to calculate the future number of employees for the mid-growth and high-growth scenarios with the assumption that the current trend of reduced floor area per employee would continue. The current population of 17,100 employees would increase to about 27,600 employees by 2030 under the land use assumptions in the new General Plan. Under the mid-growth assumptions this would increase to 38,100 employee and the high-growth assumptions would yield 47,700 employees. These longer range estimates would occur as employment growth demanded, but are expected to be post-2030.

Table 2-1: North Bayshore Growth Projections

Projection Scenario	Sq. Ft.	Occupied Sq. Ft	% Occupied Sq. Ft.	Estimated Employees	Employees per 1,000 Occupied Sq. Ft.	Percent Employment Growth
Existing - 2012	7,280,332	6,770,973	93%	17,113	2.53	100%
General Plan - 2030	10,699,359	9,950,609	93%	27,608	2.77	161%
General Plan - Mid-Growth	14,280,332	13,281,227	93%	38,117	2.87	223%
General Plan - High-Growth	17,280,332	16,071,336	93%	47,732	2.97	279%

However, the information provided by the four major employers in North Bayshore suggests that the estimates of existing employment are low, while the square footages are reasonably accurate. This in turn would suggest that the number of employees per 1,000 square feet of occupied space is higher than shown in Table 2-1 above. Because of these discrepancies, the travel forecast is based on actual observed traffic data and then the forecast percent growth factors were applied rather than the specific employee estimates to provide an indication of future travel growth. The traffic count data recorded over a 24 hour period at the four gateways to the Shoreline Community is shown in Table 2-2 below.

Table 2-2: Total Traffic Entering and Exiting the Shoreline Community

	Existing 2012 Motor Vehicles (veh-trips)					
	AM Peak Period		PM Peak Period		Daily	
Location	**In**	**Out**	**In**	**Out**	**In**	**Out**
San Antonio Road	1,847	357	919	2,078	6,402	6,586
Rengstorff Ave	4,262	608	797	3,955	9,570	8,876
Shoreline Blvd	6,415	1,018	2,658	4,950	19,266	16,103
Bayshore Road	469	152	487	600	1,912	1,880
Total	**12,993**	**2,135**	**4,861**	**11,583**	**37,150**	**33,445**

These counts represent all vehicles entering and exiting the area. One way to focus on the commute or employee related trips is to use just the peak period traffic volumes to represent commute traffic. The amount of other traffic such as trips to the parks and recreational uses, retail and restaurant trips, should be relatively low during commute periods. This is even truer during the morning commute period. The total AM peak period (three hours) traffic count was 15,128 vehicles.

The four largest employers – Google, Intuit, Microsoft and LinkedIn - reported the following combined commute mode share distribution for their employees. Assuming that there are 15,128 trips by auto or carpool combined and expanding that number to cover all the modes according to the data provided by employers, results in the following estimate of trips by mode (see Table 2-3). This approach probably overstates the number of non-auto trips somewhat, because not all the auto trips are employee commute trips, but it provides a reasonable approximation of the total peak period travel by mode.

Table 2-3: Estimated Shoreline 2012 AM Commute Period Person Trips by Mode

Auto	Carpool	Transit	Walk/Bicycle	Total
61.3%	6.4%	25.4%	7.0%	100%
13,800	1,400	5,900	1,600	22,700

Table 2-4 below shows what would happen in terms of the travel demand growth under each of the growth projections for each of the major travel modes. It assumes that the current mode share characteristics would continue in the future.

Table 2-4: Future AM Peak Period Person Trips by Mode (Assumes existing mode split distribution)

Projection Scenario	Auto	Carpool	Transit	Walk/Bicycle	Total
Existing - 2012	13,800	1,400	5,900	1,600	22,700
General Plan - 2030	22,200	2,200	9,500	2,500	36,400
General Plan - High-Growth	38,400	3,800	16,400	4,400	63,000

Figure 2-1 shows the information graphically. As can be seen, for each future case the demand for auto travel would exceed the currently anticipated system capacity (assumes new U.S. Route 101 express lanes and traffic signal system optimization and other roadway improvements representing about 125% of the current highway capacity – see Section 9 for more information). Under the high-growth scenario auto travel demand would substantially exceed capacity. This would suggest that the use of the other non-SOV modes would need to increase in order to accommodate the expected growth.

Figure 2-1: Total Weekday AM Commute Period Person Trips by Mode – Current Mode Split

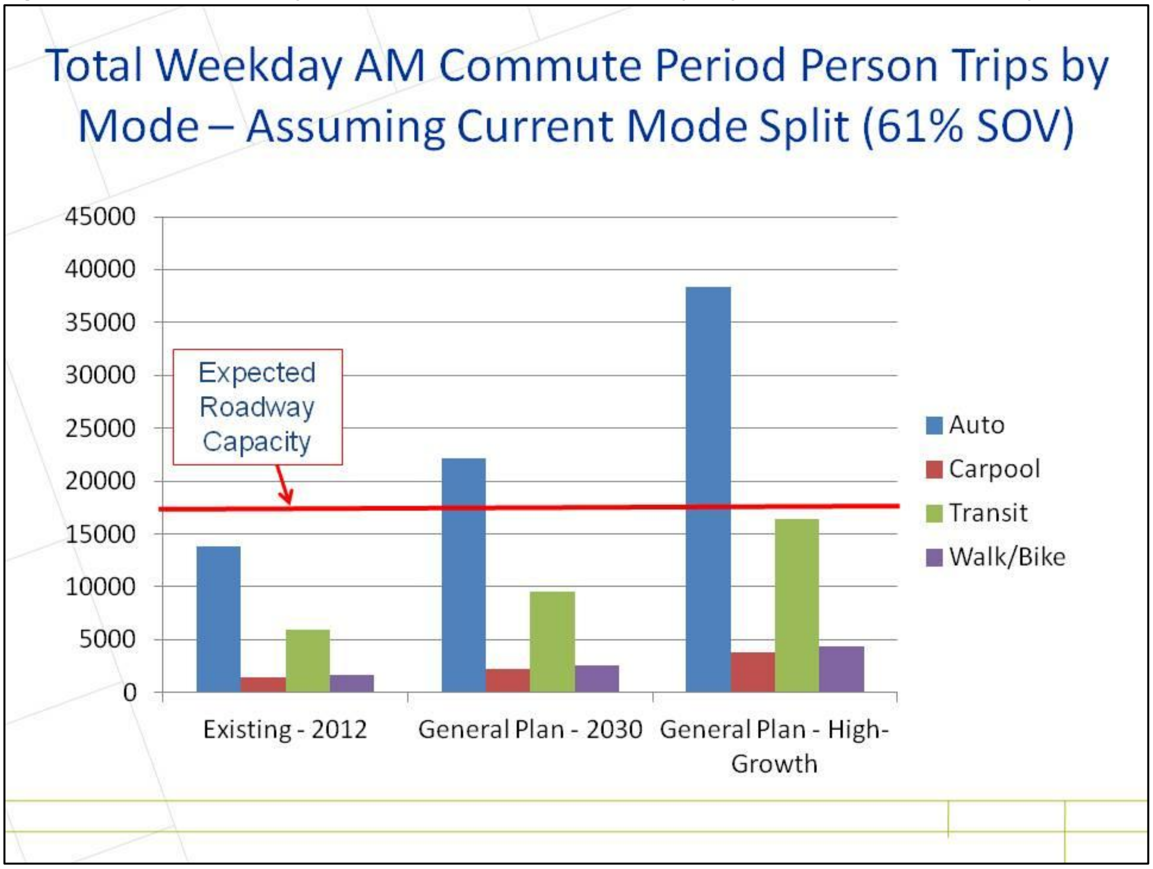
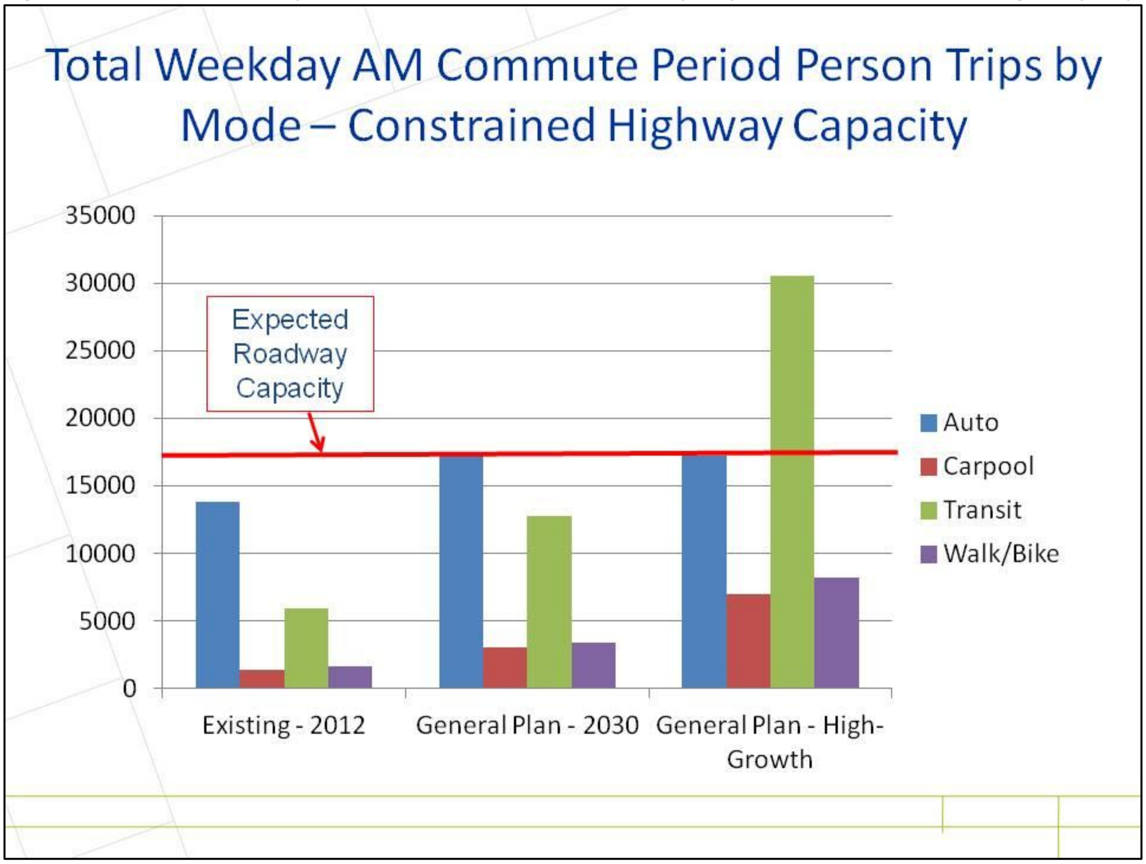


Figure 2-2 looks at what would happen to model travel demand growth if no further highway improvements were made and traffic growth was constrained to the potential roadway capacity. In this case the use of the other travel modes would have to increase more to offset the lack of highway capacity. This information suggests that a single mode focus to address the future growth needs is not practical. For example, transit or highway improvements alone are not likely to achieve the desired outcome. The solution most likely will need to be balanced investment in new facilities for all transportation modes, and in technology and other improvements that maximize the capacity and efficiency of the infrastructure.

Figure 2-2: Total Weekday AM Commute Period Person Trips by Mode – Constrained Highway Capacity



2.2 Future Mode Share Goals

The information presented above was used to support the setting of modal share goals for both the General Plan – 2030 and the General Plan – High Growth Scenarios. For each travel mode the expected future capacity that would be available if currently planned projects are implemented was estimated. For example, as noted above based on a comparison of current commute traffic volumes and the existing and planned highway improvements, it was estimated that there should be about 25 percent more highway capacity available by the year 2030, and a further 20 percent more available beyond 2030. A similar analysis of the transit network suggests that there is transit capacity available if the proper connectivity is provided to allow North Bayshore employees take advantage of the planned VTA, Caltrain, and BART improvements and that the VTA is able to funds its LRT projects. The new express lanes on U.S. Route 101 and State Route 85 also offer an opportunity to further increase carpooling. See Section 9 for more detail about the assumptions behind these conclusions.

This analysis indicates that with the appropriate improvements that would be designed to encourage commuters to use the potentially available transit and carpool capacity, excess auto demand as compared with the expected capacity shown in Figure 2-2 could be shifted to both the carpool and transit modes. This analytical process can be used to set potential modal goals which can then be used to measure the performance of the transportation strategies identified for North Bayshore. In this case, however, it was very difficult to determine how much additional capacity would be available by mode beyond the baseline assumptions noted above. The mode share goals for the High Growth Scenario are based more on what would need to happen given that major increases in highway capacity are not likely.

The results of this work suggest the following preliminary mode split targets for North Bayshore (see Table 2-5). The table includes a category of "other." This was added to consider the potential that in the future employees would opt to travel outside of the 3 hour long commute periods, or to work from home. As communication technologies continue to improve it is likely that more employees and their employers will find that working at home some or all of the time is an acceptable alternative to commuting. The category could also include the impacts of parking management and intercept parking strategies that work to reduce travel demand.

Table 2-5: Potential Future Mode Split Targets – AM Peak Commute Trips

Scenario	Auto	Carpool	Transit	Walk/Bicycle	Other	Total
Existing - 2012	61%	6%	26%	7%	0%	100%
General Plan - 2030	47%	7%	32%	9%	5%	100%
General Plan - High-Growth	31%	11%	38%	10%	10%	100%

Section 3

Strategies for North Bayshore

Based upon the review of the existing conditions, the future growth projections, and the input received during the community outreach process, a comprehensive list of transportation improvements for North Bayshore was developed. Then in turn this list was reviewed during the community outreach process and a series of transportation strategies evolved from this process.

3.1 Key Principles

The development of the improvement strategies was based upon the following key principles which were identified as part of the outreach activities.

- The strategies would involve a combination of public and private roles and responsibilities.
- There would be multiple strategies which would work together to provide a multifaceted approach.
- The North Bayshore companies (potentially through a Transportation Management Association) would have an essential role.
- The selected infrastructure investments should be able to support the strategies, serve future growth and adapt to changing technology

3.2 Matrix of Alternatives

A preliminary list of potential alternatives and strategies was developed based on community input and problem definition. The alternatives are summarized on the following pages in a matrix (Table 3-1) which lists the potential improvements or actions by category. It also indentifies the travel markets in terms of trip distance that would be best served by each alternative and the time frame in which the improvement could be implemented.

Table 3-1 Matrix of Alternatives

	Strategy	Travel Market: North Bayshore Circulation	Travel Market: Local Trips (0-30 miles)	Travel Market: Regional Trips (30+ miles)	Travel Market: Last Mile Connection (Caltrain, VTA)	Travel Market: Supporting Actions	Timeline: Near Term	Timeline: Mid Term (2030)	Timeline: Long Term
Traffic and Roadway	Real-Time Signal System Optimization	✓	✓				✓		
	Reversible Lanes	✓	✓				✓		
	Improved Internal Circulation	✓					✓		
	Increased Gateway Capacity		✓	✓				✓	
	Charleston East/West Tunnel (restricted to transit and/or Bike/Ped)		✓					✓	
	Other New Crossings of 101 (restricted to transit and/or Bike/Ped)		✓					✓	
	Direct Access Connectors to Highway-101 Express Lanes (including Moffett and San Antonio)			✓				✓	
	Direct Ramp Connections to Remote Parking Structures		✓	✓				✓	
	Reconfigure San Antonio Interchange		✓	✓				✓	
	Reconfigure Old Middlefield Road Ramp to Connect into Shoreline Area		✓	✓				✓	
	Stevens Creek Trail Transit / Ped/Bike Bridge			✓			✓	✓	
Transit	Transit Only Lanes on Moffett Boulevard and/or Shoreline Boulevard		✓	✓	✓		✓		
	Transit Bridge/Tunnel across 101 (At Shoreline, Moffett, or Charleston)		✓	✓	✓			✓	
	Stevens Creek Transit Bridge		✓	✓	✓		✓		
	Shared Shuttle Service from Mountain View Caltrain Station (color coded based on destination)		✓	✓	✓		✓		
	Shuttle Connections through Shoreline Area and across Stevens Creek to NASA area and Bayshore LRT		✓	✓	✓		✓		
	High-Frequency, Branded Internal Shuttle in Shoreline Area	✓			✓		✓		
	BRT Connection to Mountain View and/or San Antonio Caltrain Station from Shoreline Area		✓	✓	✓		✓		
	LRT Extension from Bayshore NASA LRT station to Shoreline area		✓	✓	✓			✓	✓
	LRT Extension from Bayshore NASA through Shoreline area to San Antonio Caltrain station		✓	✓	✓			✓	✓
	LRT Loop from Mountain View Caltrain, via Shoreline and east through NASA to Bayshore LRT station.		✓	✓	✓			✓	✓
	Complete Double Tracking of Existing LRT		✓	✓			✓	✓	
	Shoreline/NASA/Caltrain Streetcar Loop		✓	✓	✓			✓	✓
	Automated Guideway Transit or PRT System within Shoreline Area	✓						✓	✓
	Automated Guideway Transit or PRT System within Shoreline/NASA Area	✓	✓	✓				✓	✓
	Automated Guideway Transit or PRT System with Caltrain Connection	✓	✓	✓	✓			✓	✓
	Autonomous On-Demand Vehicle System (Shared, Semi-exclusive, or Fully-exclusive)	✓	✓	✓	✓			✓	✓
	Caltrain Transit Station Improvements (to accommodate above solutions)		✓	✓	✓	✓		✓	✓
	Central Shoreline Transit Station/Hub	✓	✓	✓	✓		✓	✓	
	Multiple Shoreline Transit Nodes	✓	✓	✓	✓		✓	✓	

Table 3-1 Matrix of Alternatives (continued)

	Strategy	Travel Market: North Bayshore Circulation	Travel Market: Local Trips (0-5 miles)	Travel Market: Regional Trips (30+ miles)	Travel Market: Last Mile Connection (Caltrain, VTA)	Travel Market: Supporting Actions	Timeline: Near Term	Timeline: Mid Term (2030)	Timeline: Long Term
Bicycle and Pedestrian	Green Lanes/Buffered Lanes/Bicycle Boulevards	✓	✓		✓		✓		
	Separated Internal Bicycle/Pedestrian Trail System	✓			✓		✓		
	Area-Wide Bicycle Sharing	✓			✓		✓		
	GPS Install on Shared Bikes for Trip Data					✓	✓		
	Digital Display Boards for Rolling Total of Cyclists (Updates as you pass by it)					✓	✓		
	Bike Repair Station (Drop off for servicing or self serve)		✓			✓	✓		
	Wayfinding and Signage from Caltrain to Bicycle Network		✓				✓		
	Shared Space Alleys	✓					✓		
	Reconfiguring Parking lots with Pedestrian Walkways	✓					✓		
	Shared Space Alleys	✓					✓		
	Fitness zones at trail heads					✓	✓		
	Complete Streets -Street Redesign		✓				✓	✓	
	Northern/Bay Trail Access Improvements		✓				✓	✓	
	Permanente Creek Trail Improvements		✓				✓	✓	
	Shoreline Boulevard Improvements		✓				✓	✓	
	Stevens Creek Trail Improvements		✓				✓	✓	
	Downtown Access/ East-West Improvements		✓				✓	✓	
	Stevens Creek Bicycle/Pedestrian Bridge		✓				✓	✓	
Parking Management and Supply	Intercept Parking Structures		✓	✓			✓	✓	
	Priority Parking for Carpools/Vanpools		✓	✓			✓		
	Parking Requirements reduced reduced to fit long term development needs		✓	✓		✓	✓		
	Area-wide parking cap		✓	✓		✓	✓		
Transportation Demand Management	Real-Time Dynamic Matching Carpool Program		✓	✓			✓		
	Car Sharing Programs		✓	✓			✓		
	Shoreline Employee Universal Free Transit Pass					✓	✓		
	Transportation Management Association (TMA)		✓	✓		✓	✓		
	Personal Real-Time Taxi Service (employee operated)		✓				✓		
	Vanpools (with subsidies or incentives)			✓			✓		
	Local Pickup Service for Employees (similar to dial-a-ride service)		✓				✓		
	Cash out Program for Employees (employees receive incentives to use alternate modes)		✓	✓			✓		

3.3 Improvement Strategies

The matrix of alternatives was reviewed during the community outreach process and evaluated against the mode share targets presented in Section 2. The result was the identification of five basic strategies or categories of improvements and actions. These strategies are shown in Table 3-2 below along with their target modal and travel distance markets.

Table 3-2: Transportation Improvement Strategies

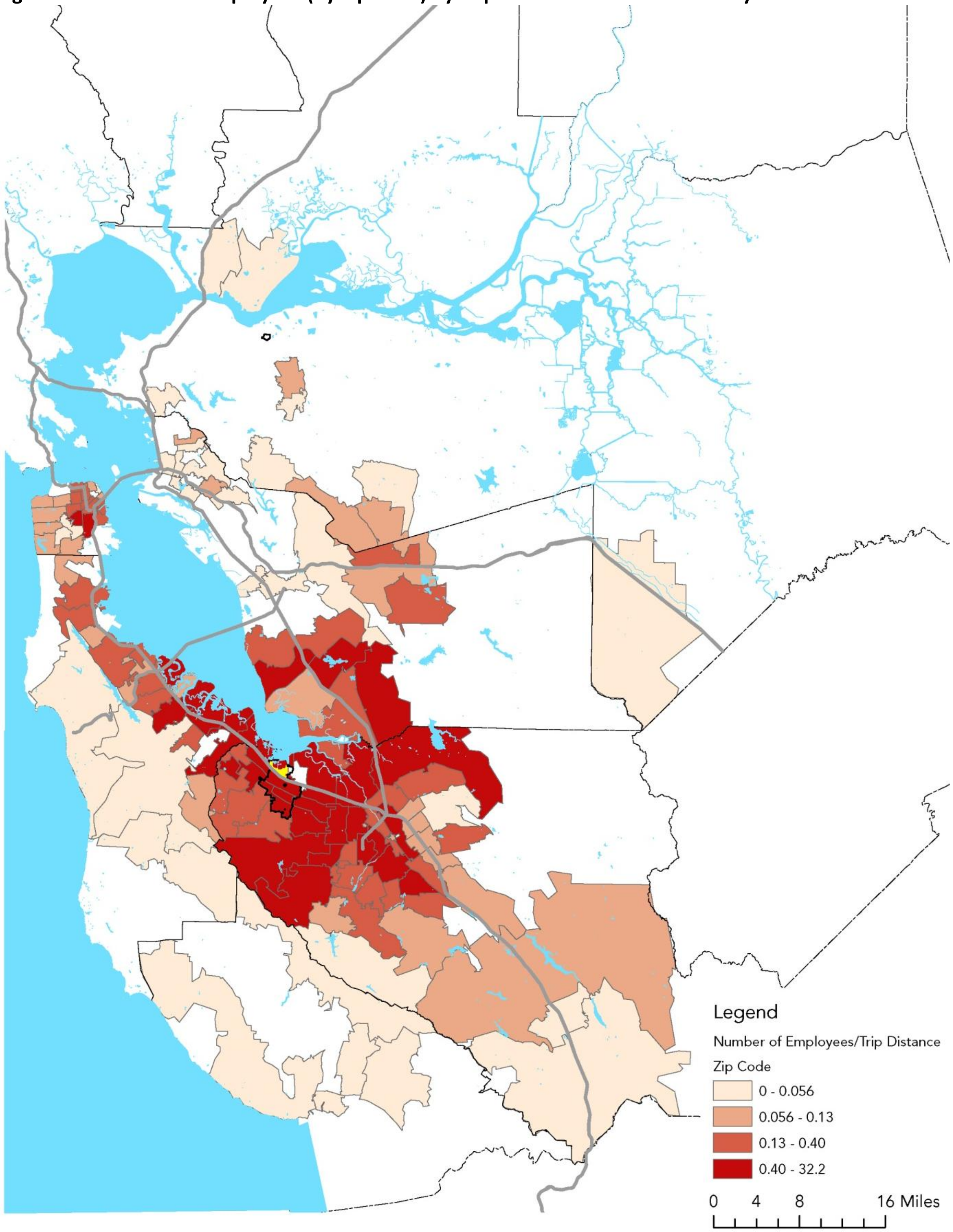
Strategy	Modal Target	Primary Travel Market
Roadway Efficiency & Capacity	Single-Occupant Vehicles / Ridesharing	All markets
Active Transportation	Pedestrian & Bicycle	Short Trips (0 to 5 miles)
Transit Connections	Transit	Medium Trips (5 to 30 miles)
Commuter Bus / Ridesharing	Transit / Ridesharing	Long Trips (30+ miles)
Intercept Parking/Other	Single-Occupant Vehicles / Ridesharing	Short and Medium Trips

The concept of the strategies is that each one would be primarily focused on specific modal and trip distance markets. The major employers have provided information regarding their employees modal travel choices and their travel origins which allows the identification of specific target markets for each of the strategies.

