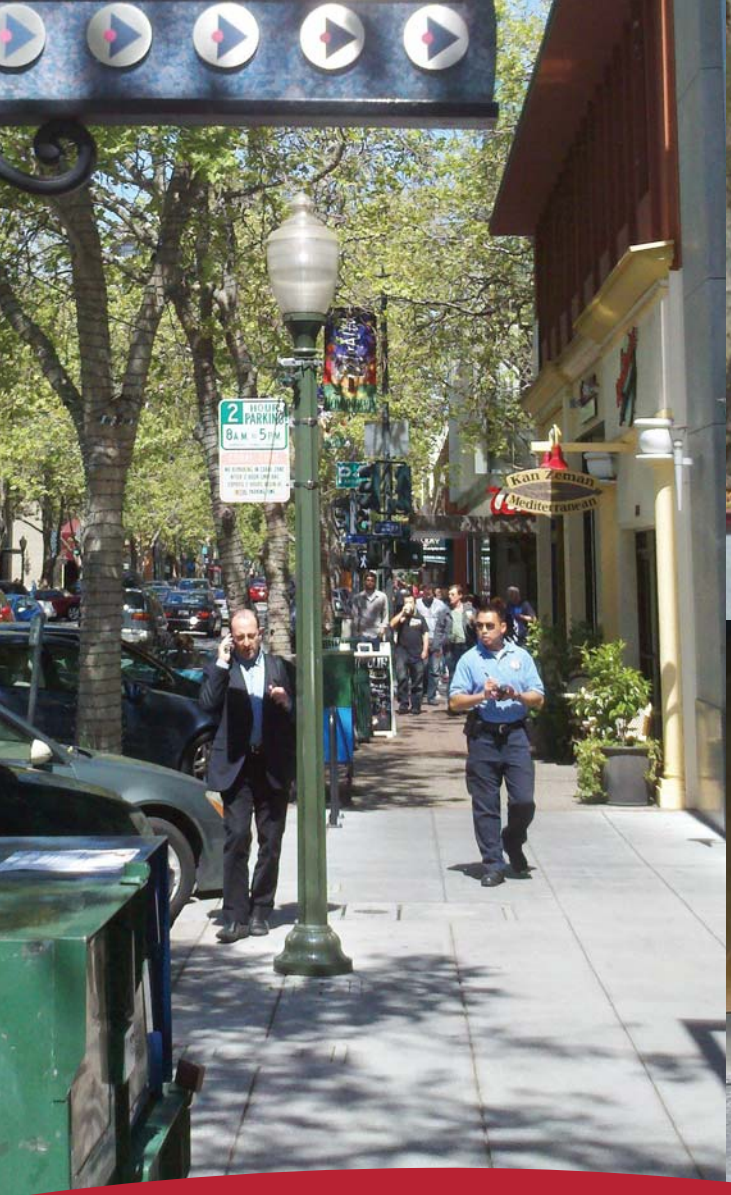

City of Palo Alto
Bicycle + Pedestrian Transportation Plan

Adopted July 2012

PREPARED BY:
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PREPARED FOR:
City of Palo Alto

BIKE PALO ALTO

alta PLANNING + DESIGN

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List of Acronyms

ABAG	Association of Bay Area Governments
AC Transit	Alameda-Contra Costa Transit District
ADA	Americans with Disabilities Act
BAAQMD	Bay Area Air Quality Management District
BEP	Bicycle Expenditure Plan
BPTP	2012 Palo Alto Bicycle + Pedestrian Transportation Plan ("the Plan")
BRT	Bus Rapid Transit
Caltrans	California Department of Transportation
CBP	Santa Clara Countywide Bicycle Plan
CEQA	California Environmental Quality Act
CIP	Capital Improvement Project
CMAQ	Congestion Mitigation and Air Quality
CPP	2007 Palo Alto Climate Protection Plan
CSTSC	City/School Traffic Safety Committee
CTC	California Transportation Commission
FHWA	Federal Highway Administration
GHG	Greenhouse Gasses
MTC	Metropolitan Transportation Commission
NACTO	National Association of City Transportation Officials
PABAC	Palo Alto Bicycle Advisory Committee
PAMF	Palo Alto Medical Foundation
PAUSD	Palo Alto Unified School District
PTOD	Pedestrian and Transit Oriented Development
SamTrans	San Mateo County Transit
SCVWD	Santa Clara Valley Water District
SWITRS	Statewide Integrated Traffic Records System
TDM	Transportation Demand Management
TLC	Transportation for Livable Communities
VERBS	Vehicle Emissions Reduction Based at Schools
VMT	Vehicle Miles Travelled
VTA	(Santa Clara) Valley Transportation Authority

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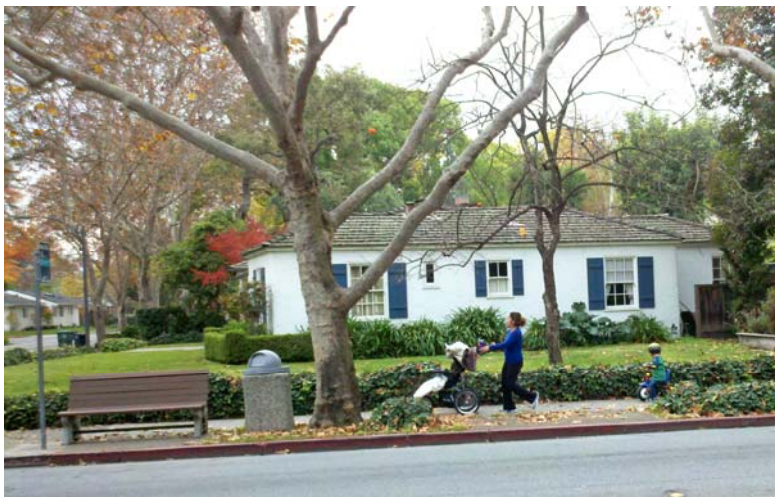
1 Introduction

Palo Alto has been at the forefront of bicycle and pedestrian planning since the early 1980's, when the City developed the nation's first bicycle boulevard on Bryant Street. Combined with a lively and historic downtown, and great connections to Stanford University and regional transit, the city attracts commuters, students, and visitors alike to bicycle or walk at much higher rates than other South Bay Area communities. Palo Alto can build upon this history and demand for bicycling and walking to solidify its status as one of the most bicycle friendly communities in California, if not the country.



Palo Alto has many residents and visitors who walk and bicycle, both recreationally and to access work, shopping, and transit.

This Plan builds upon extensive planning and design efforts already underway by the City of Palo Alto, including the implementation of the *2003 Bicycle Transportation Plan*, Safe Routes to School improvements, and creative land use planning. The Plan was developed through collaboration with the City, the Palo Alto Bicycle Advisory Committee (PABAC), the City/School Traffic Safety Committee (CSTSC), and the community. It strives to address the unmet needs of existing and future Palo Alto bicyclists and pedestrians by identifying a network for all types of bicycle travel and recommending other key improvements – including education and encouragement programs – to make non-polluting travel a viable, everyday option for more people.

1.1 Purpose

The *2012 City of Palo Alto Bicycle + Pedestrian Transportation Plan* (BPTP 2012) strategically guides public and private investments in non-motorized transportation facilities and related programs.[1] The Plan complies with state eligibility requirements for Bicycle Transportation Account (BTA) funds, as well as updates citywide priorities within the Valley Transportation Authority (VTA) Bicycle Expenditure Plan (BEP).

The BPTP 2012 expands the *2003 Bicycle Transportation Plan* to include coverage of pedestrian issues, priorities, and design standards in addition to revising the proposed bikeway network and design guidelines. It will also be adopted as part of the City's revised *Comprehensive Plan Transportation Element*, which is undergoing an update process in 2012. From planning citywide networks to reviewing private development proposals, the BPTP 2012 contains the policy vision, design guidance, and specific recommendations to increase walking and biking rates to ambitious (yet achievable levels) over the next

[1] *For the purposes of this Plan, "non-motorized" transportation includes pedestrians and bicyclists, including those using electric assists, such as e-bikes and motorized wheelchairs.*

decade and beyond – rates that will be instrumental in helping achieve local and regional targets for accommodating new growth, maintaining mobility, and reducing overall environmental impacts.