Figure 3-1 shows the geographic distribution of Shoreline employees based on the zip code of their residence. In order to define potential solutions it is important to understand the current usage of alternative travel modes based upon the residential location of Shoreline employees and the distance that they must travel to their workplace in the Shoreline area.

Outside of trips from the local area that are within ten miles of Shoreline, all trips must access the study area from either the north or south. Trips from the east end up arriving from the north, typically via the San Mateo or Dumbarton Bridges and U.S. Route 101, or from the south via State Route 237 and U.S. Route 101.

Figure 3-1: Number of Employees (by Zip Code) by Trip Distance to Shoreline Study Area



Source: LinkedIn Employee Survey

Table 3-3 shows the distribution of trips coming from the north, south, east and from within ten miles. All of this information is based upon the combined employee information provided by Google and LinkedIn.

Table 3-3: Shoreline Commute Trips by Travel Direction

Direction (from residence)	Percent
Local (within 10 miles)	44%
North	38%
South	7%
East	11%
Total	*100%*

Trips from within ten miles are a major portion of the total trips. Many of these trips use local streets to access Shoreline as well as State Route 85 and U.S. Route 101. The greatest percentage of the non-local trips comes from the north. This number is even greater when taking into consideration the fact that many of the trips from points east actually come from the north once they cross the bay. The actual number of trips approaching from the south is considerably less than the north.

Table 3-4 shows that the trips from the north and east are considerably longer than the trips from the south. The large number of trips in the 30+ mile range from the north is due to the high amount of travel from San Francisco. Roughly there are the same number of trips in the 0-5, 5-30, and 30+ mile groupings.

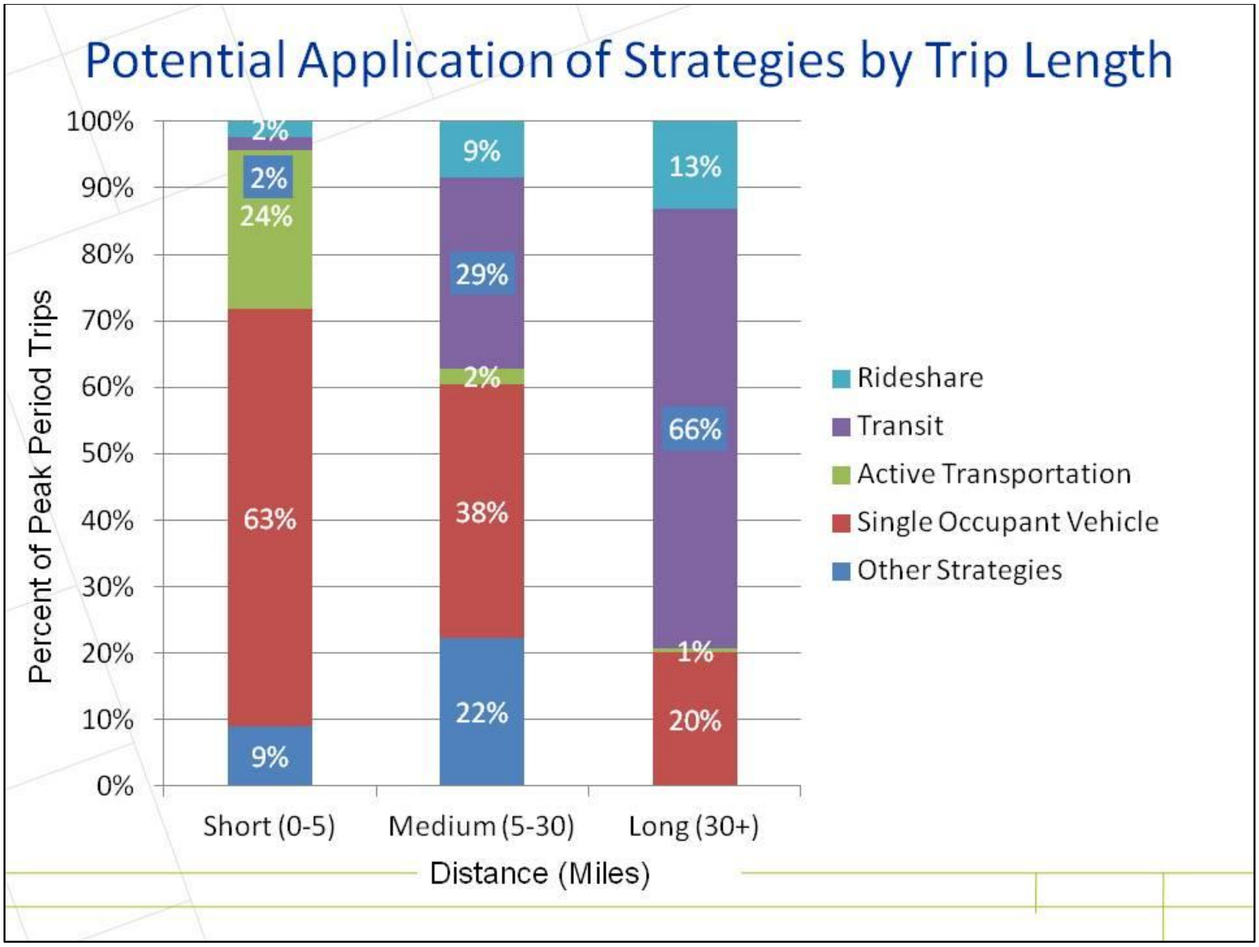
Table 3-4: Percentage of Commute Trips by Direction and Trip Length (Miles)

Direction	Average Distance (Miles)	0-5	5-10	10-20	20-30	30+	Total
Local	5.2	76%	16%	8%	0%	0%	100%
North	29.9	0%	4%	17%	11%	68%	100%
South	26.0	0%	0%	58%	2%	39%	100%
East	30.4	0%	0%	36%	15%	49%	100%
Total	*18.9*	*33%*	*8%*	*18%*	*6%*	*34%*	*100%*

This information helps define the travel markets where each of the strategies would be best focused. For example, the active transportation strategy could focus on bicycle and pedestrian travel involving trips mostly in the 0-5 mile ranges. The objective of this strategy would be to focus on improvements to the bicycle and pedestrian network within this short distance range. Today, most of the transit trips come from the north via commuter express shuttles run by the employers or by Caltrain. A key focus of the transit strategy would be to capture more medium and long distance trips from the south and to maximize the usage of Caltrain.

The chart below (Figure 3-2) shows how the strategies could be combined to serve the different travel markets (short, medium and long trips). This perspective highlights key challenges in meeting the mode share targets, including expanding bike commuting for short trips and greatly increasing transit use for medium length trips.

Figure 3-2: Potential Application of Strategies



The following sections of this report provide a more detailed description of the elements of each of the five strategies.

Section 4

Roadway Access and Efficiency

The regional roadway network which provides access to the North Bayshore Area is heavily utilized and congested in the vicinity of Mountain View. The access to the area is constrained to the three gateway freeway interchange locations along U.S. Route 101 at San Antonio Road, Rengstorff Avenue, and Shoreline Boulevard as well as Bayshore Road. The planned addition of a second HOV lane in each direction and the conversion of the HOV lanes to tolled Express Lanes will result in increased capacity, but otherwise major increases in freeway and local road roadway capacity are not likely to occur. However, there are a number of traffic and roadway improvements that will improve the accessibility and efficiency into and around North Bayshore and add some capacity.

Roadway access and efficiency improvements will involve adjustments to signal and intersection operations to increase capacity, utilizing peak reversible lanes, modifications to freeway ramps, and additional roadway connections throughout North Bayshore. While these strategies do include some new roadway segments, their primary purpose is to improve connectivity and efficiency in addition to increasing capacity. The strategies described within this section include:

- Adaptive Signal Coordination and Intersection Modifications
- Street Grid Connectivity Improvements
- Interchange Improvements

These strategies will benefit short, medium and long commute trip distances travelling to the North Bayshore. The modal target for roadway access and efficiency improvements are single occupancy vehicles, however, all modes would experience benefits. For example, bicycles and pedestrians would benefit from a more connected street network.

Managing New Roadway Infrastructure – As the ability to increase roadway capacity has become more difficult due to cost and right-of-way constraints, it has become important to effectively manage any new infrastructure. Several management approaches can be used and are suggested as part of the strategy for North Bayshore. These include reserving facilities for certain modes (e.g. transit or HOV), adjusting the operation during the day to serve peak direction flows and providing tolled access (such as the freeway Express Lanes).

4.1 Adaptive Signal Coordination and Intersection Modifications

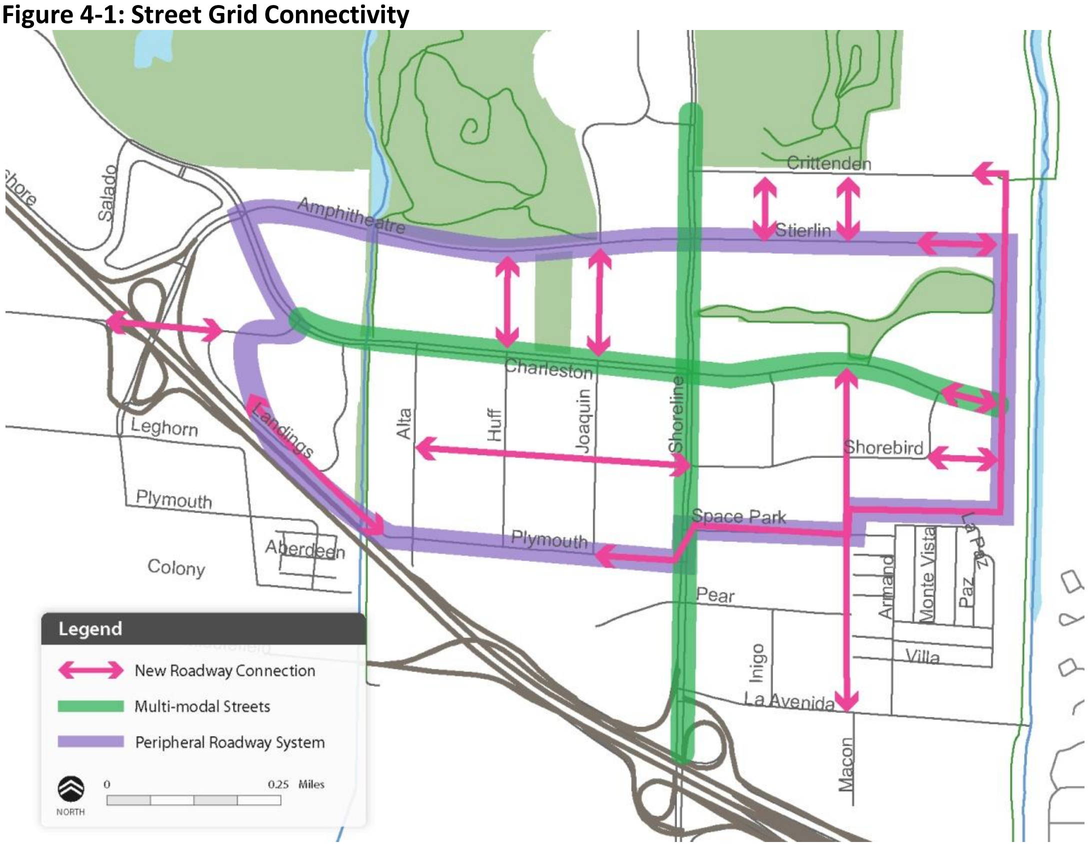
Adaptive signal control technology involves a system which adjusts the timing of the traffic signals in response to real-time measurements of traffic density and speeds throughout the roadway network. In this way the system changes signal operations to accommodate changing traffic patterns and ease traffic congestion and reduce vehicular emissions. Incorporating adaptive signal coordination and intersection operations to signalized intersections within and surrounding North Bayshore will optimize operations without the need for physical construction or roadway widening.

Additionally, intersection modifications may improve the efficiency of the roadway network. However, it is recommended that improvements do not create additional conflicts or increase crossing distances for pedestrians. Potential improvements include double left turns, longer turn pockets, and wider curb lanes to allow separation between bicycles and cars turning right. Intersection improvements should help reinforce other strategies, such as grid connectivity discussed below. For example, intersections such as Charleston Road at Amphitheatre Parkway and Shoreline Boulevard at Charleston Road may be modified to better route traffic to peripheral routes.

4.2 Street Grid Connectivity Improvements

The internal roadway system serving North Bayshore currently has bottlenecks and discontinuities which constrain traffic flow. Charleston Road and Shoreline Boulevard are forced to carry a high percentage of auto trips, which does not align with direction set in the General Plan. There are also locations where traffic, transit vehicles, bicycles and pedestrian come into conflict. The internal roadway network could be redesigned and expanded to better separate and prioritize travel modes and to more efficiently move traffic to the major employment areas (Figure 4-1). This would involve a loop system of roadways designed specifically for traffic circulation and vehicle access (including routes such as Amphitheatre Parkway, Stierlin Court, Landings Drive, Plymouth Street and Space Park Way) with separate routes for major transit, bicycle and pedestrian movements. Shoreline Boulevard and Charleston Road, in particular, would become multi-modal streets as envisioned in the General Plan. The Precise Plan will develop this concept in greater detail and identify implementation mechanisms.

Figure 4-1: Street Grid Connectivity



4.3 Interchange Improvements

Existing interchanges could be enhanced through modifications to increase capacity, improve the efficiency of the traffic movements and better serve other travel modes. There are two potential intersection improvements proposed, including San Antonio Road/Charleston Road and Shoreline Boulevard.

San Antonio Road Interchange/Charleston Road Connection

The potential San Antonio Road interchange improvements include widening the overcrossing to four lanes and creating a new on-ramp in the southbound direction, which was previously not provided (requiring drivers to use the southbound Charleston Road on-ramp). Currently, this overcrossing is two lanes and acts as a bottleneck north and south of U.S. Route 101. The reconstruction of the interchange would include other ramp modifications to improve operations and make it a more viable access point into and out of North Bayshore (Figure 4-2). These improvements would improve the capacity and efficiency at this interchange.

The San Antonio Road interchange improvements would be combined with improvements to the Charleston Road which currently provides the on-ramp in the southbound direction that is missing from the existing San Antonio Road Interchange. This on-ramp would be closed and an additional connection into North Bayshore created with a new underpass under U.S. Route 101 (Figure 4-3). The underpass would potentially include reversible auto and transit/HOV lanes, as well as bicycle and pedestrian connections.

Figure 4-2: San Antonio Road Interchange

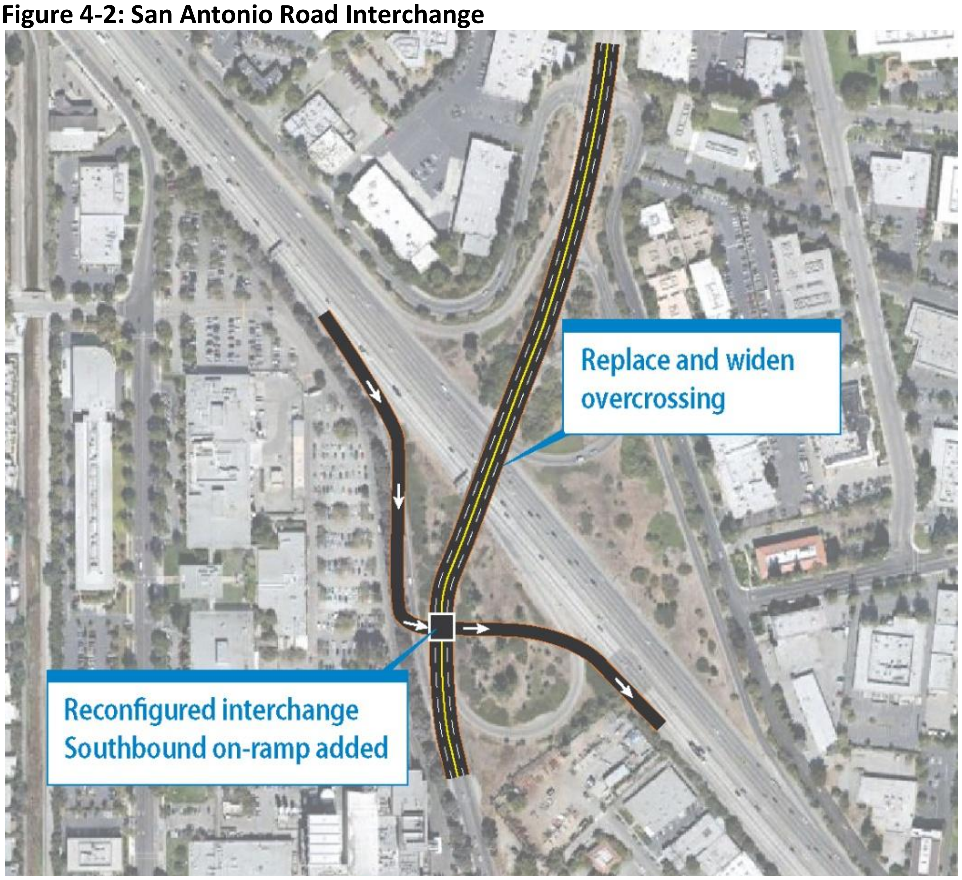
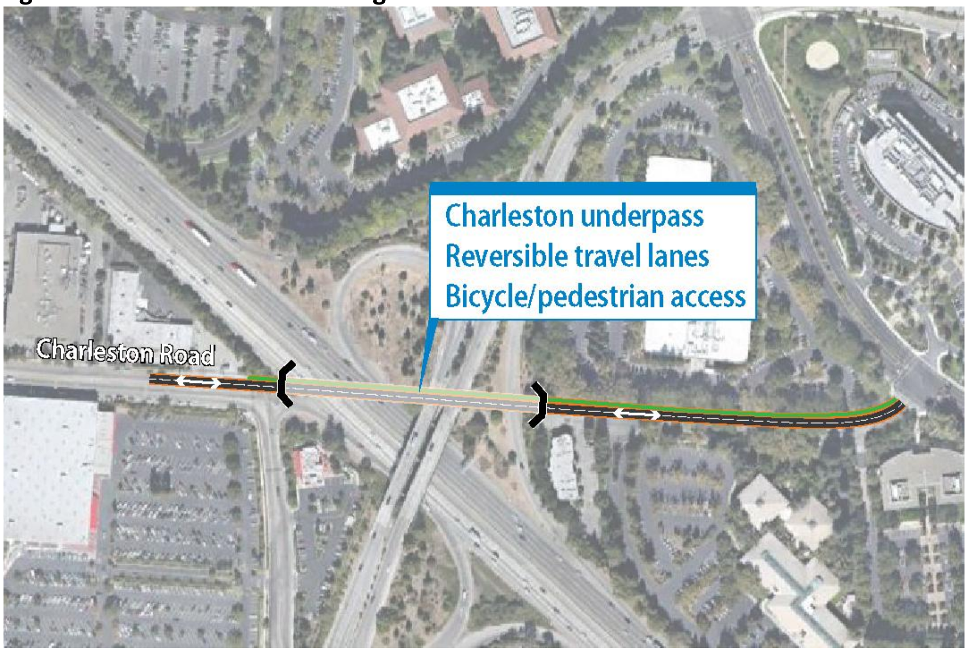


Figure 4-3: Charleston Interchange



Shoreline Interchange

The Shoreline Boulevard interchange off-ramp in the northbound direction currently connects to Shoreline at a five way intersection with La Avenida Street, U.S. Route 101 off and on-ramps. This configuration results in all traffic being funneled to Shoreline Boulevard which aggravates the bottleneck at that location and is inefficient for those needing to access locations east of Shoreline Boulevard.

The five-way intersection can become more efficient by connecting the off-ramp to La Avenida Street instead of directly with Shoreline Boulevard. This configuration accomplishes two primary efficiencies. The first is that vehicles would be able to make a more direct connection to locations east of Shoreline Boulevard. As shown in Figure 4-4, by turning right onto La Avenida Street, vehicles would be able to access internal streets without travelling on Shoreline Boulevard. This improvement would provide access from U.S. Route 101 to Microsoft offices, which has 1,700 employees, without needing to use Shoreline Boulevard. In order for this improvement to realize its full potential for increased roadway capacity it would need to be combined with street grid connectivity improvements, which prescribe greater connectivity in the area east of Shoreline Boulevard (see Section 3.2). Second, this improvement would simplify operation of the existing five-way intersection at Shoreline Boulevard by utilizing La Avenida Street as the intersecting roadway with Shoreline Boulevard.

Figure 4-4: Shoreline Interchange

4.4 Provide Dedicated Transit Facilities

Other strategies in this report relate to improvements for ridesharing, commute buses, transit, bicycles, and pedestrians, among others. As improvements are implemented there would likely be increases in roadway capacity as commuters shift to other modes. Furthermore, dedicated transit lanes and bridges will divert transit vehicles from congested roads, such as Shoreline Boulevard over U.S. Route 101. For example commuter buses, potentially more than 100 buses per hour, could utilize the proposed Stevens Creek bridge instead of Shoreline and 101. In these instances dedicated transit facilities would remove transit vehicles from congested roadways, thereby freeing capacity.

Section 5

Active Transportation

Improving active transportation to, from and within North Bayshore will involve enhancements to the bicycle and pedestrian network, which will make walking and bicycling a more convenient and viable transportation option. Improvements to increase the use of active transportation modes include utilizing the latest bicycle and pedestrian design techniques and innovations for improved safety and expanded network connectivity. The strategies described within this Section include:

- Bicycle and Pedestrian Connection Improvements
- Expand Bicycle Sharing
- New Citywide Bicycle Plan
- Incentive Based Active Transportation Program

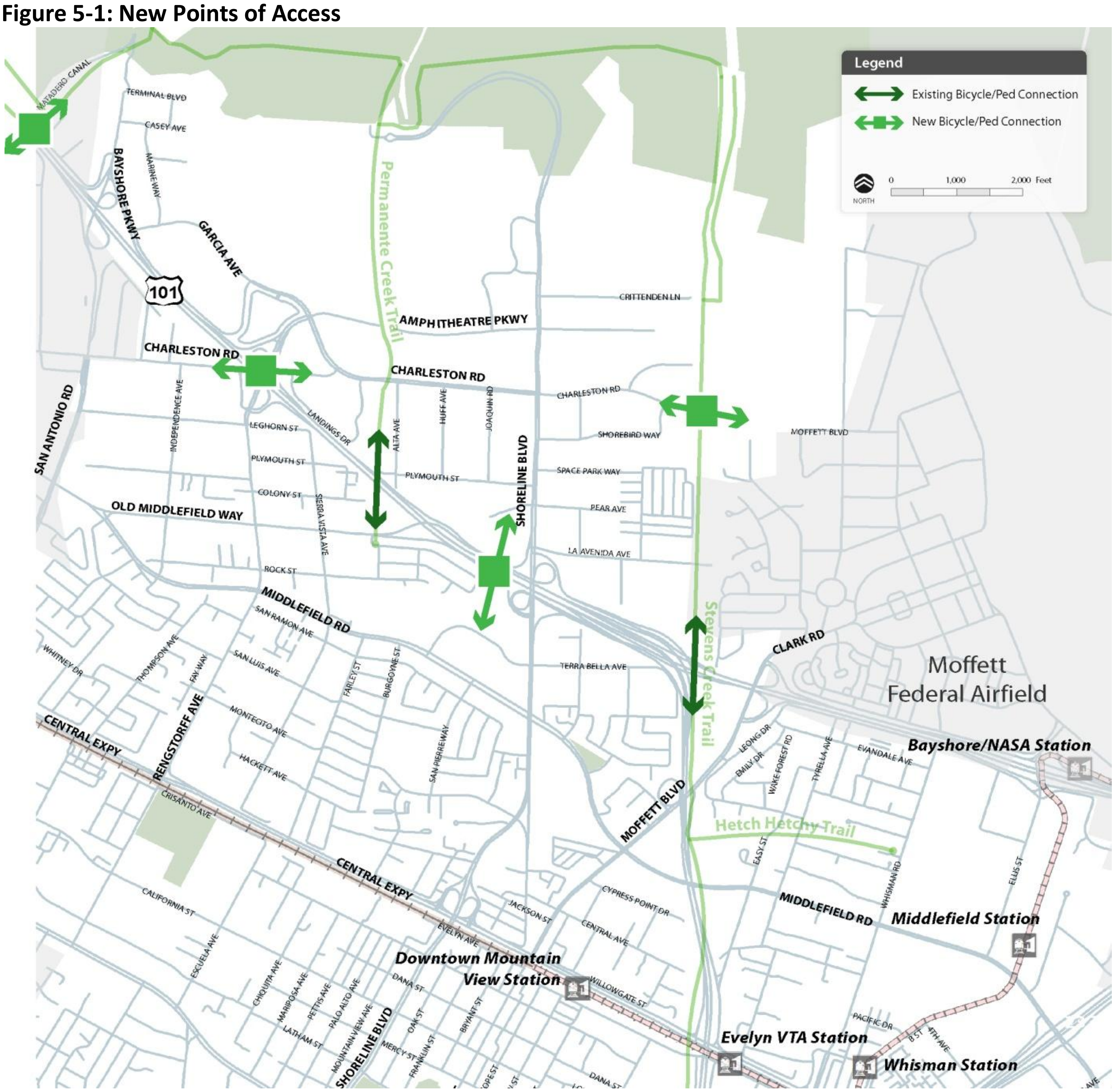
Active transportation strategies will mainly benefit short trip distances travelling to North Bayshore. However, some longer trip distances will also benefit including bicycle commuters travelling farther than five miles and those who use bicycles as a last mile solution when travelling by Caltrain or VTA light rail.

5.1 Bicycle and Pedestrian Connection Improvements

New Points of Access

The presence of U.S. Route 101 and the congested interchanges over the freeway create barriers to cyclists and pedestrians attempting to access North Bayshore. Additional points of access for bicycles and pedestrians will make travel by these modes more appealing, convenient and safe. New access points within this strategy include new bridges or tunnels at Charleston Road, Shoreline Boulevard over U.S. Route 101, Adobe Creek and Stevens Creek.

Figure 5-1: New Points of Access



Shoreline Boulevard Improvements

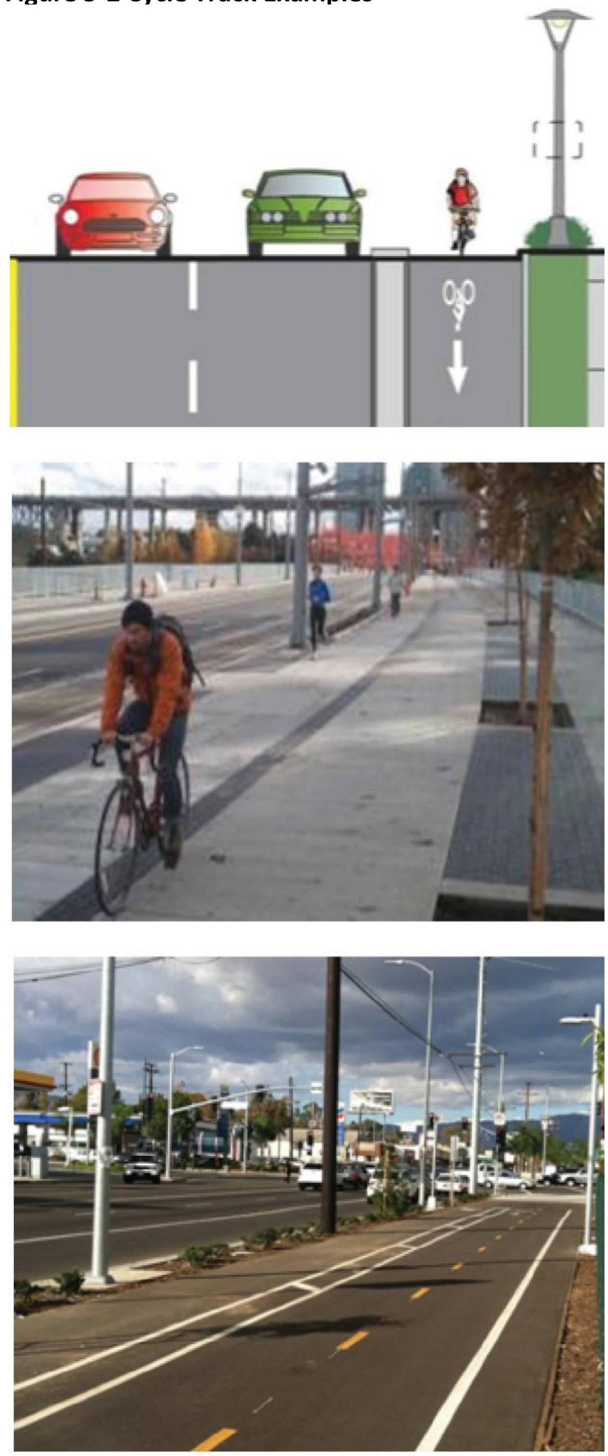
The existing U.S. Route 101 overcrossing (from La Avenida to Terra Bella Avenue) has two through travel lanes in each direction, one on-ramp/off-ramp lane in each direction, bicycle lanes in both directions, and sidewalks on both sides of the overcrossing. A large planted median divides the two directions of travel. Bicycle lanes in both directions must transition from a curb-adjacent position to the left side of the onramp lane immediately after the crest of the overcrossing. For the southbound direction, the bicycle lane is a substandard (3-4 feet) width between the through travel lane and the on-ramp lane. The crest of the overcrossing creates a sight-line hazard, blocking bicyclists from the view of overtaking drivers where they must merge across the onramp lane.

A new overcrossing structure is proposed for bicycles, pedestrians and transit vehicles over U.S. Route 101 immediately to the west of Shoreline Boulevard. This bridge would be integrated with a new transit bridge and is envisioned to connect with dedicated bicycle lanes on Shoreline Boulevard on both sides of U.S. Route 101.

Shoreline Boulevard has several different configurations of sidewalks, bicycle lanes and automobile travel lanes. Some segments have sidewalks and no bicycle lanes, other sections have bicycle lanes in the roadway with fast moving traffic. Each segment can be designed to be safer and more inviting to cyclists and pedestrians by creating a greater separation between cars and these other modes.

Raised two-way cycle tracks are proposed along Shoreline Boulevard between downtown and the heart of North Bayshore (Figure 5-2 and Figure 5-3). A cycle track allows bicycle movement in both directions on one side of the road. Cycle tracks dedicate and protect space for bicyclists by improving perceived comfort and safety and reduce the risk of conflict with vehicles or pedestrians. Combined with other bicycle improvements in this corridor, such as dedicated lanes along Stierlin Road, this strategy would create an efficient and safer route for bicyclists into North Bayshore.

Figure 5-2 Cycle Track Examples



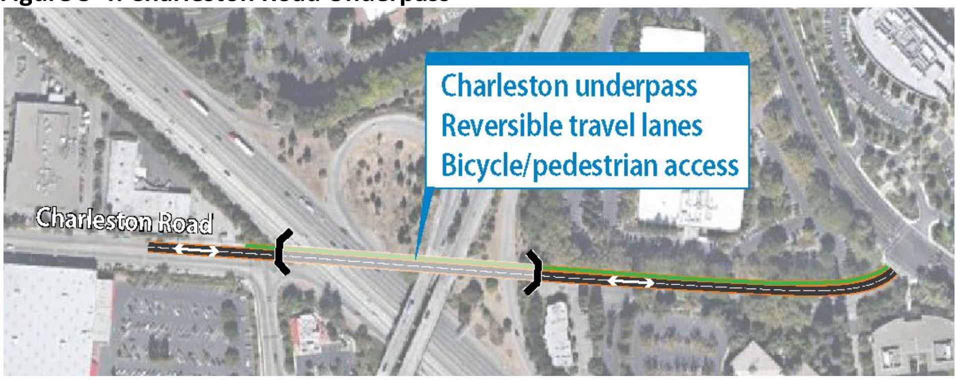
Proposed pedestrian level improvements include wider sidewalks, pedestrian level lighting and median island refuges.

Figure 5-3: Shoreline Boulevard Bridge and Cycle Track

Charleston Road at U.S. Route 101

Charleston Road is bisected by U.S. Route 101, with no connection between the two halves. A new east/west bicycle and pedestrian undercrossing of U.S. Route 101 at Charleston Road will improve connectivity into North Bayshore (see Figure 5-4). Bicycle lanes would extend westward to connect to the City of Palo Alto's bicycle network.

Figure 5-4: Charleston Road Underpass



Adobe Creek

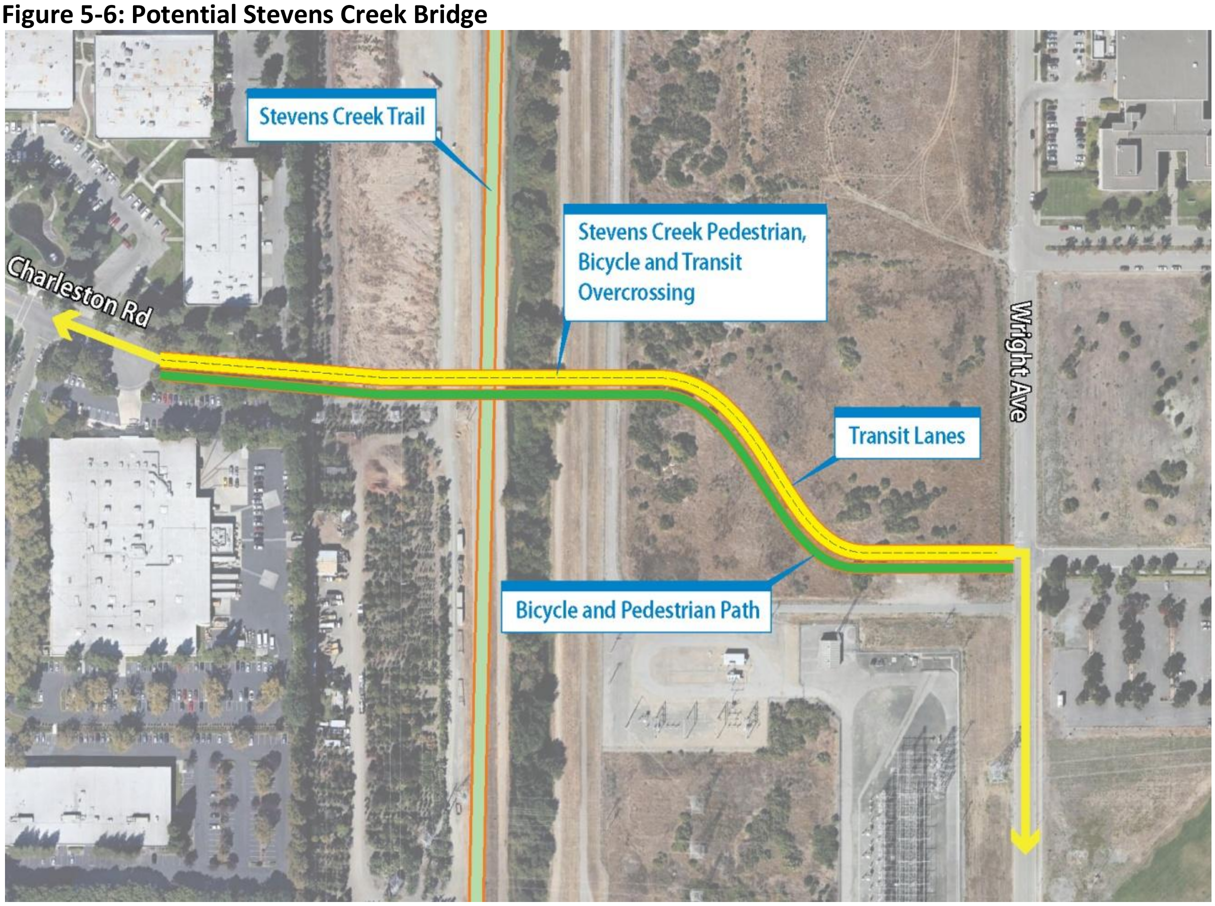
The Santa Clara County Board of Supervisors recently voted to provide funding for the City of Palo Alto's proposed new pedestrian and bicycle bridge over U.S. Route 101 at Adobe Creek (see Figure 5-5). The crossing borders North Bayshore and is a likely access point for bicycle commuters from Palo Alto. It will aid bicycle commuters by providing a safe, all-weather access point from the north.

Figure 5-5: Adobe Creek Bridge

Stevens Creek Trail Bridge connecting NASA/Ames and North Bayshore

A transit and pedestrian/bicycle bridge across Stevens Creek at or near Charleston Road would provide an additional access point from the NASA/Ames area (see Figure 5-6). This Stevens Creek crossing would provide an additional linkage between North Bayshore and the NASA/Ames area. The connection would be limited to bicyclist/pedestrians, transit vehicles and possibly other special category vehicles (e.g. electric scooters, car-sharing) and be designed to accommodate potential future expansion serve more transportation modes. The bicycle and pedestrian bridge should have a connection to the Stevens Creek Trail and the touchdowns on either side of the creek should integrate seamlessly into the bicycle and sidewalk networks. The Stevens Creek Trail, which runs parallel on the west-side of the Creek, is a highly used bicycle and pedestrian trail. This crossing would provide access not only NASA/Ames and the North Bayshore, but also provide additional access to the trail.

Figure 5-6: Potential Stevens Creek Bridge



Other Key Commute Corridors

Permanente Creek Trail

The Permanente Creek Trail runs along the eastern side of Permanente Creek from Old Middlefield Way in the south to Shoreline Park in the north. The trail has an undercrossing at Amphitheatre Parkway, an at-grade crossing at Charleston Road, a bridge over Highway 101, and an undercrossing of Old Middlefield Way. Additional improvements to Permanente Creek Trail will help connect the trail from key destinations and the surrounding bicycle network and increase usage, including:

- Extend the trail along the creek from its existing terminus at Old Middlefield Way to Middlefield Road, a primary east/west bicycle route.
- Provide an enhanced crossing at Charleston Road.
- Provide trail lighting to encourage evening commuting.

Stevens Creek Trail

Stevens Creek Trail is an important connection from the City of Mountain View to the Shoreline study area. It requires some basic improvements to support the expected increased volume in bicycle commuting. This includes on and off ramps at major intersections to improve connectivity, safety improvements such as mirrors to improve visibility, potential lighting for evening commuting, and drainage improvements at underpasses. The potential lighting of the Stevens Creek Trail will require environmental study and may not be feasible because of impacts to wildlife.

Additionally, enhancing access to Stevens Creek trail at key locations is important to enhancing connectivity, including an improved connection from Crittenden Lane.

Moffett Boulevard

There are bicycle lanes on Moffett Boulevard from Highway 85 to the south side of the U.S. Route 101 overpass, and from the north side of the U.S. Route 101 overpass to RT Jones Road. The overpass has shoulders of sub-standard width instead of bicycle lanes. The bicycle lanes in the northern portion of Moffett Boulevard could be extended south to the Central Expressway. The bicycle lanes along the length of Moffett Boulevard could potentially have a painted buffer, creating lateral separation from auto traffic. With a 66’ ROW, five (5) foot bicycle lanes with a two (2) foot buffer can be accommodated through the narrowing of travel lanes.

Figure 5-7: Separated/buffered Bicycle Lanes

Ellis Street Undercrossing

Along Ellis Street, U.S. Route 101's on and off ramps impede pedestrian and bicycle travel between the Bayshore/NASA Light Rail Station and the commercial/industrial areas nearby. The City of Mountain View is currently studying cost-effective enhancements that will improve accessibility for pedestrians and bicyclists between the Light Rail Station and the North Whisman area and also encourage light rail ridership. The study will explore a range of possible improvements including pedestrian/bicycle-friendly tunnels, overcrossings, and/or improved at-grade pedestrian/bicycle routes.

5.2 Expand Bicycle Sharing

The bicycle sharing program that has been used effectively by Google, and the new bicycle sharing program that the City of Mountain View is implementing through the VTA, offer individuals the ability to have access to a bicycle at their convenience at multiple points throughout the city. This type of program can dramatically increase the use of bicycles. There are opportunities to expand bicycle sharing within the North Bayshore to create a program, potentially operated by a TMA, which includes a more expansive network and allows all North Bayshore employees use of bicycles. This program may be combined with either the new citywide bicycle sharing program or Google's bicycle sharing program.

5.3 New Citywide Bicycle Plan

A new comprehensive bicycle plan that sets forth innovative strategies for making bicycling in Mountain View safe, convenient and efficient is proposed to provide helpful policy guidance and ensure a well-connected network throughout the City. Making citywide improvements to bicycling infrastructure makes biking safer and accommodates bicyclists of all skill levels leading to an overall increase in bike commuting (mode share). While the new plan would have city-wide benefit, it may be desirable to prioritize specific improvements that will provide the greatest benefit to North Bayshore commuters.

5.4 Incentive-based Active Transportation Program

An incentive program is designed to motivate and reward commuters who change their daily commute habits to choose walking or bicycling over driving alone. The program may include any of the following incentives, among others:

- Rebate for purchase of a bicycle or walking shoes;
- Bicycle sharing program;
- Free bicycle valet and/or bicycle servicing;
- Financial reimbursement for not using a parking space (e.g. parking cash-out); and
- Special perks and giveaways for people who commute by walking or bicycling.

An incentive program for active transportation would likely be managed by a Transportation Management Association (TMA) or by individual employers. The City may consider providing recommended guidelines employees to administer an incentive program.

Section 6

Transit Connections

In order to meet the future mode share targets, a substantial increase in transit ridership is needed. Both Caltrain and VTA LRT offer potential capacity to attract and accommodate North Bayshore commuters. Improvements to transit connections into the North Bayshore area will focus on creating more effective “last-mile” connections by providing dedicated lanes for transit, new access points, and Downtown Transit Center/Caltrain Station improvements. These improvements will increase transit mode share, while building upon existing plans to improve and expand Caltrain and light rail service. The major areas of improvement concentrate around the following key strategies.

- Support expanded Caltrain/VTA service - Improvements to Mountain View Station will be needed to accommodate the expected increase in Caltrain and LRT riders and redesign will be required to improve shuttle operations.
- Shuttle Operation Improvements– The current system could be much more efficient and frequent if operated as a coordinated system.
- Improved access to North Bayshore - Transit only connections to the North Bayshore will allow shuttles to bypass congestion and improve service reliability.
- Incorporate Adaptability for Evolving Transit systems - As ridership grows beyond 2030 projections, initial short and medium term improvements will become less effective and additional investment will be considered for higher capacity transit systems such as BRT, LRT, or APM/PRT or autonomous vehicles.

These strategies would focus particularly on medium distance trips, but will also benefit both short and long trips travelling to the North Bayshore. The modal target for transit connections is transit; however, all modes would experience benefits. For example, bicycles and pedestrians would benefit from improved connections to North Bayshore.

6.1 Support Expanded Caltrain and VTA Bus and Light Rail Service

Caltrain and VTA Light Rail provide important mid-range (5-30 miles) and long range (30+ miles) commute connections to Mountain View. Plans for expansion should be encouraged and supported, while focusing on enhancing connections to the North Bayshore. As regional service is expanded it will be essential for transit service to the North Bayshore to be enhanced to provide the critical "last mile" link from the station to the work place. This will include increased capacity at the transit center to accommodate more Caltrain service, on site capacity for shuttle parking, and circulation and local station area access improvements for walking, bicycling and other alternative modes.

Caltrain

- Caltrain's electrification and modernization (CalMod) program will improve operations and increase capacity.
- Improvements to the Mountain View Station / Transit Center to accommodate expanded Caltrain service and increased ridership.
- Explore grade separation alternatives at Rengstorff Avenue and Castro Street.
- Support dedicated Caltrain funding to sustain and increase service.

VTA Light Rail and Bus

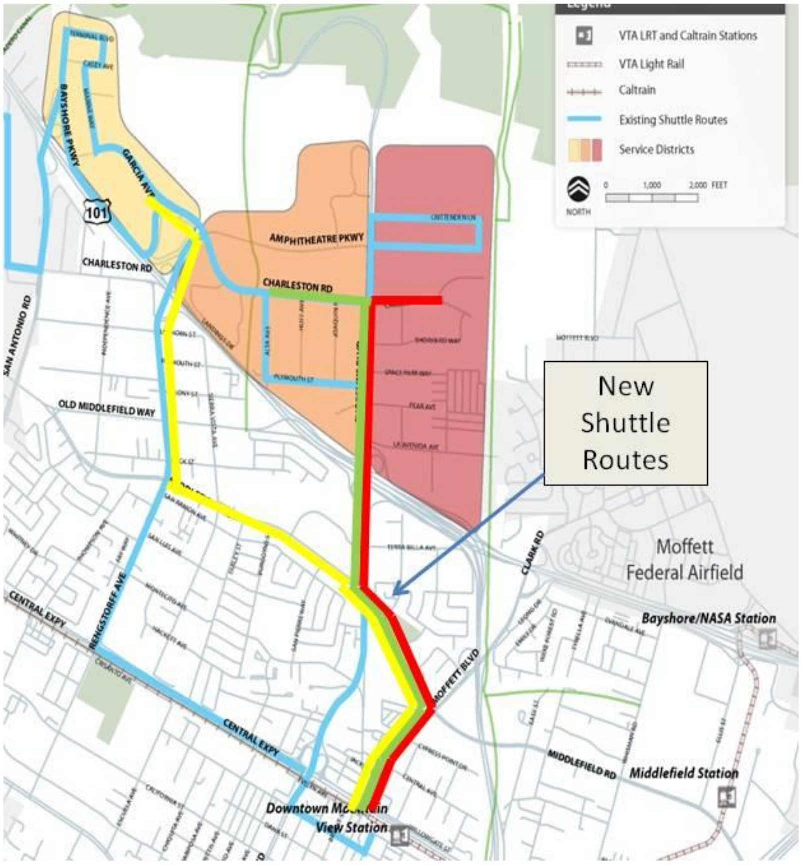
- Support VTA efforts to expand service and operate express trains from BART, and work cooperatively with VTA in the planning, design, construction and operation of Transit Center and track improvements required to support enhanced service.
- Support future service improvements to increase capacity and ridership. Encourage efforts to create an expanded system of local transit routes and shuttles, connecting and supporting light rail service.