1.2 Setting

The City of Palo Alto is a community with an estimated 64,500 residents (a 10 percent increase from 2000) located between the open space preserves of the foothills and the tidal flats of San Francisco Bay. With an established grid network of streets, vibrant business districts, a well-known park and trail system, and direct proximity to Stanford University, much of Palo Alto is highly walkable. Flat terrain, tree-lined streets, and a temperate climate also make Palo Alto a relatively easy place to bicycle. Two U.S. Interstate highways, a major rail corridor, and one county expressway divide the city into several distinct communities with unique circulation patterns.

1.3 Benefits of Bicycling and Walking

Bicycling and walking are low-cost and healthy transportation options that provide economic and livability benefits to communities. When residents and visitors bicycle or walk for a trip, it alleviates congestion, minimizes greenhouse gas emissions, and helps extend and improve the quality of people's lives. Below is a brief overview of the benefits of greater investments in walking and bicycling.

The Palo Alto Caltrain station has the rail line's second most daily passenger boardings and bicycle boardings.

1.3.1 Environmental Benefits

Due to emissions from "cold starts" (i.e., when a car hasn't been driven in a few hours and the engine is cool), a one-mile automobile trip emits up to 70 percent as much pollution as a 10-mile excursion. This means that when people decide to bicycle or walk even just for very short trips, they are still significantly reducing their environmental footprint.[2] From reducing local levels of harmful pollutants that cause asthma and other respiratory illnesses to addressing global climate change, higher rates of bicycling and walking provide tangible, significant air quality benefits.

Bicycling and walking also do not pollute water as driving an automobile does. Cars leak oil, petroleum products and other toxins onto road surfaces that eventually make their way to storm drains, creeks, and large bodies of water. This "non-point source" pollution is a major threat to urban aquatic habits, contaminates drinking water, and can cause major illness. Some toxins and metals accumulate in sea life and cause medical problems to people when eaten. Others cause explosive growth of algae, which depletes water of oxygen, killing fish and aquatic life.[3] Every bicycle and walking trip is one less

[2] *Bay Area Air Quality Management District. (2007). Source Inventory of Greenhouse Gas Emissions.*
[3] *City and County of Honolulu Department of Environmental Services*

opportunity for these toxins to enter the environment, which on a large scale can make the difference in the health of local water ways and aquatic systems.

1.3.2 Economic Benefits to Cities

Multiple studies have shown that walkable, bikeable neighborhoods are more livable and attractive, helping increase home values[4] and retain a more talented workforce that result in higher property tax revenues and business competitiveness. Similarly, bike lanes can improve retail business directly by drawing customers and indirectly by supporting the regional economy. Patrons who walk and bike to local stores have been found to spend more money to visit local businesses than patrons who drive.[5]

The League of American Bicyclists reports that bicycling makes up $133 billion of the US economy, funding 1.1 million jobs.[6] The League also estimates bicycle-related trips generate another $47 billion in tourism activity (of which Palo Alto has opportunities to capture an ever increasing share). Many communities have enjoyed a high return on their investment in bicycling. For example, the Outer Banks of North Carolina spent $6.7 million to improve local bicycle facilities, and reaped a reported benefit of $60 million of annual economic activity associated with bicycling.[7]

Walkable, bikeable downtowns attract residents and visitors to spend money at local businesses while reducing household transportation costs when families can own fewer automobiles and reduce their driving trips.