6.2 Enhanced Shuttle Operations

The current shuttle system is a mix of Caltrain shuttles sponsored by employers and private shuttles run by individual employers. Currently Caltrain and Light Rail account for about 5 percent of commute trips. However, as these systems are expanded, there is limited capacity for growth in transit ridership with the current shuttle system. Operations could be much more efficient and frequent if all the shuttles were operated as a coordinated system with routes that serve the various portions of North Bayshore directly. A refined shuttle program, with improvements to operations, access and integration with Caltrain, would help improve capacity and provide a more efficient "last-mile" connection into the North Bayshore from regional transit stops in Downtown Mountain View. It should be noted that a streamlined shuttle program is only part of the solution needed to increase transit mode share. Improved connectivity and an eventual transition/evolution to higher capacity transit technologies will be needed to support growth forcasted beyond 2030.

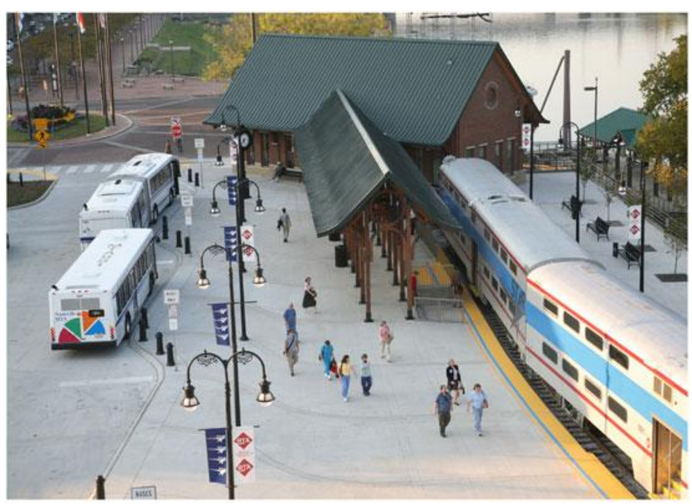
A streamlined shuttle program could incorporate service districts (as shown in Figure 6-1), improved, branded shuttle vehicles, extended service hours and frequency. In this concept there would be three high frequency branded shuttle routes, such as the red, green, and yellow routes, between the Caltrain Station and North Bayshore. Each route would serve one of the three areas or districts within North Bayshore. The creation of a Transportation Management Association (TMA) is one potential way to manage and fund a streamlined shuttle program, where employers join and pool their resources to implement employee various TDM measures. Under the guidance of a TMA, the shuttle program could be redesigned to avoid potential duplication of services and inefficiencies that result when individual employers run their own programs. Additional benefits may include improved capacity, service hours and supplemental features (e.g. wi-fi).

Figure 6-1: Potential Branded Shuttle Service Concept



6.3 Caltrain/Light Rail Station Improvements

Improvements to the existing Mountain View Transit Center and Caltrain Station will be needed to accommodate the increased number of Caltrain and LRT riders and provide facilities for better connections to other transit modes at the station site or in close vicinity. In addition, space will be required for bike and car sharing services, and expanded parking. Figure 6-2 shows the elements of the overall improvement concept. The improvement plan should also consider the potential need for future APM, PRT, or autonomous vehicle facilities.



An improved new shuttle pick-up location would be integrated into a redesign of the Caltrain/Light Rail Station with shuttle access on the north side of the Central Expressway. This configuration would shorten travel time between Downtown Mountain View and the North Bayshore area. There may be opportunities to combine new parking and/or commercial development in conjumction with the shuttle area.

As a hub for local, regional, and "last mile" connections to the North Bayshore, the Mountain View Transit Center should be developed as part of an integrated station area plan to incorporate both the adjacent land use needs and support long term forecasted trips. This plan would also encourage walking and biking for local residents and could also reduce parking and traffic congestion within the area.

Figure 6-2: Downtown Transit Center Improvements (Caltrain/LRT Stations)

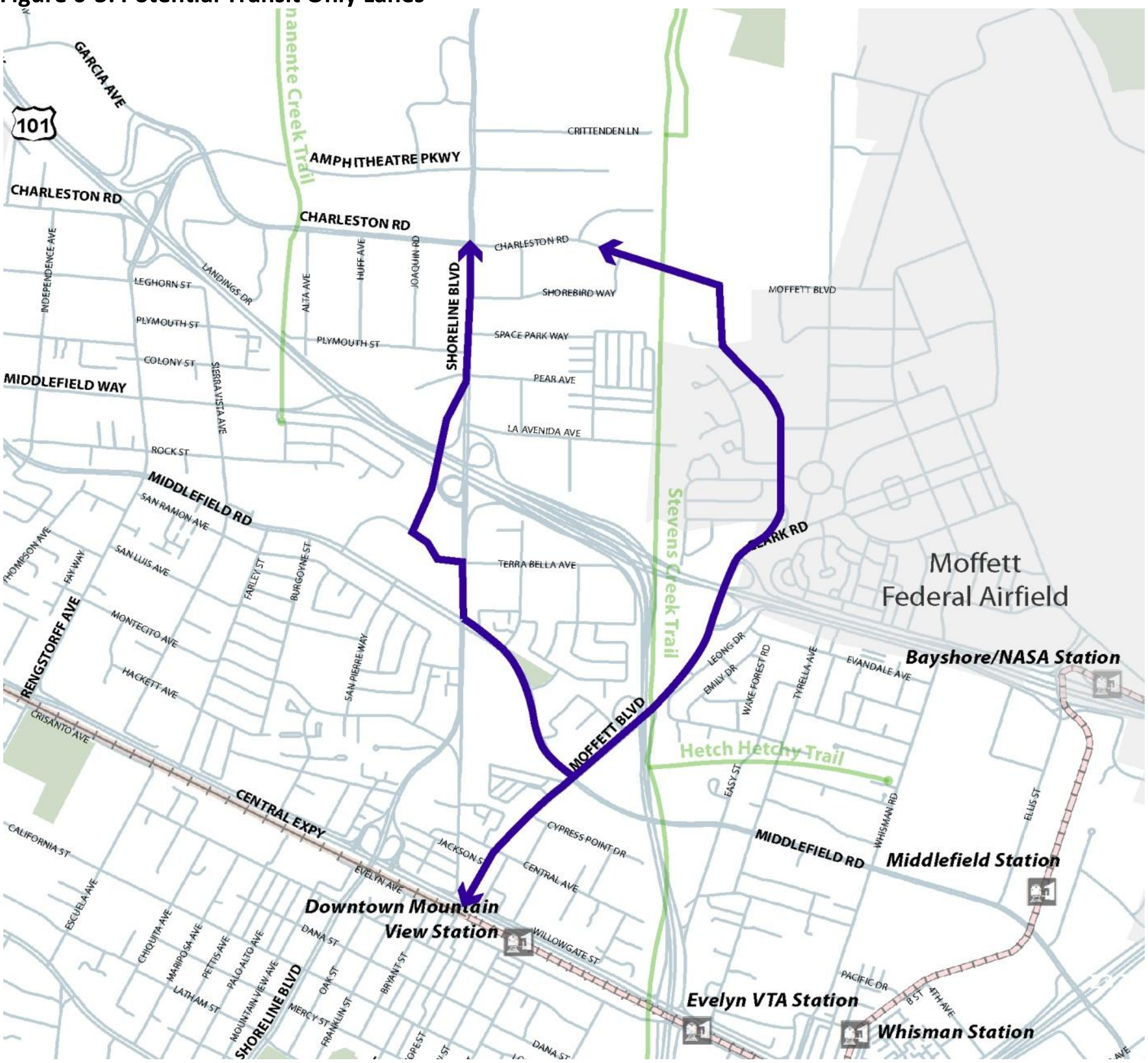
6.3 Improve Transit and Shuttle Access into North Bayshore

Transit only lanes, bridges and underpasses would provide connections into the North Bayshore area that bypass congestion and improve efficiency for shuttles and transit.

Transit Only Lanes on Moffett Blvd and/or Shoreline Blvd

Transit only lanes can provide an effective near-term solution for connection between the LRT and Caltrain stations with the Shoreline Area (See Figure 6-3). Transit only lanes and crossings can be used for conventional bus or shuttle service, which would allow them to bypass most traffic congestion and provide for more reliable service. In the long-term, these lanes could potentially evolve into right-of-way for fixed guideway transit options such as LRT, streetcar, APM, or PRT. A well thought out implementation program would be needed to mitigate impacts to existing service during the transition.

Figure 6-3: Potential Transit Only Lanes



Existing street right-of-way is limited in select parts of Moffett and Shoreline Boulevards, and the addition of transit only lanes could cause potential impacts to traffic and bike lanes, parking, turn pockets, streetscapes, and curb, gutter, and sidewalks. Options that could be considered include center versus side running lanes, with either non-median or median separated lanes from standard vehicular traffic.

Side running transit lanes would be traversable to vehicular traffic to allow for right turns, reducing the amount of green light time available for transit vehicles. The center running option would reduce conflicts at intersections with right turning vehicles, and considerations will need to be taken for limiting left turns through the corridor. Colored pavement treatments or a raised running surface could also help to mitigate the effect of cars and other non-HOVs from entering the transit only lanes.

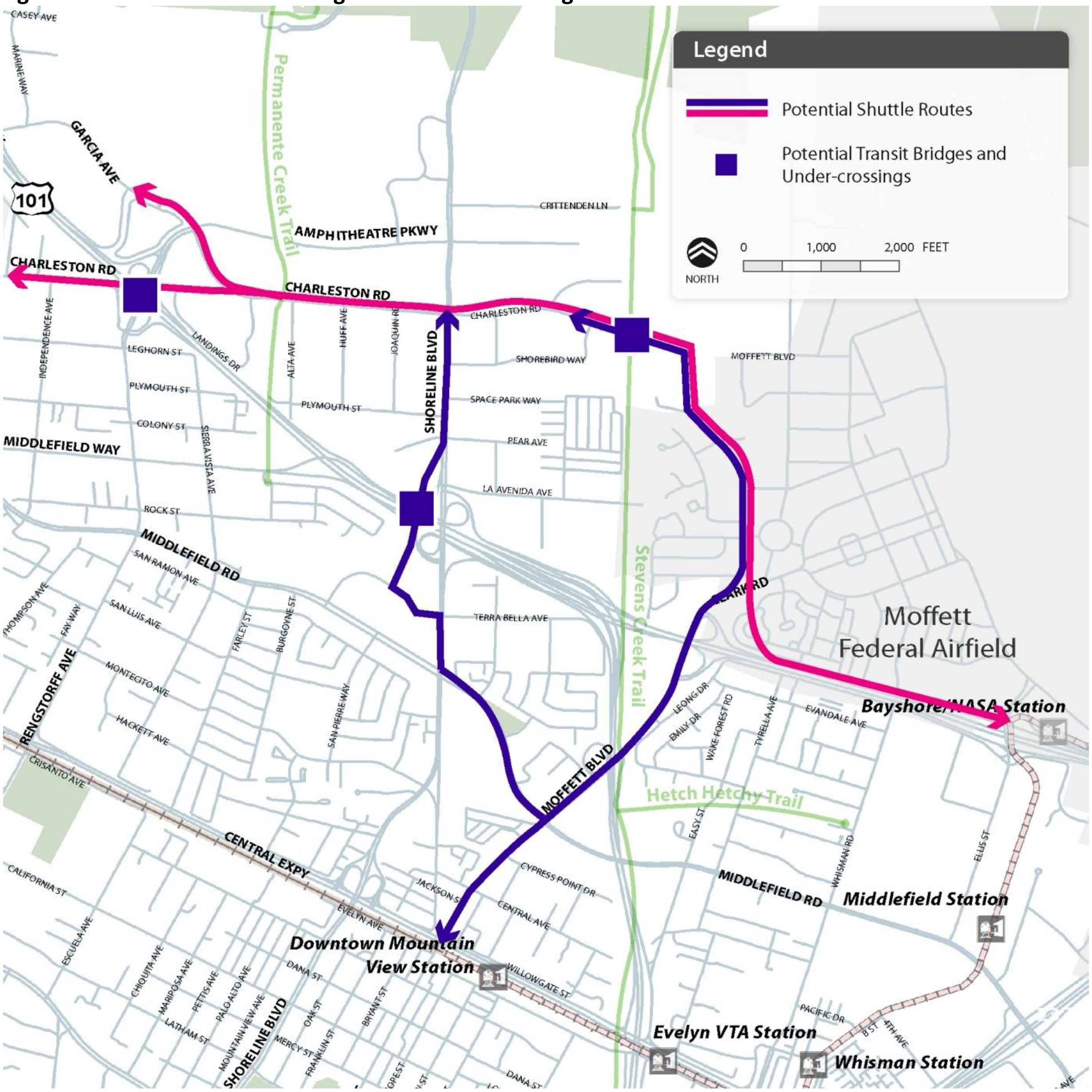
Transit Bridges and Under-crossings (across U.S. Route 101 and Stevens Creek)

In combination with transit only lanes, transit only crossings of U.S. Route 101 at select locations could allow for more direct transit access into the North Bayshore. Locations proposed include Shoreline Boulevard, Charleston Road or Moffett Boulevard (See Figure 6-4). These crossings could allow for access on and off of the highway for and provide connection with transit only lanes in the Shoreline Area.

Right-of-way acquisition would likely be required to accommodate the construction of either a bridge or tunnel (i.e. column locations or retaining wall tiebacks). Also, potential impacts to adjacent properties and utilities, as well as closures to perpendicular streets near the crossings could be likely due to the distance and grades required to obtain adequate clearance over/under the highway.

A crossing of Stevens Creek near Charleston Boulevard would provide an additional linkage between the North Bayshore and the NASA/Ames area. This crossing or crossings would be limited to transit vehicles and bicyclist/pedestrians, and possibly other special category vehicles (e.g. electric scooters, car sharing) or expanded to serve more transportation modes.

Figure 6-4: Potential Transit Bridges and Under-crossings



6.4 Plan for Higher Capacity Transit Systems

Considering potential future technologies when developing a network of transit and shuttle improvements is important for designing systems that adaptable and resilient. As increased demand occurs for transit, the transit and shuttle network should be designed to adapt to higher capacity systems.

Potential Future Adaptations

Future adaptations may include a variety of systems with semi-exclusive and fully-exclusive transit ways or guide ways, including the following:

- Light Rail Transit: Steel rail-based vehicles that can operate in mixed traffic or in exclusive right-of-ways.
- Automated People Mover: Automated vehicles that operate on an exclusive guideway.
- Group Rapid Transit: A technology that uses medium-sized, automated vehicles on exclusive guideways that provide direct service between a group of passenger's origin and destination.
- Personal Rapid Transit: A technology that uses small, automated vehicles on exclusive guideways that provide direct service between a passenger's origin and destination
- Autonomous Vehicles: Automated road-based vehicles (e.g. cars, vans, small buses) that can operate in mixed traffic or exclusive right-of-ways.

Considerations

High capacity transit systems typically require an exclusive, dedicated right of way. Planning for a transition from bus based services to a higher capacity system should focus of the preservation or creation of a right of way that could one day be used for the new transit system. Figure 6-5 illustrates the potential evolutionary process that can support a transition from a bus operation to a higher capacity transit system. Buses can operate in a right of way shared with general traffic or in transit only lanes which can be accommodated within the street cross-section. The operations can be enhanced by adding segments of semi-exclusive transitways to separate the buses from traffic. This type of semi-exclusive environment also works well for BRT and LRT operations. In order to convert to a systems such as PRT, APM, or GRT the transitway or guideway would need to be fully exclusive. This could be accomplished by upgrading the non-exclusive section of the 2nd generation semi-exclusive transitway to a fully separate, exclusive right of way.

Figure 6-5: Transit Evolution

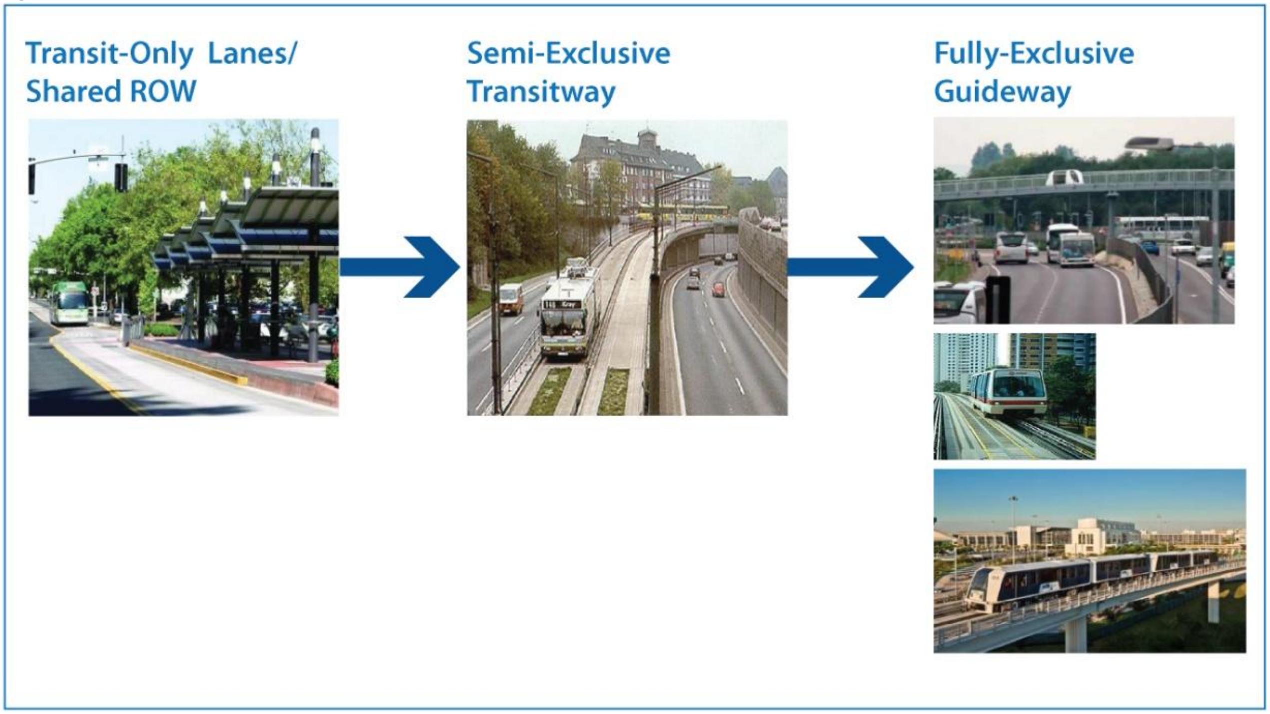


Table 6-1 provides a detailed summary of transit technologies including the phaseability (ability to transition from/to another technology type). Table 6-2 provides some more detailed considerations for the implementation and phasing of the transit connection solutions.

Table 6-1 Transit Technology Summary

Technology	Description	Functions	Capacity	Minimum/ Optimal Guideway Required	Speed	Technical Maturity	Phaseability ****
Light Rail Transit (LRT) 	Steel rail-based vehicles that can operate in mixed traffic or in exclusive right-of-ways	Local and regional connections	Moderate to high line capacity	Shared/ exclusive ROW	Low / moderate speed, limited mixed traffic	Excellent	Medium
Automated People Mover (APM)* 	Automated vehicles that operate on an exclusive guideway	Local connections	High line capacity	Exclusive right-of-way	Moderate speed, exclusive right-of-way	Excellent	Low
Personal Rapid Transit (PRT) 	A technology that uses small, automated vehicles on exclusive guideways that provide direct service between a passenger's origin and destination	Local connections and circulation	Low to moderate capacity **	Exclusive right-of-way	Moderate speed, exclusive right-of-way	Limited	Low
Autonomous Vehicles 	Automated road-based vehicles (e.g., cars, small vans, small buses) that can operate in mixed traffic or exclusive right-of-ways	Local connections and circulation	Low capacity ***	Shared/ Exclusive ROW	Low / moderate speed, limited mixed traffic	Under Develop-ment / Testing	High
Shuttle Bus 	Shuttles serve specific locations and can operate in mixed traffic or in exclusive right-of-ways	Local connections and circulation	Low line capacity	Shared/ Exclusive ROW	Low speed, mixed traffic	Excellent	High
Conventional Bus 	Typical single unit and articulated transit buses, operate in mixed traffic or in exclusive right-of-ways	Local and regional connections	Low to moderate line capacity ***	Shared/ Exclusive ROW	Low to moderate speed ***	Excellent	High

* Assumes self-propelled, rubber-tired APM technology for discussion purposes
** Depends on design and configuration
*** Depends on degree of shared right-of-way with conventional vehicles and how large a vehicle is used
**** Capability of transitioning from/to another technology type by means of civil improvements (mixed traffic → shared/exclusive ROW → grade separated lanes/guideways)

Table 6-2 Transit Connection Evolution and Considerations

Transit Improvement	Benefit/Goal	Adaptation/ Evolution	Implementation Timeline	Project Impacts/Considerations
Transit Only Lanes	Provides an effective near-term solution for connection between the LRT and Caltrain stations with the Shoreline Area	In the long-term, these lanes could potentially evolve into right-of-way for fixed guideway transit options such as LRT, streetcar, APM, or PRT. Would require a detailed implementation program.	3 to 5 years (Initial phase) 15+ years (LRT, Streetcar, APM, PRT)	Existing street right-of-way is limited in select parts of Moffett and Shoreline Boulevards, and the addition of transit only lanes could cause potential impacts to traffic and bike lanes, parking, turn pockets, streetscapes, and curb, gutter, and sidewalks. Widening the existing overpasses at Shoreline and Moffett Boulevards to accommodate transit only lanes could also be considered and would require construction staging and traffic detours in order to maintain vehicular traffic during construction.
Streamlined Shuttle Program	Improves link between the Mountain View Caltrain and the Bayshore/NASA LRT stations with the Shoreline Area in the near term w/ buses and shuttles to provide more direct service with shorter wait times.	Developed in conjunction with transit only lanes, service times and reliability can be improved. It may potentially be better served as a mid-term strategy to be employed in conjunction with other transit strategies including a Central Shoreline transit hub or transit nodes located throughout Shoreline Area and transit only lanes.	1 to 5 years (Initial phase), 5 to 10 years (mid-term)	The shuttle program should be coordinated with existing employer and agency programs (potentially managed through a TMA) and include development of station design and Shoreline route (s) redesign. Further it will need to consider property acquisition (for transit hubs and nodes) to support long term implementation.
Transit Bridge Stevens Creek	Provides an additional linkage between the Shoreline Area and the NASA/Ames area. Crossing would be limited to transit vehicles and bicyclist/pedestrians, and possibly other special category vehicles or expanded to serve more modes.	As a potential near term strategy, the construction of the transit bridge could initially be used to serve shuttles, HOVs, and bicyclist/pedestrians, then could eventually evolve into an LRT crossing as part of the light rail extension strategy from the Bayshore/NASA LRT Station.	3 to 5 years (Initial phase) 15+ years (potential LRT extension)	Any transit crossing of Stevens Creek will provide adequate vertical clearance over the existing trail and avoid/minimize impacts to heritage trees. In the North Bayshore area, the Stevens Creek Trail runs adjacent to sensitive wild life areas, so potential impacts to these areas and the wildlife in them should be studied thoroughly. Five high-voltage transmission lines are also located within a utility corridor to the west of Stevens Creek and the Stevens Creek Trail and depending on the vertical profile of the bridge crossing; coordination with the local utility district may be required in order to raise the power lines to allow for adequate clearance.

Transit Improvement	Benefit/Goal	Adaptation/ Evolution	Implemen-tation Timeline	Project Impacts/Considerations
Transit Bridge/Tunnel US 101 (Shoreline) Charleston Road	Provides transit-only connections (with pedestrian and bicycle provisions) into the North Bayshore area that would bypass congestion and improve efficiency for Shuttles and other transit.	Transit vehicles will be required to operate in mixed traffic lanes until separate transit -only connections are developed.	10 to 15 years	ROW preservation, acquisition needed to support long term implementation. Potential impacts to adjacent properties and utilities, as well as closures to perpendicular streets near the crossings could be likely due to the distance and grades required to obtain adequate clearance over/under the highway. Coordination with VTA and Caltrans will also be important.
Mountain View Transit Center Improve-ments	Needed to accommodate the increased number of Caltrain and LRT riders and provide facilities for better connections to other transit modes.	As a hub for local, regional, and "last mile" connections to the Shoreline Area, the Mountain View Transit Center should be developed as part of an integrated transit oriented development and station area plan	5 to 15 years	Property acquisition may need to be considered for station area improvements and ROW and traffic circulation improvements. Vertical clearance would be needed for potential APM or PRT systems in the future. A decision regarding the possible grade separation of Castro Street may also influence the station plan.

6.5 Expand Local Transit Network

Previous improvements mentioned in this section have focused on improving transit access directly to North Bayshore. However, an overall expansion of the transit network would improve connections to destinations and origins throughout the community. Expanding VTA local routes into different neighborhoods, connecting to key activity centers such as San Antonio Center, and extending service hours are all strategies for expanding the local transit network. With the formation of a TMA for North Bayshore there may be opportunities for public/private partnering to help support the enhanced bus network.

6.6 Bicycle and Vehicle Sharing Program

Major shuttle and transit stops should be developed as staging areas for bicycle and vehicle sharing facilities to augment the transit network. Car sharing, bicycle sharing, scooter sharing and other services near transit stops, provide transit riders with an additional alternative to access last-mile connections to their destinations more easily, thereby making transit a more viable transit option.

Section 7

Commuter Bus and Ridesharing

Commuter buses and ridesharing (vanpools and carpools) provide significant opportunities for improving accessibility to and from the North Bayshore area. This strategy would be primarily driven by employer-based programs that encourage and directly operate bus and ridesharing services. These programs, which are already in place, would be sustained and expanded in conjunction with employment growth. The focus of this strategy is focused on medium and long distance trips.

Since commuter bus and ridesharing vehicles encounter the same traffic issues experienced by single occupancy vehicles, infrastructure investments supporting this strategy focus on bypassing congestion and increasing roadway capacity for transit and ridesharing trips. The strategies described within this section focus on access from U.S. Route 101 into the North Bayshore area and include:

- Commuter Bus Support and Expansion
- VTA Express Lane Projects
- Direct Access Ramps to U.S. Route 101 Express Lanes
- Ridesharing Programs

7.1 Commuter Bus Support and Expansion

Commuter buses (often referred to as shuttles) are employer-run buses that provide transportation directly to company locations from surrounding communities, such as San Francisco, San Jose and Oakland. Express lanes and direct access ramps would improve efficiency of commuter buses, as described in previous strategies in this section. Furthermore, because the North Bayshore area has limited points of access, additional connections for transit into the area would also benefit commuter buses. These connections could include a transit bridge over Stevens Creek, the San Antonio Interchange improvements and the Charleston underpass, which are described in the other sections of this report.

Support for the commuter bus programs operated by employers will also need to address other program elements, including:

- Residential pick-up locations, including coordination with local communities and transit agencies for safe and effective sites
- Development of expanded park-and-ride locations

Supporting commuter buses and expanding programs may be coordinated through a Transportation Management Association (TMA). A TMA would be able to combine resources of multiple employers to expand commuter bus operation. There may also be opportunities for the TMA to partner with public transit providers to run additional commuter bus services. This could be implemented similar to the agreement between Stanford University and AC Transit. Stanford University subsidizes partially the

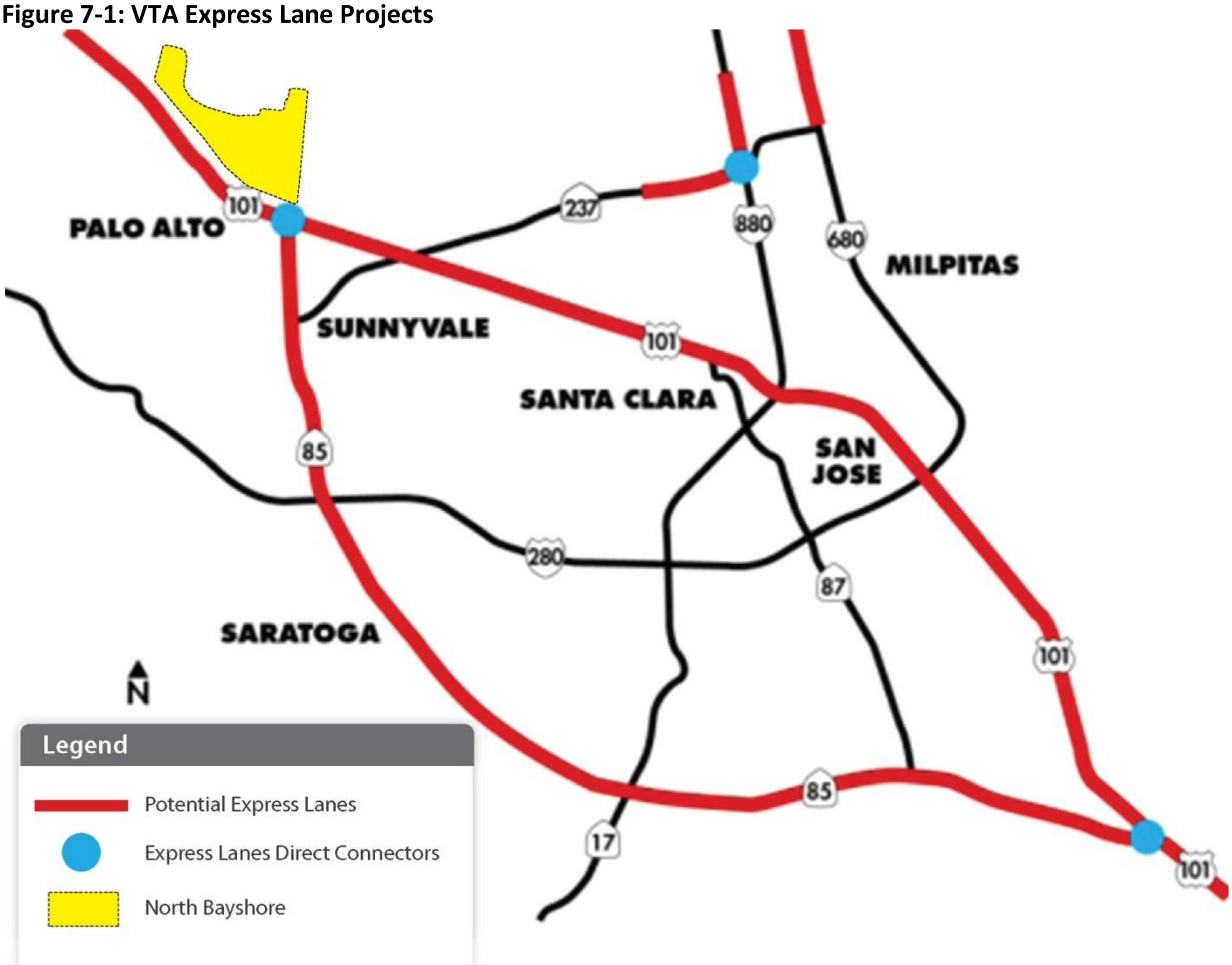
Dumbarton Bridge Express Route U which provides transbay service to the University from the East Bay. This approach could result in expanded commuter bus opportunities that would be available to all North Bayshore employees.

7.2 VTA Express Lane Projects

The Santa Clara Valley Transportation Authority (VTA) Express Lane Program provides congestion relief and more efficient use of roadways by creating express lanes throughout Santa Clara County. There are two express lane projects adjacent to the project area located on State Route 85 and U.S. Route 101. Express lanes would accommodate carpools with two or more occupants, motorcycles, buses, shuttles, and eligible hybrids. Solo drivers will have the option of paying a toll to use the express lanes during commute hours. Express lanes will encourage ridesharing, increase capacity and improve travel times for commuter buses and carpools accessing the North Bayshore area.

Express lane projects surrounding the project area will support congestion relief on U.S. Route 101, which will accommodate growth in the North Bayshore area (See Figure 7-1).

Figure 7-1: VTA Express Lane Projects



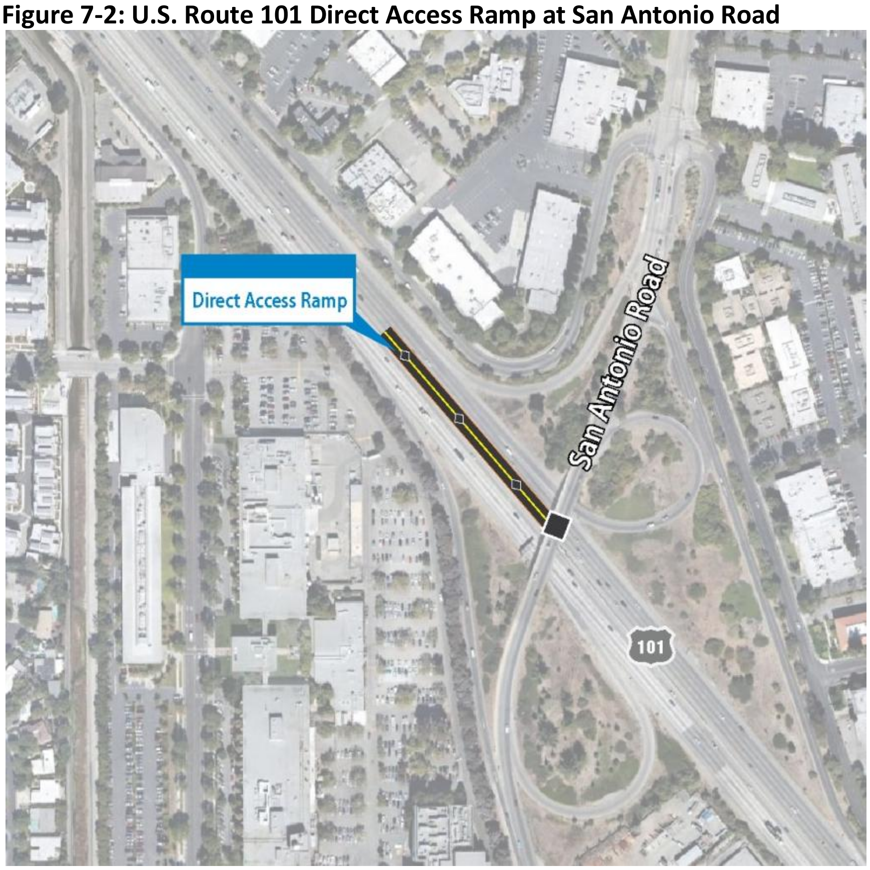
7.3 Direct Access Ramps to U.S. Route 101 Express Lanes

Additional new express lanes on U.S. Route 101 and the conversion of the HOV lanes to express lanes could be further enhanced by the creation of direct connections between the express lanes and North Bayshore area where commuter buses and carpools could avoid congested on and off-ramps used by general traffic. Potential locations include San Antonio Road, Moffett Boulevard and Ellis Road, each are described below.

San Antonio Road Direct Access Ramp

A Direct Access amp (DAR) at San Antonio Road (see Figure 7-2) could accommodate incoming southbound/outgoing northbound express lanes on U.S. Route 101. Carpools, vanpools and commuter buses and shuttles would utilize the center-running ramp to access San Antonio Road. A new signalized intersection would be necessary at the intersection of the direct access ramp and San Antonio Road. This ramp configuration would best benefit morning commuters arriving from the north and facilitates good circulation through North Bayshore.

Figure 7-2: U.S. Route 101 Direct Access Ramp at San Antonio Road



Moffett Boulevard Direct Access Ramp

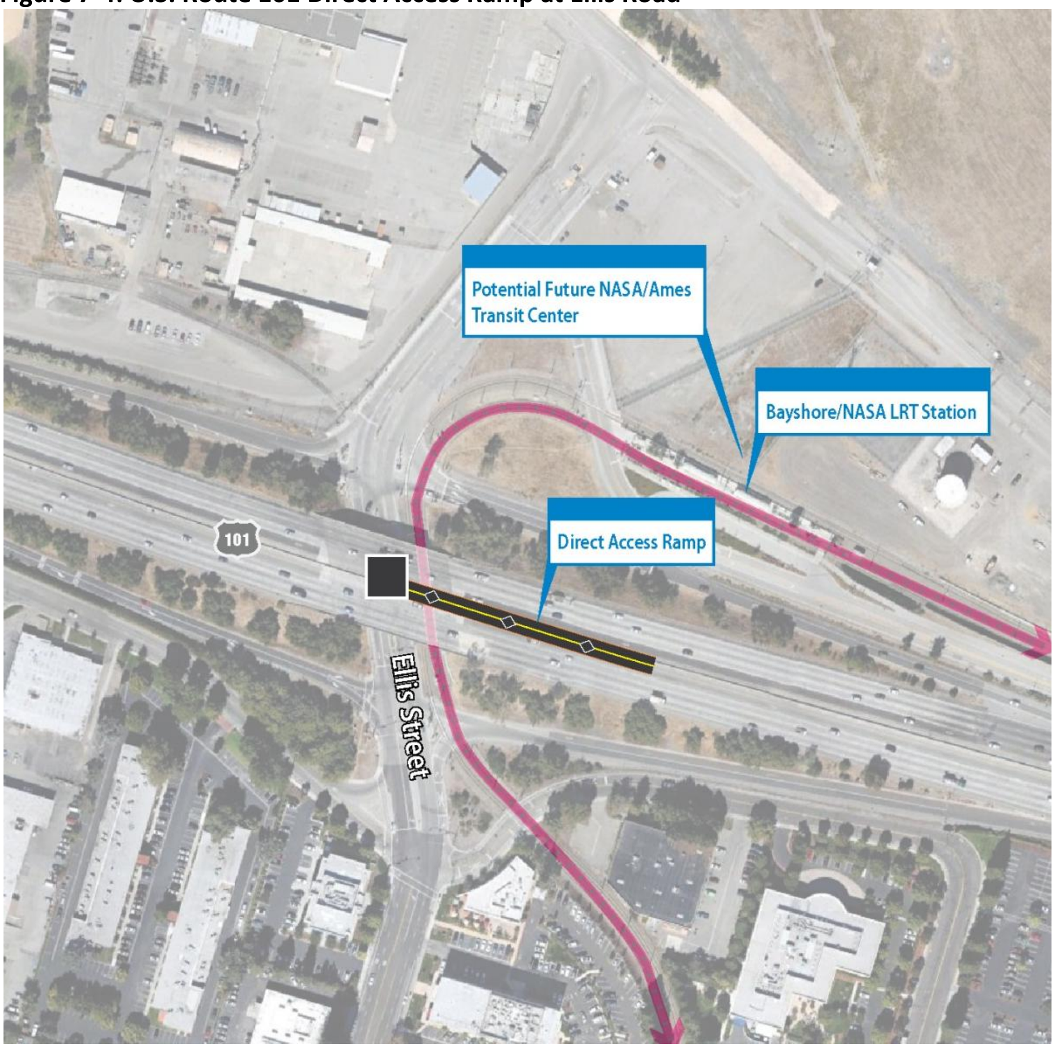
A Direct Access Ramp at Moffett Boulevard as shown in Figure 7-3 could accommodate incoming northbound/outgoing southbound express lanes on U.S. Route 101. However, since there is only room for one express lane through the 85 interchange one of the express lanes would exit directly into the Moffett DAR. Carpools, vanpools and commuter buses and shuttles would utilize the center-running ramp to access Moffett Boulevard. Vehicles could then travel north on Moffett Boulevard, then RT Jones Road and utilize a potential new transit, bicycle and pedestrian bridge over Stevens Creek (see Section 5.3) and connect with Charleston Road to continue into North Bayshore.

Figure 7-3: U.S. Route 101 Direct Access Ramp at Moffett Boulevard

Ellis Road Direct Access Ramp

A Direct Access Ramp at Ellis Road could accommodate incoming northbound/outgoing southbound express lanes on U.S. Route 101and could be an alternative to the Moffett Boulevard Direct Access Ramp (see Figure 7-4). This DAR would connect to the NASA /Ames Research Center and to a potential future transit center located near Macon Road and Ellis Street. Carpools, vanpools and commuter buses could also travel through the NASA/Ames Research Center and utilize a new transit, bicycle and pedestrian bridge over Stevens Creek (see Section 5.3) and connect with Charleston Road into the North Bayshore area.

Figure 7-4: U.S. Route 101 Direct Access Ramp at Ellis Road



7.4 Ridesharing Incentives

An incentive program could be designed to motivate and reward commuters who change their daily commute habits to choose ridesharing/carpooling over driving alone. The program may include any of the following incentives, among others:

- Use of TMA or company-owned vehicle;
- Financial incentives (e.g. parking cash-out); and
- Special perks and giveaways for people who commute by carpooling.

There may also be opportunities to utilize new technologies to link drivers to riders along their route and to connect individuals who work and live in nearby locations.

An incentive program for ridesharing would likely be managed by a Transportation Management Association (TMA) or by individual employers. The City may consider providing recommended guidelines employees to administer an incentive program.

Section 8

Intercept Parking & Other Strategies

The following strategies are designed to support the previous modal strategies by providing approaches to further manage parking and trip demand and help meet forecasted growth targets. They can reduce peak vehicle trips into North Bayshore, addressing at least partially the limitations of the other modal strategies.

8.1 Intercept Parking

Intercept parking is a transportation strategy that can help the area meet forecasted growth targets by intercepting local commuters that drive to work at designated parking hubs located near U.S. Route 101 and provide alternate last mile connections to North Bayshore via shuttle, bicycle, walk, or other means. The purpose of this strategy is to reduce vehicle trips into Shoreline by deflecting single-occupant vehicles from the roadway network near, but outside of, the most congested locations.

For intercept parking to be successful it would require transportation support infrastructure and parking management controls to be implemented by employers within the Shoreline Study area. They would function as extensions of workplace parking, with shuttle or other connections substituting for on-site parking. The hubs would be designed for multiple connecting modes to the work site, including shuttles, community bikes, car-sharing and other ideas, and could adapt for future use by an autonomous vehicle fleet. The parking facilities could also be designed to allow eventual conversion to office/R&D space as the need for parking diminishes over time.

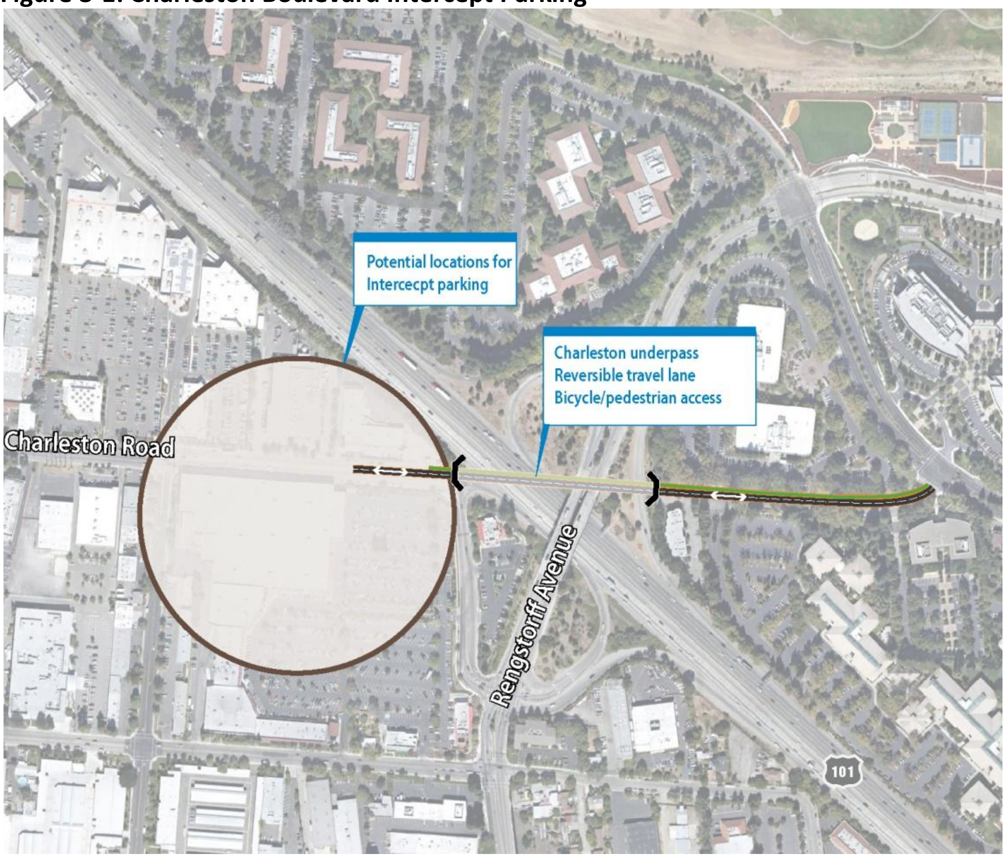
Intercept parking structures could also serve as hubs for connections to the regional transit network and car sharing. The parking facilities would naturally accommodate shared parking for complementary uses in the study area. For example, visitors to Shoreline Amphitheatre for evening events could park in these structures when the majority of daytime Shoreline employees have left for the day. This would allow a reduction of overall parking supply for the area.

Two locations have been identified for potential intercept parking locations; each is described below with a figure showing its general location. These potential intercept parking sites are located to the southwest of U.S. Route 101 from the Shoreline Study area. It is anticipated that these locations would be most attractive to local commuters who currently drive and live within ten miles of their work place. Each of the potential locations has adequate local roadway access.

Charleston Boulevard (west of U.S. Route 101)

An intercept parking structure could be located somewhere near Charleston Boulevard and U.S. 101. The last mile connection to North Bayshore would be by way of a new Charleston Boulevard underpass with reversible travel lanes and a bicycle/pedestrian pathway. The facility would be attractive to commuters from Palo Alto, Los Altos and northern parts of Mountain View via Charleston Road, Middlefield Avenue, San Antonio Road and N. Rengstorff Avenue.

Figure 8-1: Charleston Boulevard Intercept Parking



Terra Bella Avenue (west of Shoreline)

This potential intercept parking option consists of a parking garage on Terra Bella Avenue between Middlefield Avenue and Shoreline Avenue. The last mile connection to North Bayshore would be by way of the proposed bicycle, pedestrian and transit bridge over U.S. Route 101 west of Shoreline Boulevard. This option would be attractive to commuters from central parts of Mountain View via Middlefield Road and Shoreline Boulevard.