1.3.3 Benefits to Households and Individuals

Walking and biking are not just forms of travel, they are important forms of exercise. Many public health experts associate the rising and widespread incidence of obesity with automobile-dominant development patterns and lifestyles that limit such daily forms of physical activity.[8] This association is perhaps most apparent, and acute, with respect to children and school travel. After decades of declining rates of walking and biking – from roughly half of all non-high school students in 1968 to just 14% in 2009 - obesity among youth has become an epidemic.[9] In California, one in three kids age 9-17 are now at risk of becoming or are already overweight.[10]

For children, the Center for Disease Control and Prevention recommends 60 minutes of daily aerobic exercise. The CDC recommends 75 to 150 minutes of vigorous exercise, in combination with muscle strengthening exercises, for adults on a weekly basis. For many adults and children, walking or biking to work or school is a viable - if not the only – option for achieving these recommended exercise regimens.

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[4] *Cortright, Joe for CEOs for Cities. (2009). Walking the Walk: How Walkability Raises Home Values in U.S. Cities.*
[5] *The Clean Air Partnership. (2009). Bike Lanes, On-Street Parking and Business: A Study of Bloor Street in Toronto's Annex Neighborhood.*
[6] *Flusche, Darren for the League of American Bicyclists. (2009). The Economic Benefits of Bicycle Infrastructure Investments.*
[7] *N.C. Department of Transportation, Division of Bicycle and Pedestrian Transportation. (No Date). The Economic Impact of Investments in Bicycle Facilities.* atfiles.org/files/pdf/NCbikeinvest.pdf
[8] *October 27, 1999 issue of the JAMA*
[9] *United States Department of Transportation, National Household Travel Survey*
[10] *The California Endowment. (No Date). Fighting California's Childhood Obesity Epidemic.* http://www.calendow.org/article.aspx?id=348

Pedestrian and bicycle infrastructure also provides transportation choices to those who cannot or do not drive, including people with disabilities, youth, seniors, and people with limited incomes. Families that can replace some of their driving trips with walking or bicycling trips spend a lower proportion of their income on transportation,[11] freeing additional income for local goods and services. Pedestrians with mobility, vision, or hearing impairments particularly depend on high-quality, well-maintained infrastructure as a basis for travel, from audible signals and curb ramps that indicate safe crossings to separated bike lanes that discourage bicyclists from riding on the sidewalk. For others who cannot afford to live near employment centers or who work away from transit, bicycling may provide the only affordable and reliable means of commuting.

1.4 Relation to Other Plans

Several key planning efforts directly influenced the development of the *Bicycle + Pedestrian Transportation Plan*. **Appendix E** of this Plan provides a more detailed review of existing plans and policies.

1.4.1 State and Regional Planning Initiatives

At the state level, the passage in 2008 of Assembly Bill 32 and Senate Bill 375 – which together require a statewide reduction of greenhouse gas emissions (GHG) to 1990 levels by 2025, among other mandates – has propelled a number of regional planning initiatives that positively influence the BPTP 2012 and transportation investments in Palo Alto. Within the regional framework established by the Association of Bay Area Governments (ABAG) and the Metropolitan Transportation Commission (MTC), new programs and funding sources are being developed that emphasize:

- **"Complete" streets and the routine accommodation of bicyclists and pedestrians in all projects.** The *California Complete Streets Act* (AB 1358) requires all cities and counties, when they update their general plan circulation element, to identify how the city or county will provide for routine accommodation of all roadway users including motorists, pedestrians, bicyclists, people with disabilities, seniors, and users of public transportation – or to design 'complete streets' for all users.
- **Climate action and reduction targets for greenhouse gas (GHG) emissions**. MTC's *Transportation 2035 Plan*, the regional blueprint for transportation investment, includes a new $400 million Climate Action Campaign to reduce the region's carbon footprint and complement established programs such as the Transportation for Livable Communities (TLC) and Regional Bicycle Program. The Climate Action Campaign includes funding for the Safe Routes to School and Safe Routes to Transit programs and an $80 million Climate Initiatives Program that aims to test new strategies to reduce transportation-related emissions and vehicle miles traveled, such as a regional Bike Share Program organized around the Caltrain corridor that will include Palo Alto.
- **The integration of land use and transportation planning to support livable, walkable, transit-oriented communities.** More than ever, the viability of transportation planning is viewed in the context of its ability to shape and serve compact neighborhoods and mixed-use centers that help reduce average trip lengths, promote transit patronage, and encourage more active and healthy lifestyles.