Figure 8-2: Terra Bella Avenue Intercept Parking

8.2 Automated Parking

Automated parking systems allow for a more efficient use of valuable land by reducing the amount of space required to store vehicles, resulting in doubling or tripling the amount of vehicles that can be stored on a typical site. Automated parking garages could be integrated into the intercept parking strategy.

The City of West Hollywood, CA is in the process of developing a 200 space automated garage for a site that had many design limitations. West Hollywood decided upon the automated garage because of the ability to accommodate the number of spaces they needed while retaining open space for other public uses. The footprint for the automated garage was 40 percent smaller than a conventional garage and provided significant cost savings as a result. The West Hollywood Garage design is illustrated in Figure 8-3 below.

Figure 8-3 Automated Parking Garage Design Schematic for West Hollywood

Source: City of West Hollywood, http://www.weho.org/Modules/ShowImage.aspx?imageid=1389

Automated garages are designed with computer operated vertical lifts and horizontal shuttles that move vehicles from the arrival area to remote parking storage. Once stored, vehicles take up to two minutes to be retrieved. Both the storage and retrieval process is activated by a customer card or ticket swipe. The system can also be informed about the employee's planned length of stay, and the vehicle can be kept in short term storage. An automated garage can be designed with advanced communications and several delivery/retrieval bays, so when a shuttle drops off a group of employees, wait time is minimized. Ultimately, this system is designed to feel like a valet service.

The benefits of automated parking are reduction in land needed for parking and reduction in employee time used to search for parking and driving through the garage. The deposit and retrieval process takes the parking process out of the employees' hands, ensures that vehicles are secure and limits unnecessary driving and potential facility accidents. Furthermore, there is no longer any need for employees to spend time inside a parking garage.

8.3 Trip Diversion

Some of Shoreline's major employers (Google, LinkedIn, Intuit, and Microsoft) currently support some degree of flexible work schedules for their employee population. As the employee population grows per the 2030 General Plan forecast this strategy could grow and may need to expand significantly.

Work from Home/Remote Work

LinkedIn is currently developing hoteling work stations on their Shoreline campus to accommodate employees that work remotely and need a place to sit when they work on campus (approximately 1/2 time). Intuit also supports a significant number of employees (average 13 percent) that work from home.[3] This work from home rate will need to be maintained in order to support the projected General Plan growth. Higher levels of growth may need to rely on additional incentives and policies that can support and encourage greater telecommuting.

Commute Shifting

Another approach to reducing peak commute trips and reducing unmet need for the high growth scenario is to increase incentives for off-peak commuting. On an average weekday, a total of five to eight percent of Intuit's employees are commuting off the morning peak[4] and ten to eleven percent of Intuit's employees are commuting off the afternoon peak.[5] As growth continues, these rates will need to be maintained and increased to the extent possible.

[3] Thirty percent of Intuit employees work from home on Fridays, an average five percent of employees work from home the remainder of the weekdays.

[4] Two to three percent of Intuit employees arrive before the morning peak (6-7 AM), and 5-6 percent arrive after the morning peak (10-11 AM).

[5] Two percent of Intuit employees depart before the peak (3-4 PM) and 8-9 percent depart after 7 PM.

Section 9

Summary and Evaluation of Proposed Strategies

The five strategies defined in the previous sections must work in combination to approach the identified goals for meeting the transportation needs of the General Plan 2030 and High Growth Scenarios. It is also important to note that the benefits of a given strategy can "spillover" into other modes. For example, the planned express lanes on U.S. Route 101 and State Route 85 will offer increased capacity for carpools and for employer commute bus modes. In addition, SOVs can pay the toll to use the express lane. By shifting added carpools, buses, and SOV to the express lanes, the capacity of the general traffic lanes in the freeways is also increased. In this example all modes benefit from a single improvement. This demonstrates one of the key principals for each of the proposed strategies—that all improvements should be multi-modal in nature. If highway capacity is added it should be done in a manner that benefits all the travel modes, encouraging transit, ridesharing, and bicycle/pedestrian use. As such, the strategies are interlinked and support each other.

9.1 Assumptions

In order to evaluate the effectiveness of the various strategies a number of assumptions had to be made to help quantify the impacts of each improvement in terms of capacity and usage. The key assumptions were as follows:

1. The existing geographic distribution of employees would not change significantly.

2. Highway – completion of the additional HOV lanes on 101 and 85 and their conversion to express lanes. These improvements should add approximately 25% to the freeway capacity while nearly doubling the capacity for carpools, vanpools and buses. The added HOV lanes would free up capacity in the general traffic lanes. Also the implementation of areawide adaptive traffic signaling systems is assumed as it would be a low cost way to increase access capacity by about 5%. Today the San Antonio and Rengstorff gateways have available capacity. During the AM peak hour the usage of the three interchange gateways is 87% of capacity, suggesting that it should be practical to accommodate about 25% more peak period traffic entering North Bayshore provided some additional access improvements are made.

3. Caltrain – Implementation of the planned electrification and positive train control programs. This will result in improved train performance and the ability to add one additional peak hour train. This will increase Caltrain capacity by about 20%. Currently during the AM peak hour southbound Caltrain is at about 52% of capacity at the peak load point with about 1,500 riders getting off the train at the Mountain View station. It is estimated that about 700 of these riders are destined for the Shoreline Area. This suggests that Caltrain could handle about 1,950 more riders in the peak hour at the Mountain View station and as many as 3,600 additional riders in the AM peak period. It was assumed that about half of this capacity would be available for Shoreline employees.

4. VTA – An analysis of its Light Rail System, recently initiated by VTA, includes consideration of significant improvements on the Tasman Line which serves Mountain View. The improvements proposed would eliminate single track sections on the line allowing a doubling of service which would include a direct route linking Mountain View to the Silicon Valley BART extension and also allowing express peak period service between Santa Clara and Mountain View. When in place these improvements would more than double the capacity of the service to Mountain View and would improve its connectivity and speed. Currently there are about 70 peak hour passengers and 180 peak period passengers getting off the LRT at Mountain View. There is substantial capacity currently available for additional passengers, as much as 3,500 additional riders in the peak period, and this would more than double when the improvements currently under study are implemented. However, the challenge will be to attract substantially more riders than use the service today. A direct express connection to BART and faster, more frequent LRT service to Mountain View should be able to capture trips from the south in the 5-10, and 10-20 mile distance range as well as trips from the East Bay that would be able to use BART.

5. BART – The Silicon Valley BART Extension is scheduled to be completed by 2018. This extension will provide a new transit opportunity for East Bay residents to access Mountain View via either VTA's LRT System or by privately operated commuter express bus services. Currently about 11 percent of the total commute trips to the Shoreline area come from the east. Many of these trips would be candidates to use BART.

6. Dumbarton Express Bus Service – Recently as part of the ongoing Dumbarton (DB) Rail Corridor Project, the MTC agreed to allow RM2 operating funds that were earmarked for the future rail services to be used to fund the DB Express bus service. Currently the service is focused on connections between Union City BART and the Stanford University campus and adjacent business park and medical facilities. Future plans include the potential of a new bus service to the Shoreline and NASA/Ames areas.

7. Employer Shuttles – Currently about 85 percent of the transit commute trips (about 4,800 employees) to the Shoreline area are accommodated by long distance employee operated shuttles. Other employer sponsored shuttles provide connections to Caltrain, VTA LRT, and ACE. If the employers would agree to expand the connecting shuttle services as the usage of Caltrain and VTA increases this would allow employees to use the improved Caltrain and VTA services. However, employers would still have to increase the number of long distance shuttles to at least keep pace with employment growth. The baseline capacity forecast assumes that employers will at least maintain the existing level of long distance shuttle service per employee. This would mean expanding the existing long distance shuttle service by about 60 percent by the year 2030.

8. Local Bus Services – There are really only two VTA bus routes that directly serve the Shoreline area today, Route 40 and Express Route 120. Of those, only Route 40 actually provides service that connects the local portion of Mountain View and Los Altos to Shoreline. There is a need for improved local transit service to capture a portion of the high percentage of short distance commute trips to Shoreline. This will require at least two or more additional local serving routes.

Table 9-1 shows the existing transit usage by mode and then the potential increases in transit capacity that would be available given the assumptions above. For example, Caltrain currently serves about 900 riders going to North Bayshore in the AM peak commute period. The capacity analysis described above determined that with the planned Caltrain improvements there would be an increase in capacity of 3, 500 riders of which half would be North Bayshore employees. This results in a total capacity of 2,450 riders by the year 2030. A similar process was used to estimate the transit capacity that would be used by North Bayshore employees through the year 2030 for each transit mode. By the year 2030 the available Caltrain and VTA capacity would be fully used by North Bayshore employees. Further ridership increases beyond that point, for the High Growth scenario for example, would require improvements to Caltrain and LRT which are beyond those currently envisioned. Commuter bus services provided by the employers would continue to expand as employment grows. Similar assumptions were made for the High Growth scenario, although the rate of ridership growth on Caltrain and VTA LRT was assumed to slow as no significant capacity increases on either of these two systems beyond those already planned would occur.

Table 9-1: Existing Transit Usage and Potential Future Capacity by Mode

Mode	Existing Transit Usage - 2012	Potential Transit Capacity - 2030	Potential Transit Capacity High Growth
Caltrain	900	2,500	3,500
LRT	150	1,200	2,500
Commuter Bus	4,700	7,700	9,400
Local Bus	100	200	400
Total	**5,850**	**11,600**	**15,800**

9.2 Proposed Strategies

The following is a summary of each set of strategies and improvements including priorities for near term (GP 2030) and long term (High Growth). An assessment of the ability of the strategies to achieve the mode share targets for each time frame is provided, as well as identifying the potential linkage of improvements to levels of development. This includes consideration of the possible impact on the maximum level of development and/or any additional constraints on peak trips that could occur. The potential costs of the improvements are also considered, as well as the ability of each of the improvements to assist in achieving the mode share goals.

Roadway Access and Efficiency

Table 9-2 provides a summary of the key improvements included in the roadway access and efficiency strategy. The key findings include the following:

- Roadway improvements have been intentionally limited to those improvements that improve the efficiency of the existing roadway system or improve the access to North Bayshore by increasing the capacity of the gateways (the three interchanges and Bayshore Road). This is to avoid widening local streets or other major improvements that would increase traffic capacity to the detriment of transit, ridesharing, and bicycle/pedestrian access.

- Some capacity gain can be had at a relatively low cost by implementing an adaptive traffic signal control system with transit priorities, and by making minor street and intersection modifications. In addition, U.S. Route 101 improvements currently under construction (including new auxiliary lanes) should help to fully utilize all the interchanges providing North Bayshore access.

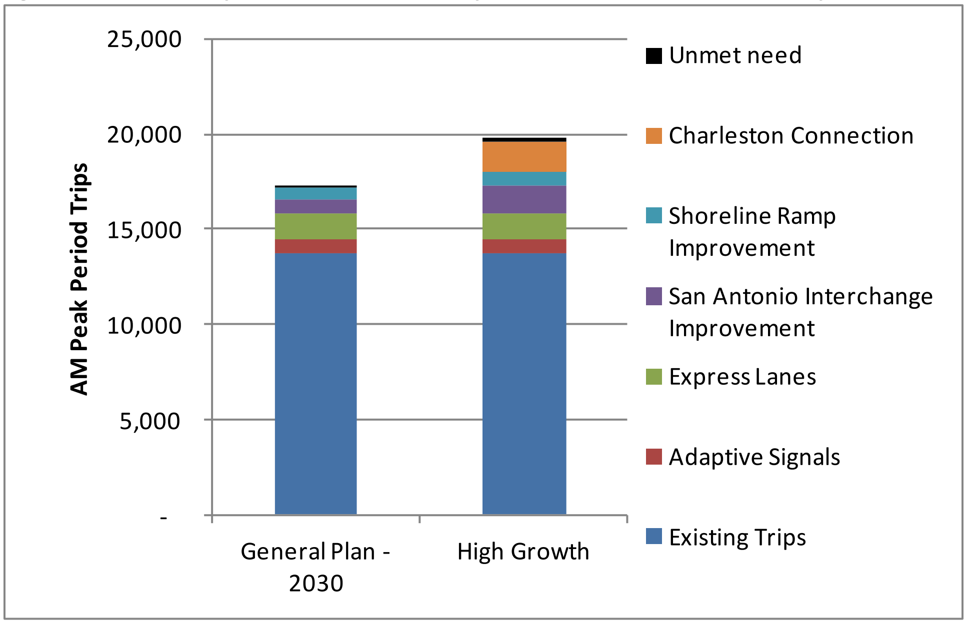
- The VTA Express Lanes project on U.S 101 and State Route 85 will improve the operation of the mainline freeway. This could yield as much as a 20% increase in total freeway capacity for general traffic, carpools, and buses. However, in order to take full advantage of this capacity there will need to be related improvements that will increase the ability of all freeway traffic to access North Bayshore. The two most important improvements in this category are the reconstruction of the San Antonio Interchange, the proposed modification to the northbound 101 Shoreline Boulevard off-ramp and the internal circulation improvements to the street network in the Shoreline area.
- The improvements to the San Antonio Interchange would increase the capacity of the southbound on and off ramps as well as the capacity of the bridge across U.S. Route 101. This would allow the full capacity of the San Antonio Road gateway to North Bayshore to be used representing about 500 peak period vehicle trips. Significant additional increases could be gained by improving the internal circulation system within the northwest portion of North Bayshore to accept more traffic from the San Antonio Interchange. This could be as much as 3,000 peak period trips.
- All of the above improvements combined would yield about a 25% increase in roadway access capacity to the Shoreline area. This should be sufficient to meet the highway mode share goal of 47% under the General Plan 2030 scenario.
- The mode share goal for the High Growth scenario will be more challenging to meet. It requires about 20 percent more highway access capacity than the GP 2030 scenario. Some of this capacity could be provided by the three proposed transit/bicycle/pedestrian connections – the Shoreline bridge, the Charleston tunnel and the Stevens Creek bridge and by the Direct Access Ramps (DAR) proposed as part of the commuter express bus and ridesharing strategy. These improvements serve to remove buses and carpools from the normal traffic lanes and accordingly free up capacity for general traffic. The San Antonio Interchange improvements would provide for as much as 3,000 additional peak period trips beyond those needed to reach the performance level required for the year 2030. In addition, the Charleston tunnel connection was considered with the option to include a reversible peak period traffic lane which could also accommodate up to 3,000 additional peak period trips.

Table 9-2 Summary Assessment of Roadway Access and Efficiency Strategies

Description	Estimated Costs (millions)	Trip Markets Served	Time-Frame	Benefits	Overall Assessment
Adaptive Signal Coordination Intersection Modifications	$4 to $5 for multiple corridors ($1.2 for initial phase)	All	Near Term	5% increase in local street system and gateway capacity	Very cost effective
Internal North Bayshore circulation/ street grid improvements	TBD (details to be developed through Precise Plan)	All	Near to Midterm	Increase in capacity for all modes and elimination of modal conflicts. Critical to allow more balanced use of gateways.	Substantial long term land use and transportation benefits.
San Antonio interchange widening and upgrade	$40-45	Medium and Long	Midterm	50% increase in gateway capacity at this location, overall gain of about 5%.	Cost-effective, more effective if combined with North Bayshore circulation improvements and San Antonio DAR projects.
Shoreline ramp modification	$3.5 – 4	Medium and Long	Near-term	Reduced traffic on Shoreline if coupled with North Bayshore circulation improvements, potential 15% percent gain in gateway capacity at this location, overall gain of about 5%.	Cost-effective if internal street improvements can be made to take advantage of the dispersed traffic flow opportunities.
Alternative access for transit: Shoreline Bridge, Charleston Tunnel, Stevens Creek Bridge	$20 – 30 for each new connection	All	Short to Midterm	Shoreline bridge provides for a reliable transit link to Caltrain and LRT. Charleston Tunnel allows improved local transit access and circulation. Stevens Creek Bridge provides important connections to LRT. Adding a reversible traffic lane to the Charleston connection would increase traffic capacity by about 2,000 - 3,000 peak period trips.	Good transit connections are vital to allow the full potential of Caltrain and LRT to be realized. Each of these connections would increase access capacity by the equivalent of 1,000 to 2,000 peak period person trips peak period.
Note: Costs include estimates for all project elements. It would be expected that larger projects will require multiple phases including feasibility studies, environmental clearance, design and construction.					

Each improvement described above increases the capacity of the roadway network. Figure 9-1 shows how each improvement will increase the ability of the roadway network to accommodate growth in relation to projected trips for the General Plan – 2030 and the General Plan – High Growth scenarios. The proposed improvements will be able to meet projected single-occupancy vehicle demand for the General Plan – 2030 scenario, meeting the goal of 47% mode share. This assumes that the improvements discussed as the baseline assumptions occur, as well as the Shoreline ramp modification, the San Antonio interchange recommendations, and the improvement to the internal circulation system for North Bayshore. For the High Growth scenario the improvements would result in a mode share of just slightly below the goal of 31%.

Figure 9-1: Roadway Access and Efficiency Performance versus Goals by Growth Scenario



Active Transportation Program

The assessment of the active transportation program strategy, which addresses bicycle and pedestrian system related improvements, is provided in Table 9-3. A significant investment in this strategy is proposed in the near term as these types of improvements are relatively inexpensive compared to many of the transit and highway improvements and they focus on the most difficult travel market to shift to alternative modes – the trips that are in the 0-10 mile distance range. Key findings are as follows:

- U.S. Route 101 and Stevens Creek are barriers to bicycle travel, as well as other barriers such as the Central Expressway, the Caltrain tracks and State Route 85. The crossings of these barriers are limited and most of them are challenging and pose safety concerns for bicyclists and pedestrians.
- A key part of the active transportation program strategy is to create some new bicycle/ pedestrian-friendly access points to the Shoreline area. The first priority should be to enhance the Shoreline Boulevard corridor with a new bridge crossing over U.S. Route 101 and enhanced bicycle facilities. This corridor is the most convenient route between the Downtown, the Caltrain/LRT station, and much of the rest of the city and the Shoreline area.
- A connection across Stevens Creek is also important. This connection would provide another North Bayshore access point from the Stevens Creek Trail as well as access to the NASA area to the east.

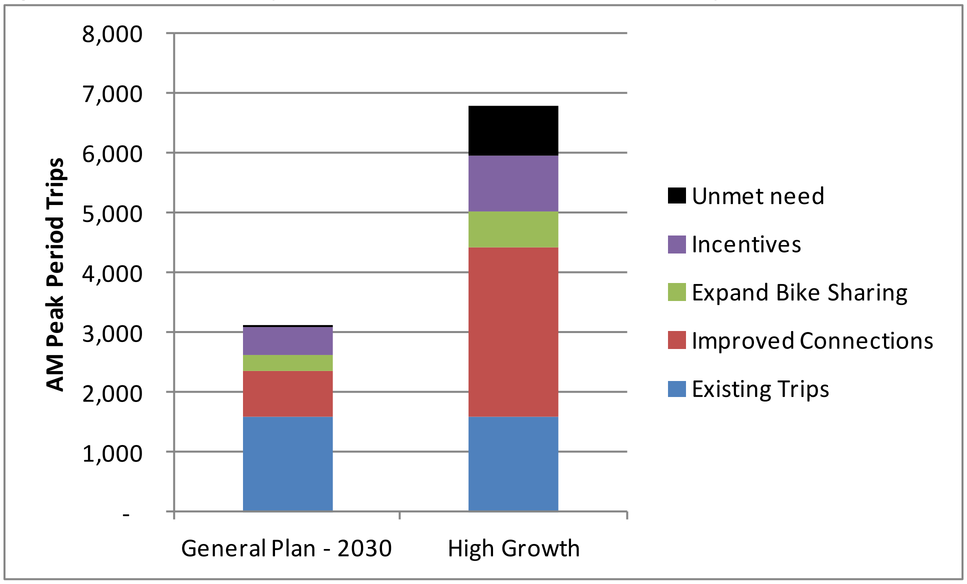
Table 9-3 Summary Assessment of Active Transportation Program

Description	Estimated Costs (millions)	Trip Markets Served	Time-Frame	Benefits	Overall Assessment
New access points, including Adobe Creek, Charleston, Shoreline and Stevens Creek	Adobe Creek to be funded by Palo Alto. Other bridges are part of the transit crossings included in the Highway strategy.	Short	Near to Midterm	Provides safe, convenient access routes for bicyclists/pedestrians.	If a significant increase in the number of bicyclists is to occur these projects will be necessary.
Shoreline Cycletrack along west side of Shoreline north and south of 101	$11 - 15	Short	Near to Midterm	Enhances the primary bicycle route between Downtown/ Caltrain/LRT and the Shoreline area.	To be truly effective this project needs to be combined with the Shoreline bicycle transit bridge.
Expanded, city-wide bike-sharing program; community bike program in North Bayshore through TMA	$1 - 3	Short	Near Term	Facilitates use of regional transit and allows employees and residents to use a bicycle in lieu of their car for short trips.	Although a relatively small number of trips are involved this program is an important component of the transit and ridesharing programs.
Improvements to other key commute corridors – Permanente, Stevens Creek, Moffett, Charleston, etc. with (for example) buffered lanes, lighting on trails, new under-crossings	$10 - $20 depending on the components selected from the plan	Short	Near to Mid Term	Provides for a safe and convenient network of bicycle facilities serving the Shoreline Area and much of the city.	These projects can be phased in over time and will serve to support to required significant increase in bicycling.
Comprehensive plan for bike and pedestrian program throughout city with innovative strategies	$0.2	Short	Near Term	An update to the City's Bicycle Plan with new facilities and services.	This work is needed to allow the above improvements to proceed.
Incentive programs through companies and/or TMA	Private funding	Short	Near Term	These programs demonstrate the employer's support for use of alternative modes.	These programs in conjunction with the above improvements will make cycling or walking a viable option for an expanded group of employees.

- The first step towards the implementation of these improvements would logically be to update the City's Bicycle Transportation Plan. This would help to set priorities and rank projects, as well as giving the community an opportunity to weigh in on the ultimate design of the plan.
- Today about 7% of North Bayshore commuters walk or bike. The goal setting exercise indicated that under the GP 2030 scenario the mode share needed to increase to 9%, and by the time the High Growth scenarios levels of development occur, 10% would be needed. These goals require a doubling of cycling by 2030 and a quadrupling in order to reach the High Growth level of development. In order to achieve these goals an ambitious program of bicycle and pedestrian improvements are needed.

It is very difficult to evaluate the impact that the proposed improvements will have on the growth in the use of active transportation by North Bayshore employees. Figure 9-2 indicates how the various improvements might increase capacity. Meeting the mode share goal of 9% for the General Plan -2030 should be doable given the aggressive package of proposed improvements. The goal for the High Growth scenario will be more difficult to achieve and it may not be practical to fully realize. The chart indicates that, despite the implementation of an aggressive set of active transportation improvements, a 9% mode share is most likely with the High Growth Scenario.

Figure 9-2: Active Transportation Performance versus Goals by Growth Scenario



Transit Connections

In order to meet future mode share targets, a substantial increase in transit ridership is needed. Both Caltrain and VTA LRT offer potential capacity to attract and accommodate North Bayshore commuters. The strategies shown in Table 9-4 would be necessary to make use of that capacity and to attract additional commuters to transit. Key findings include:

- Improvements will be needed to the Mountain View Transit Center to accommodate the substantial increase in riders on both Caltrain and LRT. Currently there is limited space available for all the shuttles which provide the linkage to North Bayshore, and the location of the shuttle loading areas requires that shuttles travel through portions of the Downtown impacting traffic circulation.

- The current shuttle system is a mix of Caltrain shuttles, sponsored by the employers, and private shuttles run by individual employers. These operations could be more efficient and frequent if all the shuttles were operated as a coordinated system with routes that serve the various portions of North Bayshore directly. To accommodate the expected year 2030 ridership, it is estimated that 27 shuttle buses will need to operate in each direction within a 15 minute period. The High Growth scenario would require 60 shuttle buses in an equivalent period.

- As ridership grows, the shuttle system will become more complex and less efficient. Even with improvement the Transit Center may not be able to handle such a high volume and the labor costs of operating such a large number of buses will be high. From a technical standpoint the shuttles should function well up to the year 2030, but it may prove desirable to begin to transition to a higher capacity, faster and more reliable system (or systems) before that time.

- As shown in the table below, a number of modal options are available. BRT improvements for the buses, an LRT extension, a streetcar loop, an Automated People Mover (APM) system, or a Personal Rapid Transit (PRT) System are among the choices. An Autonomous On-Demand Vehicle system is another option. This option would be somewhat like an automated shuttle or PRT system but the vehicles could operate for some or all of the trip on existing roadways. All of these systems involve a significant capital expense, but most also offer reduced operating costs and improved performance compared to the bus shuttle system.

Table 9-4 Summary Assessment of Transit Connections

Description	Estimated Costs (millions)		Trip Markets Served	Time-Frame	Benefits	Overall Assessment
Improvements to the Mountain View Station / Transit Center to accommodate expanded Caltrain/LRT and shuttle services	$50 - 60		All	Mid-Term	The current Caltrain station is not capable of handling the tripling of ridership expected by the year 2030. Intermodal connections need to be improved to encourage usage.	These improvements are required to allow the full potential of Caltrain and LRT to be realized and support the North Bayshore shuttle connection.
Explore grade separation alternatives at Rengstorff and Castro		$0.6	Short	Mid-Term	Traffic delays at grade crossings and conflicts with transit, bicycles and pedestrians will create congestion and hamper movement with the City.	This would be a study to determine the update the previous Rengstorff Avenue study and investigate the feasibility of a Castro grade separation.
Develop improved and expanded shuttle bus service to North Bayshore	Capital (purchase of new buses) $12-15	O&M per yr. $10-125	All	Near Term	This would consolidate and expand the current array of shuttles into a coordinated bus shuttle system.	These improvements are required to the allow the full potential of Caltrain and LRT to be realized.
	Typical costs for representative transit systems					
Convert shuttle operations to higher capacity system when warranted – A number of options were considered:	Capital Costs	O&M Costs per yr.	All	Mid to Long Term	As shuttle use increases there will come a time when it will be more efficient to convert labor intensive shuttle operations to a high capacity, faster, more reliable system.	The travel demand analysis suggests that as 2030 approaches, the shuttle system will become inefficient and a higher capacity system will be justified.
BRT via Shoreline and Shoreline Transit Bridge	$84.0 2.8 mi.	$3.1				
BRT via Moffett via Stevens Creek Bridge	$99.0 3.5 mi.	$3.1				
LRT from NASA LRT Station via Stevens Creek Bridge	$207.0 2.3 mi.	$2.5				

Description	Estimated Costs (millions)		Trip Markets Served	Time-Frame	Benefits	Overall Assessment
LRT Loop from Mountain View Caltrain, via Shoreline and East through NASA to Bayshore LRT	$402.0 4.4 mi.	$5.1				
Shoreline/NASA/ Caltrain Streetcar Loop	$135.0 4.4 mi.	$2.6				
APM within Shoreline Area	$272.0 1.5 mi.	$3.7				
APM Caltrain/ Shoreline Connection	$435.0 2.4 mi.	$3.9				
PRT within Shoreline Area	$824.0 9.0 mi.	$4.8				
PRT Caltrain/Connection	$365.0 2.4 mi.	$4.9				
Autonomous On-Demand Vehicle System	TBD	TBD				
Expanded system of local transit routes and shuttles, including new VTA routes, commuter shuttles from key activity centers such as San Antonio Center (TMA service) and possible off-peak service.	Capital: O&M:	$4 - 8 $2 - 5	Short	Near-Term	Today there is very little transit service internal to Mountain View and the adjacent communities that would link these areas to Shoreline.	This service is intended to provide a transit option to those that live within 0-10 miles of North Bayshore.

The capacity characteristics of the various transit modes are an important consideration. Table 9-5 shows the number of vehicles that would be required to serve the forecast future demand for a transit connection between North Bayshore and the Caltrain station as compared to the existing level of demand. The peak 15 minute demand estimates include a surge factor of 1.5 to account for the peak within the peak hour. Any of the systems shown could be developed to serve the estimated demand. The key question, however, becomes one of convenience and cost versus practicality. There is a significant difference in the number of vehicles required for the various technologies. The more vehicles, the higher the frequency of service, but too many vehicles can result in complex and expansive station configurations.

Table 9-6 shows the operating characteristics of the various systems under year 2030 peak conditions for service between North Bayshore and Caltrain. For example, the service could be provided by 27 shuttle buses operating at less than a minute apart or by just two LRT trains operating every 7.5 minutes. The most vehicles would be required for a PRT service, 134 four passenger vehicles, with a vehicle arriving at the station every 0.1 minutes. In order to accommodate that many vehicles arriving that close together the PRT terminal at the Caltrain station would have to be large, as there needs to be space for the vehicles to stage and dwell as they are loading and unloading passengers without compromising the continuous flow of vehicles. A higher per-vehicle capacity system such as a Group Rapid Transit system may be more practical in this respect, but still would pose challenges.

Even the shuttle bus service would require a substantial expansion of the Downtown Transit Center / Caltrain station complex. For example, if it takes 3-5 minutes for a bus to unload and then load passengers and a new bus arrives every 30 seconds, there would need to be room for at least 6-10 buses to be in the loading area at once. However, it would be desirable to schedule the buses to meet each train. This would require at least half the buses (13-14 buses) to be at the station at one time. When it is considered that today the North Bayshore shuttles are less than half of the total Caltrain shuttles using the station, it can be envisioned that there will eventually be more shuttles than can be reasonably accommodated using the station. The large number of buses attempting to enter or exit the station area at the same time will pose difficult traffic operations issues. As a result, it is likely that the operation of a shuttle bus system will begin to become impractical by 2030 and it would be best to plan for a transition to a higher capacity system well before that time.

Realistically, at the point of approaching the employment growth associated with the General Plan 2030 growth scenario, the current shuttle-based connection will require such a large loading and staging area at the Caltrain station that it would become inefficient and not cost-effective.

Table 9-5 Transit Requirements to Serve Peak 15-Minute Demand

Transit Technology	Typical Capacity Per Vehicle (Pass.)	No. of Vehicles Required to Serve Peak 15-min Demand		
		Existing	GP-2030	GP-HG
LRT	170	1	4	7
APM	100	1	6	12
PRT	4	25	134	297
GRT	15	7	36	80
Autonomous Vehicle	5	20	107	238
Shuttle Bus	20	5	27	60
Conventional Bus	100	1	6	12

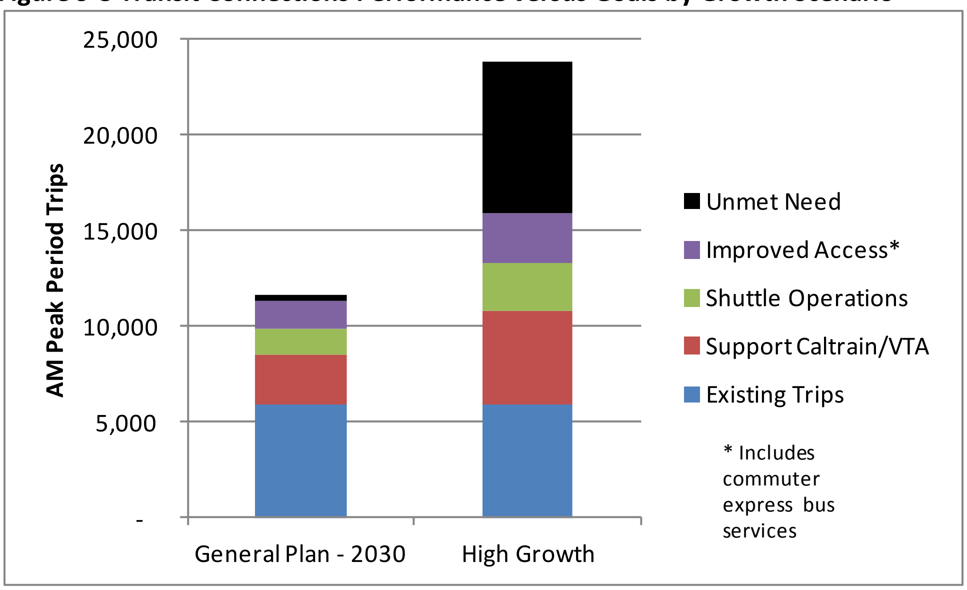
Table 9-6 Potential Operating Plans for Various Transit Systems - GP-2030

Transit Technology	Number of Trains or Vehicles	Avg Headways (min)	Capacity during peak 15-min	Load Factor
LRT	2	7.5	680	79%
APM	3	5	600	89%
PRT	134	0.1	536	100%
GRT	36	0.4	540	99%
Autonomous Vehicle	107	0.1	535	100%
Shuttle Bus	27	0.6	540	99%

Figure 9-3 shows how the various transit improvements would perform in terms of providing the capacity to meet the mode share goal of 32% by 2030 and 38% under the High Growth Scenario. The improvements focus on using the planned available capacity of Caltrain assuming the CalMod electrification program is implemented, and VTA LRT assuming the improvements currently under study are implemented. This requires the improvements to the Caltrain station and improved Caltrain shuttle services. It also assumes that the employers will expand their commuter shuttle services as employment grows. With these assumptions it would be possible to meet the year 2030 mode share goals.

Beyond 2030, however, significant additional improvements to Caltrain, VTA LRT and the connection between Caltrain and North Bayshore would be needed. Improved transit connections such as the Stevens Creek Bridge and the Shoreline and Charleston connections would also be needed.
Beyond 2030, however, significant additional improvements to Caltrain, VTA LRT and the connection between Caltrain and North Bayshore would be needed. For example, in order to increase the capacity of Caltrain there would need to be longer and more peak period trains than the current modernization program would support. Longer trains would require the lengthening of station platforms and trackwork improvements throughout the system. Additional trains could not be accommodated without trackwork improvements at the bottlenecks in the corridor. In addition, access to the stations all along the Caltrain corridor would need to be improved with more station parking and transit access. Similar issues would occur with the VTA LRT system. As these improvements are not currently planned or funded there would be a significant "unmet" need that would have to be fulfilled to meet the goal for the High Growth Scenario.

Figure 9-3 Transit Connections Performance versus Goals by Growth Scenario



Commuter Bus and Ridesharing

The HOV lanes on U.S. Route 101 and S.R. 85 provide commuters with an incentive to carpool and they also serve to accommodate the large number of employee run commuter buses that serve North Bayshore. The VTA plans to add additional HOV lanes on both highways as part of the conversion to Express Lanes. Direct Access Ramps (DARs) provide a way for carpools and buses to go directly from the HOV lanes to the surface street system. This eliminates all these vehicles weaving across the freeway and using the regular on and off-ramps. The result is improved operations for all vehicles. Table 9-7 provides a summary assessment of these projects. Key findings include:

- Currently the express commuter buses run by the employers account for 4,700 peak period transit trips or over 85 percent of the existing transit use. As such, these commuter bus services are critical to maintaining and achieving high levels of transit use.

- In order to meet the transit mode share goals for the General Plan 2030 scenario, at least 300 buses would be required, and as many as 600 to meet the needs of the High Growth scenario. These represent high volumes of buses using the express lanes and needing to access North Bayshore during the peak periods. DARs could play a significant role in managing the impacts of all these buses on traffic operations and ensuring efficient operation of the buses. A single DAR could easily accommodate 100 – 200 buses per hour, removing a significant amount of traffic from the mainline freeway and the interchange ramps.

Table 9-7 Summary Assessment of Commuter Bus and Ridesharing

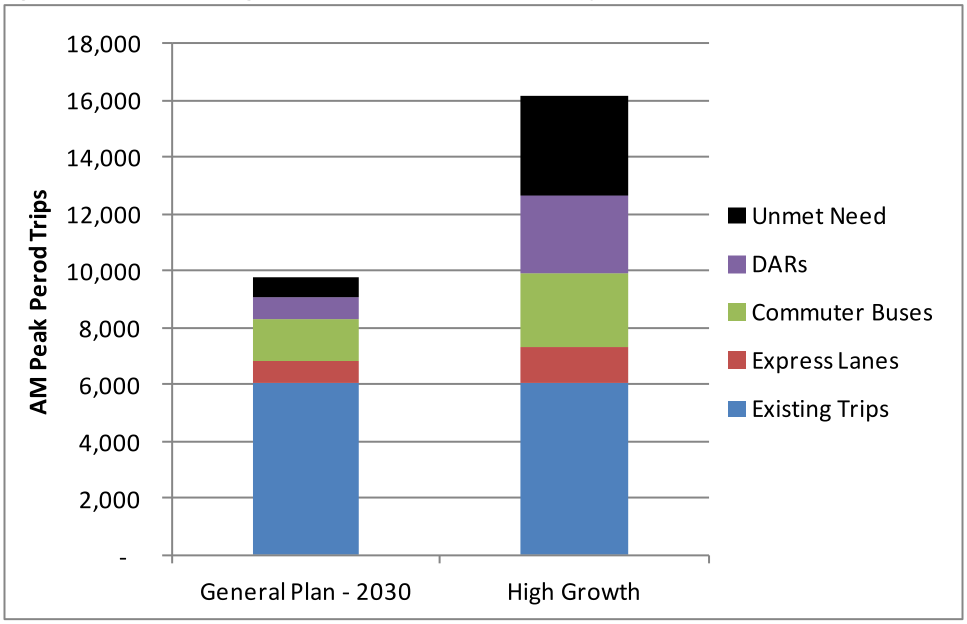
Description	Costs (millions)	Trip Markets Served	Time-Frame	Benefits	Overall Assessment
Develop Direct Access Ramp (DAR) at San Antonio from the north in conjunction with reconstruction of interchange	$20 - 30	Medium-Long	Mid-Term to Long Term	Provides additional access capacity from the express lanes to North Bayshore and removes carpools and buses from the existing freeway ramps.	This improvement is needed to address the large number of buses and carpools which will be using the express lanes.
Develop DAR at Moffett or Ellis from the south providing bus access to NB via new Stevens Creek bridge	$20 - 30 each	Medium-Long	Mid-Term to Long Term	Provides additional access capacity from the express lanes to North Bayshore and removes carpools and buses from the existing freeway ramps.	This improvement is needed to address the large number of buses and carpools which will be using the express lanes.

- Today there are nearly 1,300 peak period carpools accessing North Bayshore, with a goal of 2,900 carpools by 2030, and 6,800 carpools by the buildout of the High Growth Scenario. These represent substantial flows of carpools that would use the DARs , 400 – 800 carpools per hour.

Figure 9-4 shows how these improvements would perform relative to meeting the ridesharing mode share goal of 7% in 2030 and 11% for the High Growth Scenario. Once the capacity of the planned express lane improvements is used up, the potential for growth in long distance ride sharing capacity will be limited. The express lanes will essentially double the existing capacity for commuter buses and for carpools and provide travel time saving that makes them attractive to users. However, as the lanes approach capacity these benefits diminish and the productivity of the buses will be reduced. In addition, there will be a limit to how many commuter buses can operate in given areas. Even today, there are concerns about the number of private commuter buses operating on San Francisco streets and using the bus stops. For these reasons the chart shows “unmet needs” for both the General Plan 2030 and the High Growth Scenarios.

Ridesharing usage could also increase with the use of innovative real-time dynamic ridesharing concepts. Potential participants would agree to use a company-provided vehicle equipped with the technology to direct them in real-time to pick up individuals who live near them and request a ride to work each day, allowing for much more flexible arrangements than conventional carpools. Concepts like this offer promise to support the necessary increases in ridesharing to meet the mode share goals.

Figure 9-4 Ridesharing Performance versus Goals by Growth Scenario



Intercept Parking, Other

The intercept parking concept is a way of reducing the amount of traffic actually entering the North Bayshore and circulating on local streets. The parking structures would be designed to be accessible from the local street system and employers would incentivize those who live nearby (0-15 miles) to use these structures. Convenient transit and bicycle connections to North Bayshore would be provided.

- Properly planned and operated these intercept parking facilities would capture trips before they enter North Bayshore reducing the traffic demand at the gateways. Their success would depend on the ability to provide good transit and bicycle/pedestrian connections across Highway 101 and Stevens Creek.
- The concept of intercept parking is often used on college campuses and in larger downtown areas to reduce the amount of traffic internal to the area and to limit the amount of traffic entering through the major gateways to the area. The success of the concept depends on the convenience of the location of the parking for commuters, on the ability of the street network around the parking to be able to accommodate the traffic generated by the parking structures, and on the quality of the linkages from the parking structures to the employment destinations.
- For North Bayshore, the intercept parking would complement other proposals such as the planned transit and bicycle/pedestrian bridge/tunnel connections (Charleston, Shoreline, and Stevens Creek) and the bike sharing programs. The size of the facilities would need to take into consideration the capacity of the adjacent street network to make sure that traffic would operate well and not impact nearby businesses and residents. Automated parking should be considered to minimize the amount of land devoted to parking.

- Another source of peak period trip reduction is time shifting or alternative work schedules. Some employees are willing to adjust their work schedules to avoid the times when the commute is most heavily congested and also to work at home some days or fulltime. In order for this to occur the employers must be willing to be flexible regarding their policies. The main argument against flexible work schedules and tele-commuting is the limitation on face-to-face collaboration. Communications advances such as video conferencing and virtual meetings are helping to soften the employers concerns when it comes to flexible work schedules. Further advances are likely to make the need to commute and to travel for meetings less of an issue.

Table 9-8 Summary Assessment of Intercept Parking

Description	Costs (millions)	Trip Markets Served	Time-Frame	Benefits	Overall Assessment
1,500 parking space structures, three sites: 1. Charleston 2. Shoreline 3. Moffett	$40.0 per site	Short - Medium	Near – Mid-term	Diverts traffic out of the gateways to Shoreline, each space represents one diverted trip, so each structure represents a 1,500 trip reduction at the gateways.	Replaces on-site parking and increases gateway capacity.

9.3 Overall Summary

The combined performance of all the strategies is summarized in Figure 9-5 and Table 9-9. Each bar in the chart shows how the various strategies would combine to meet the mode share goals developed in the methodology section. For the General Plan 2030 scenario the strategies, if successfully implemented, would satisfy the overall capacity, accommodating the 36,000 peak period trips that are forecast for that scenario.

For the High Growth scenario, however, the total trips accommodated by the strategies would fall short of the estimated 63,000 peak period trips by about 10,000 trips (Unmet Need). Additional transportation improvements and measures would be needed to accommodate all the trips. This would suggest that the strategies outlined in this report would only be sufficient to support about 60% of the growth anticipated with the High Growth Scenario as compared with the General Plan 2030 Scenario. This level of growth equates to about 14.5 million square feet of total development.

Figure 9-5 Summary of Strategy Performance – AM Peak Period Trips by Strategy

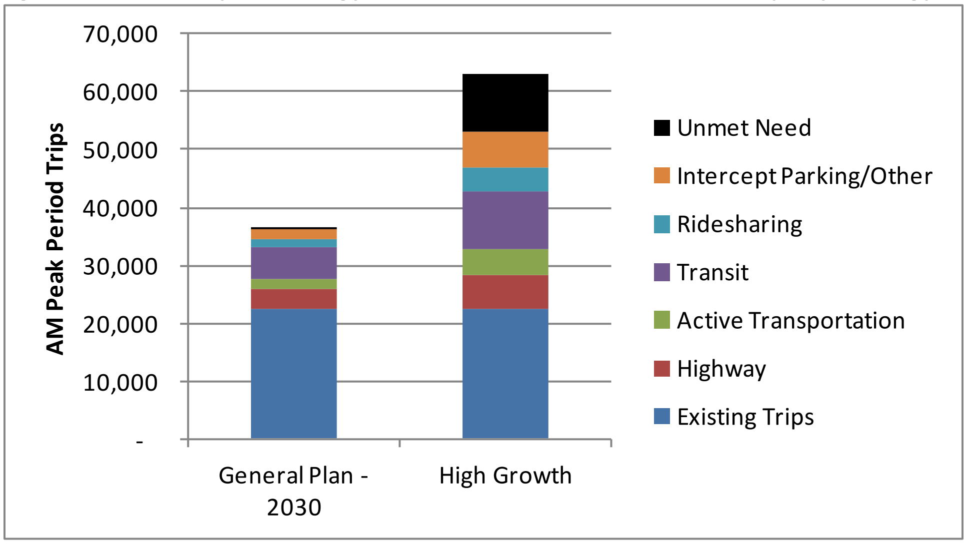


Table 9-9 Summary of Strategy Performance versus combined Modal Goals (AM Peak Period Trips)

	General Plan – 2030	High Growth
Existing Trips	22,600	22,600
Highway	3,500	5,800
Active Transportation	1,500	4,400
Transit	5,500	10,000
Ridesharing	1,600	4,000
Intercept Parking/Other	1,700	6,300
Unmet Need	- - -	9,900
Goal	36,400	63,000

Section 10

Summary Conclusions

Based upon the evaluation of the strategies and the specific improvements that was provided in Section 9 it is possible to develop conclusions regarding transportation planning for future North Bayshore development. These findings should help to guide the preparation of the North Bayshore Precise Plan and to define the next steps in terms of addressing the transportation needs of the area.

10.1 Findings

The following conclusions provide a summary of the results of this evaluation:

- Serving the planned employment growth in North Bayshore is challenging because the transportation facilities (especially roadways) were designed for the existing, lower level of development.
- A significant increase in commute trips can only be accommodated through a substantial shift to alternative commute modes.
- Recent changes by employers and employees alike provide an opportunity for a significant shift in commute behavior. These changes include greater personal support for transit and other modes by young people and greater active responsibility for commute services by companies.
- Regional agencies' current plans for South Bay transportation improvements (e.g., express lanes on U.S. Route 101 and State Route 85, Caltrain electrification and other upgrades, BART extension, and improved connecting light rail service) provide unique opportunities for expanded use of alternative transportation modes.
- There are, however, limitations to the capacity and capability for serving North Bayshore commuters of the Caltrain, VTA Light Rail and Express Lane systems.
- North Bayshore is an ideal location for the implementation of new and innovative transportation technology, including the use of electric vehicles and advanced transit and ridesharing information applications.
- There is a feasible set of strategies, with moderate new services and improvements, which can serve the transportation demand associated with the General Plan Growth Scenario which represents 10.7 million square feet of development.
- A medium level of growth (estimated at an additional 7 million square feet of development compared with existing development) can be served, but will require substantial new transportation investments.

- An effective transportation program for the High Growth Scenario (a total of 17.3 million square feet of development which is approaching build-out) will be difficult to achieve due to the limits of alternative commute modes. Significant, but likely unreachable, shifts of commute trips outside of the peak period or to intercept parking facilities would be needed.

10.2 Mode Share Targets

Table 10-1 below provides a summary of the various growth scenarios and the mode share targets that resulted from the evaluation process. As noted previously, there is a shortfall in serving trips with the High Growth Scenario. Implementation of the transportation strategies proposed in this study is designed to meet these mode share targets, although it will be important to monitor the performance over time and adjust the strategies as needed.

Table 10-1 Summary of Growth Scenarios and Mode Share Targets

	Growth Scenarios			
	Existing	General Plan	Medium	High
Development (million sq. ft.)	7.3	10.7	14.3	17.3
Est. Time Frame (Years)		10	20	30+
AM Commute Trips (estimated)				
Single-Occupant Vehicle	13,800	17,200	19,200	19,600
Rideshare Vehicle	1,400	2,800	4,800	5,400
Transit - Company Commuter Bus	4,700	7,700	9,000	9,400
Transit - Caltrain/LRT/Bus	1,200	3,900	6,000	6,400
Active Transportation	1,600	3,100	5,500	6,000
Intercept Parking / Other	0	1,700	5,500	6,300
Shortfall	0	0	0	9,900
Total	22,700	36,400	50,000	63,000
Proposed Commute Mode Share Targets				
Single-Occupant Vehicle	61%	47%	38%	31%
Rideshare Vehicle	6%	8%	10%	9%
Transit	26%	32%	30%	25%
Active Transportation	7%	8%	11%	9%
Intercept Parking / Other	0%	5%	11%	10%
Shortfall	0%			16%

10.3 Priority Improvements

For the General Plan Growth Scenario (an additional 3.4 million square feet), the proposed strategy includes a number of near term improvements to the transit and bicycle/pedestrian systems combined with some modest roadway upgrades. Of equal importance will be expanded employer programs, individually and through a TMA, which will increase the use of commute alternatives by employees. These strategies include:

- Modification to the Shoreline Boulevard off-ramp from U.S. Route 101, combined with a more complete and connected roadway system in North Bayshore
- A substantial expansion and consolidation of the shuttle system connecting transit stations to North Bayshore. Ideally the numerous employer specific shuttles operated today would be consolidated into a single unified shuttle system with a few routes serving the various subareas of the North Bayshore. These improvements would include higher capacity shuttles on new routes, dedicated transit lanes along Shoreline Boulevard and new transit bridges across U.S. Route 101 near Shoreline Boulevard and across Stevens Creek. The shuttle system would connect to and serve both Caltrain and light rail stations.
- Improvements to the downtown Mountain View Caltrain Station and Transit Center that will support the expanded shuttle program as well as addressing the impacts and needs of the Caltrain electrification plan.
- Comprehensive bicycle commuting improvements (developed through a new Bicycle Plan), including a Shoreline Boulevard cycletrack and use of the new bridges across U.S. Route 101 and Stevens Creek.
- Establishment of a Transportation Management Association that can play a significant role in increasing the use of commute alternatives coordinating the operation of shuttle services, bike sharing and other critical programs.

For the Medium Growth Scenario, the transportation program will build on, and expand, the above strategies, supplemented by more substantial improvements that will add capacity needed to serve the higher trip demand. These additional improvement strategies include:

- Reconstruction of the San Antonio Road interchange and construction of the new Charleston Boulevard connection into North Bayshore.
- Full development of the U.S. Route 101 Express Lanes and construction of Direct Access Ramps.
- Additional improvements to and expansion of the downtown Mountain View Caltrain Station and Transit Center.
- Development of a higher-capacity transit connection between downtown and North Bayshore, potentially a rail or automated transit system.

While the above improvement strategies may not be needed, or fully implemented, for ten to twenty years, initial feasibility studies are warranted in the near term to confirm their viability and to enter the often extended process for project development and funding.

Table 10-2 summarizes the proposed improvement strategies by stage and timeframe. Several of these strategies directly benefit and serve North Bayshore travel demand. Others, however, have broader City of Mountain View and regional benefits, in addition to North Bayshore benefits These are noted in the table and would be candidates for additional regional funding and partnerships.

Funding for these improvements can potentially come from a variety of sources. Direct North Bayshore contributions could be provided from the Shoreline Community Fund, from direct developer contributions and through Traffic Mitigation Fees. Other sources for regional funding participation include:

- Roadway projects could be candidates for State Transportation Improvement Program (STIP) funds along with some other federal funds that are administered by VTA.
- The OneBayArea grant program, administered by MTC, could potentially support bicycle and pedestrian improvements.
- Some transit elements may be eligible for the federal Small Starts program, which includes funds for "core capacity" improvements such as the Caltrain Station upgrades.

10.4 Final Considerations

This study provides a "high-level" view of potential transportation strategies that could support the forecast future levels of development of the North Bayshore. It is important to understand that the strategies are very much integrated and supportive. For example the highway related improvements that are proposed were developed to be supportive of the transit and active transportation improvements. If one improvement is eliminated from consideration, then it will be important to consider how that will the impact the performance of the other related improvements. Also the improvements were defined on a very conceptual level with no actual engineering, which is why the steps outlined in Table 10-2 for each improvement includes further study and analysis.

Table 10-2 Improvement Strategies by Timeframe and Cost

Strategy / Improvement Element	Est. Cost ($ millions) 0 – 2 Years	3 – 6 Years	7 – 10 Years	Transportation Benefit
Roadway Efficiency				
Adaptive Traffic Signal Improvements	$1.3			City
Shoreline Ramp Modification				North Bayshore
Feasibility Study	$0.2			
Design and construction		$4.0		
San Antonio Interchange Reconstruction				Regional
Feasibility Study	$0.2			
Project Study Report; environmental clearance		$1.0		
Design (construction after 10 years)			$5.0	
Charleston Connection				North Bayshore
Feasibility Study	$0.2			
Project Study Report; environmental clearance		$0.8		
Design (construction after 10 years)			$4.0	
Active Transportation				
Updated Bicycle Plan	$0.2			City
Shoreline Cycle Track				North Bayshore
Feasibility Study & Design	$0.2			
Implementation		$11.0		
Bicycle / Pedestrian Program Improvements	$1.0	$3.0	$3.0	City
Transit Connections				
Shoreline Transit Corridor (new bridge, dedicated lanes)				North Bayshore
Feasibility Study (incl. high-capacity transit)	$0.7			
Design and construction		$35.0		
Downtown Caltrain Station & Transit Center				
Develop Master Plan	$0.7			
Design & Construction (Phase 1)		$10.0		North Bayshore
Design & Construction (Phase 2)			$40.0	Regional
Stevens Creek Transit Bridge				North Bayshore
Feasibility / Environmental Study	$1.0			
Design and construction		$25.0		
Commute Bus & Ridesharing				
Direct Access Ramps from 101 HOV (2)				Regional
Feasibility Study	$0.2			
Project Study Report; environmental clearance		$1.0		
Design (construction after 10 years)			$5.0	
Other				
TMA Start-up Costs (e.g. shuttle purchase)	$5.0	$5.0		North Bayshore
TMA Operating Cost	$1.0	$4.0	$4.0	North Bayshore
Corridor Protection & ROW Acquisition	$5.0	$10.0	$5.0	City
Total - All Projects	**$16.9**	**$109.8**	**$66.0**	**$192.7**

Transportation Benefits:
North Bayshore - Improvement primarily benefits access to North Bayshore employment.
City - Improvement benefits both North Bayshore and general city population.
Regional - Improvement has regional benefit as well as direct North Bayshore value.

Section 11

Zero SOV Trip Growth Scenario

During its February 5, 2013 Study Session, the City Council indicated its interest in a growth scenario that represents no future growth in the number of Single Occupant Vehicle (SOV) trips generated by North Bayshore development. This section provides additional information relative to the transportation improvements and measures that would be necessary to achieve this goal.

Two approaches to achieving the zero SOV increase goal were explored and presented to the City Council at a March 26, 2013 Study Session:

1. Explore an upward revision of the mode share targets that could serve the forecast future travel demand without increasing SOV use.

2. Determine the square footage reduction of development in the General Plan – 2030 growth scenario that could be accommodated without requiring commute mode shifts beyond what has already been presented for the 2030 General Plan Growth Scenario (Original Scenario).

Table 11-1 provides a comparison of the trip projections and mode shares that result from these two new scenarios in comparison with the Original Scenario.

11.1 Revised Mode Share Targets

Table 11-1 shows a revised version of the original General Plan – 2030 growth scenario that represents no growth in SOV trips. The table indicates the number of AM peak commute period trips that would have to be made by each of the travel modes in order for the goal of zero SOV trip growth to be a satisfied. In order to hold the number of SOV trips at a constant level equal to the current number of trips, there would have to be increases in all the other modes of travel. In particular, since SOV trips are often shorter commute trips, special emphasis is needed for alternative modes for those trips. This is discussed in more detail below and illustrated in Figure 11-1.

SOV

In 2012, an estimated of 13,800 SOVs entered or exited the North Bayshore during the three hour long AM peak commute period representing 61% of the total trips. The original General Plan – 2030 growth scenario suggested a goal of 47% SOV trips or 17,200 trips in the AM peak commute period. If the number of SOV trips was not allowed to increase over current levels, then only 38% of the commute trips would be in SOVs under the 10.7 million square foot level of development associated with the General Plan – 2030 growth scenario.

Rideshare

Under the original General Plan – 2030 scenario it was anticipated that the number of rideshare trips would double from current levels up to 2,900 commute trips. This level of growth would be supported by the planned express lanes project that would add an addition lane for HOVs and SOVs willing to pay a toll on U.S. Highway 101 and State Route 85. Increase in ridesharing beyond this level would be difficult to support as the added freeway capacity would already be taken. In order to add more carpools a strategy would be needed which target shorter non-freeway trips. These would be trips within 0-5 or 5-10 miles from North Bayshore. Employers would have to make a special effort to encourage these short distance commuter to carpool or rideshare in some manner. The concept that Google has indicated it is testing is to provide some employees with a vehicle with the understanding that they would agree to pick up two or more employees on the way to work each day. Something like this would be needed to increase the ridesharing up to 10% of the total trips or 3,500 morning commute trips.

Table 11-1 Mode Share Goals

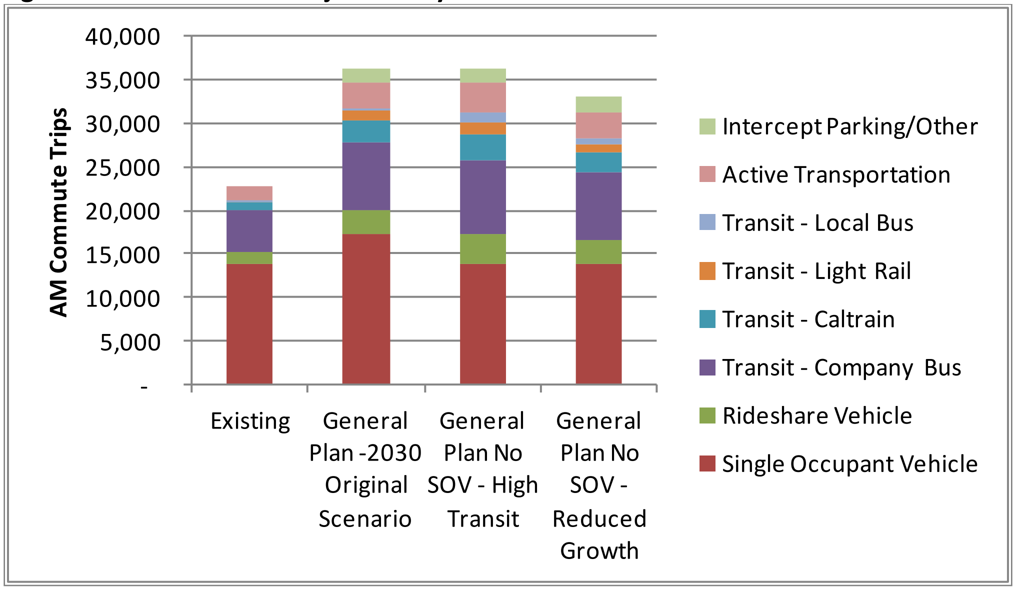
		Scenarios		
	Existing	General Plan - 2030 Original Scenario	General Plan - 2030 No SOV Increase - High Transit	General Plan No SOV Increase - Reduced Growth
Development (million sq. ft.)	7.3	10.7	10.7	9.7
Increase (million sq. ft.)		3.4	3.4	2.4
Estimated Time Frame (years)		10	10	10
AM Commute Trips (Estimated)				
Single Occupant Vehicle	13,800	17,200	13,800	13,800
Rideshare Vehicle	1,450	2,900	3,500	2,800
Transit - Company Bus	4,700	7,700	8,400	7,700
Transit - Caltrain	900	2,500	3,000	2,400
Transit - Light Rail	150	1,100	1,400	900
Transit - Local Bus	100	200	1,100	600
Active Transportation	1,600	3,100	3,500	3,100
Intercept Parking/Other	-	1,700	1,700	1,700
Total	*22,700*[1]	*36,400*	*36,400*	*33,000*
Commute Mode Share Targets				
Single Occupant Vehicle	61%	47%	38%	42%
Rideshare Vehicle	6%	8%	10%	8%
Transit	26%	32%	38%	35%
Active Transportation	7%	9%	10%	9%
Intercept Parking/Other	0%	5%	5%	5%
Total	*100%*	*100%*	*100%*	*100%*

1. Existing trip estimates are slightly revised from information presented to the Mountain View City Council on March 26, 2013 to reflect the most current estimates and for consistency with prior information.

Company Bus

Today, the commuter buses run by the major employers (primarily Google) account for nearly 80% of the transit trips to North Bayshore. In order to attract enough riders to help achieve the zero SOV trip growth objective, commuter bus usage will need to further increase above the already ambitious estimate with the original scenario, nearly doubling of the current number of employer buses. A 200 bus operation in North Bayshore is considered the maximum number that can be effectively operated. The number of trips captured per bus is also likely to decline as the prime longer distance trip markets will become somewhat saturated and it will become harder to attract new riders. Thus, it is estimated that the number of company bus users would grow from 4,700 today to about 8,400 under the no SOV trip growth scenario.

Figure 11-1 Modal Share Objectives by Growth Scenario



Transit – Caltrain

Under the original General Plan – 2030 scenario it was assumed that ridership on Caltrain would grow up to level of estimated available capacity that is planned as part of the Caltrain electrification program. This meant an increase from 900 commuters today to 2,500 commuters. Further increases require additional improvements to Caltrain that are currently not planned. It was assumed that some small increases in Caltrain use could occur over that level, and the estimated number of riders was increased to 3,000 commuters. This would mean that there would be less capacity available for other potential riders on the system.

Transit – Light Rail

Current use of the VTA light rail system by North Bayshore commuters is relatively low and there is substantial capacity available. In order to improve the attractiveness and efficiency of the service VTA is planning a number of improvements including double tracking current single track sections and operating express or limited stop trains which would address the long travel times involved for many trips on the system. These trains would offer direct service to the BART extension in Milpitas now under construction.

There is significant growth potential for this service, particularly if the connection between the Mountain View Transit Center and North Bayshore can be improved. The improvements to the connecting shuttle services and the transit center that are discussed in this report will be essential to supporting the increased ridership that would be needed, which is estimated at 1,400 commuters or nearly ten times the number using the system today.

Transit Local Bus

Today there is very limited local bus service to North Bayshore and current ridership is less than 100 commuters. In order to dramatically increase the number of riders there would need to be a dedicated local bus network which would link North Bayshore with the rest of Mountain View and the adjacent areas (other than the downtown) via two or more new bus routes. These routes would need to be high frequency (every 10-15 minutes in the peak period) and connect to major nodes of residential development such as the San Antonio Road – El Camino Real corridors. With an investment of this nature it should be practical to attract the estimated 1,100 commuters.

Active Transportation

The active transportation program proposed for the original General Plan Growth Scenario was already very aggressive, increasing the number of commuters bicycling or walking from 1,600 to 3,100. It is not prudent to assume that this number could be increased much beyond this level. However, if the delivery of the projects outlined in this report were accelerated an increase up to 3,500 commute trips might be achievable.

Intercept Parking/Other

Intercept parking was not considered as a significant component of the improvement strategy for the original General Plan – 2030 scenario. It was planned to be used for the level of growth beyond that scenario. As the intercept parking idea is not supportive of a zero SOV trip growth policy it would not be included as one of the strategies. However, the assumption that up to 5 percent of the total trips would either shift outside the peak commute period or would be eliminated by telecommuting, virtual meetings, and other shifts in workplace practices was retained.

11.2 Reduced Development

Table 11-1 also shows the implications on the amount of total development that could be accommodated if no growth in SOV trips is allowed and the non-SOV trips are not allowed to increase beyond the values that were identified for the Original Scenario. In this case the amount of allowable new development would be reduced from 3.4 million sq. ft. to 2.4 million sq. ft. This would reduce the total number of commute trips from 36,400 to 33,000.

11.3 Mode Share Experiences

Table 11-2 shows the current mode share characteristics of some major metropolitan downtown areas and for urban centers such as Mission Bay in San Francisco, the Lloyd District an urban center located just east of Portland, Oregon and Stanford University in Palo Alto.

Table 11-2 Mode Share Characteristics of Downtowns and Urban Centers

	Downtowns				Urban Centers		
Travel Mode	Portland, OR	Seattle, WA	Chicago, IL	San Francisco, CA	Mission Bay, San Francisco	Lloyd District, Portland	Stanford University, Palo Alto
Auto - Single Occupant Vehicle	37.7%	21.5%	37.3%	29.0%	33.0%	40.8%	45.0%
Carpool/Vanpool	4.0%	5.8%	7.9%	9.0%	4.9%	9.2%	10.0%
Public Transit	19.7%	24.2%	25.6%	48.0%	30.0%	39.2%	25.0%
Walk, Bicycle, or Other	32.0%	42.3%	23.8%	10.0%	23.9%	7.5%	15.0%
Worked at home	6.6%	6.2%	5.4%	4.0%	8.2%	3.3%	5.0%
Total	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*

The major urban downtowns have been able to achieve a SOV mode share near or less than the 38% goal that would need to be achieved for the North Bayshore to keep SOV trips at the current level. It is important to note that these downtowns are very well served by high capacity transit and that they all have substantial residential populations. In addition they are known for being walkable and bicycle friendly. Of the urban centers, only Mission Bay in San Francisco achieves an SOV mode share less than 38%. The plan for the Mission Bay project includes 6,000 housing units and 500,000 sq. ft. of neighborhood serving retail. Unlike North Bayshore these urban centers have significant housing available on site or within a short walking distance. They also have direct connections to the regional transit network. As such it is important to understand that the 38% goal for North Bayshore is very aggressive, given that housing is not a component of the plan and it is remote from regional transit.

11.4 Mode Share Targets

Recognizing the desire to limit the growth of SOV commute trips the following mode share targets are proposed for the General Plan Growth Scenario. These are aggressive goals in terms of increasing the use of transit, ridesharing, and active transportation which allows only a relatively small growth in the number SOV commute trips.

Table 11-3 Mode Share Targets

Travel Mode	2030 General Plan Growth Scenario
Ridesharing (Carpools and Vanpools)	10%
Transit (Public and Private)[6]	35%
Active Transportation	10%
Single-Occupant Vehicle	45%

The potential change in commute trips by mode, with these mode share targets, is shown in Table 11-4 and Figure 11-2 below. These estimates represent one scenario for achieving the goals. As development proceeds and infrastructure and service improvements are provided, the actual mix could change over time. Ideally, even greater shifts to alternative modes could be achieved, resulting in less growth in SOV trips.

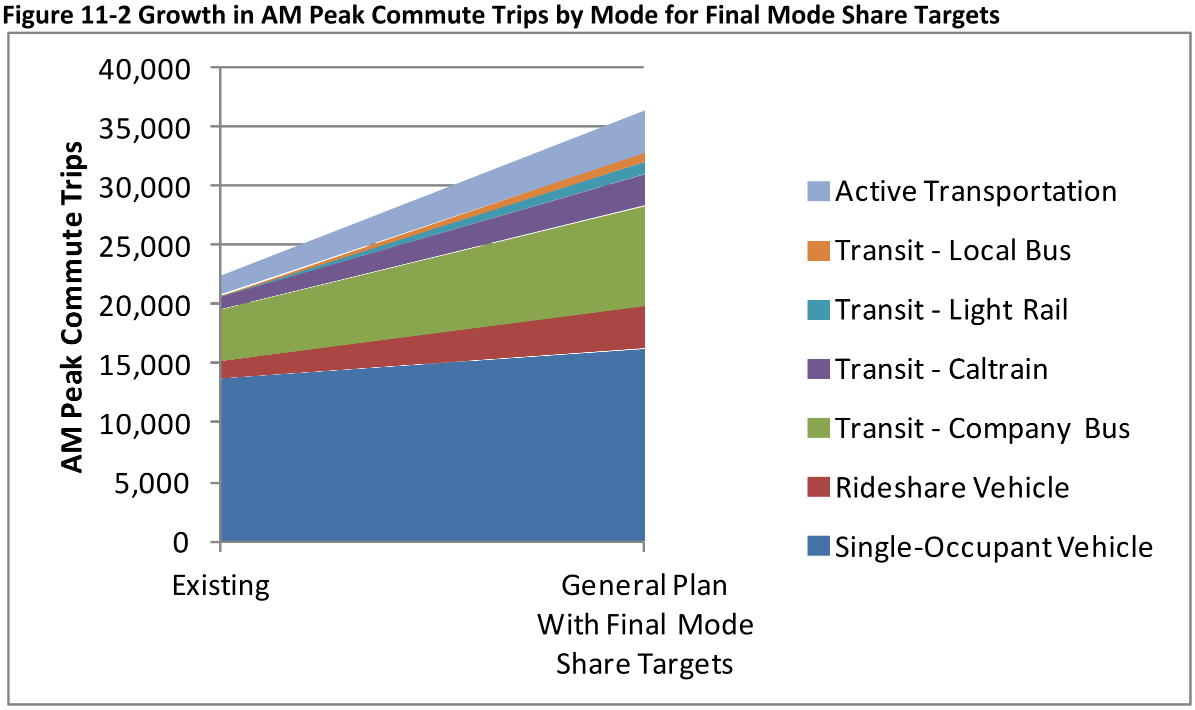
6 Transit use split equally between private commute service and public transit.

Table 11-4 Potential Change in Commute Trips by Mode

	Existing	General Plan With Final Mode Share Targets
Development (million sq. ft.)	7.3	10.7
Est. Time Frame (Years)		10
AM Commute Trips (estimated)		
Single-Occupant Vehicle	13,800	16,300
Rideshare Vehicle	1,450	3,600
Transit - Company Bus	4,700	8,500
Transit - Caltrain	900	2,600
Transit - Light Rail	150	1,000
Transit - Local Bus	100	800
Active Transportation	1,600	3,600
Total	*22,700*	*36,400*
Commute Mode Share Targets		
Single-Occupant Vehicle	62%	45%
Rideshare Vehicle	6%	10%
Transit	26%	35%
Active Transportation	7%	10%

Under this growth and transportation scenario, the total number of commute person trips would increase by 63% while SOV trips would rise less than 20%. To offset, transit, ridesharing and active transportation trips would increase by 130-150%.

Figure 11-2 Growth in AM Peak Commute Trips by Mode for Final Mode Share Targets



The results of this additional analysis were presented to the Mountain View City Council on March 26, 2013. At that meeting, the City Council endorsed the proposed mode share targets for the 2030 General Plan Growth Scenario and directed staff to incorporate the targets into the North Bayshore Precise Plan effort.