[11] *Center for Neighborhood Technology. (2005). Driven to Spend: Pumping Dollars out of Our Households and Communities.*

While these ideas are not new, their widespread adoption in recent years has brought meaningful progress toward policy goals and targets with "teeth" and improved practices and funding opportunities for non-motorized facility planning and design.

1.4.2 Valley Transportation Plan (VTP 2035/2040)

The *Valley Transportation Plan* (VTP) 2035 is Santa Clara County's long-range planning document that feeds into (and is consistent with) MTC's *Regional Transportation Plan*, and incorporates specific needs identified by the Valley Transportation Authority (VTA) and individual municipalities, including Palo Alto. The VTP 2035 considers all travel modes and addresses the linkages between transportation and land use planning, air quality, and community livability.

The *Santa Clara Countywide Bicycle Plan* (CBP) is an element of the VTP that guides the development of bicycle facilities to serve trips of countywide or intercity significance. The CBP identifies over $330 million in bicycle capital project needs, which include major Cross-County Bicycle Corridors (CCBC's), 24 On-Street Bicycle Routes, 17 Trail Networks, and over 100 Across Barrier Connections (ABC) project concepts. The large-scale projects identified for Palo Alto include the Adobe Creek/Highway 101 Bicycle/Pedestrian Grade Separation project.

The Bicycle Expenditure Plan (BEP) of the VTP 2035 seeks to fund the Tier 1 projects in the *Countywide Bicycle Plan* in the next ten years. The BEP is funded from the 1996 Measure B Sales Tax Bicycle Program, Transportation Development Act Article 3, the Transportation Funds for Clean Air Program, and the Transportation Equity Act for the 21st Century Transportation Enhancement. Palo Alto received $1 million for the Homer Avenue undercrossing project under this program.

1.4.3 City of Palo Alto Comprehensive Plan

The *City of Palo Alto Comprehensive Plan* establishes clear support and priority for investing in non-motorized transportation, improving access to transit, and reducing dependence on single-occupant vehicles to improve the overall efficiency of the transportation system. The existing *Comprehensive Plan*, which is under revision at the time of this planning effort, includes a vision statement and variety of goals that strongly influence and reflect the values of the *Bicycle and Pedestrian Transportation Plan*.

Comprehensive Plan goals include:

- Goal T-1: Less Reliance on Single-Occupant Vehicles
- Goal T-3: Facilities, Services, and Programs that Encourage and Promote Walking and Bicycling
- Goal T-6: A High Level of Safety for Motorists, Pedestrians, and Bicyclists on Palo Alto Streets
- Goal C-5: Equal Access to Educational, Recreational, and Cultural Services for All Residents

To harmonize with the *Comprehensive Plan Transportation Element* revision process, the BPTP 2012 proposes no new goal statements. Instead, this Plan presents a manageable set of objectives, key strategies, and benchmarks to guide plan implementation, along with recommended policies and programs for consideration within the *Comprehensive Plan* update process. More detail on the relationship with the existing and future revised Palo Alto *Comprehensive Plan* is provided in **Appendix E.**

1.4.4 Palo Alto Climate Protection Plan

The *2007 Palo Alto Climate Protection Plan* (CPP) targets a 15 percent reduction in greenhouse gas emissions from 2005 levels by 2020 to comply with state reduction goals. Recognizing that automobile travel comprises 36 percent of total GHG emissions within Palo Alto, the CPP recommends providing a transportation demand management (TDM) coordinator position. Medium-term recommendations are to expand pedestrian-friendly zoning regulations and to complete transit projects on El Camino Real and the Palo Alto Intermodal Transit Center. Unfortunately, the CPP does not make extensive reference to the *2003 Bicycle Transportation Plan* or efforts to accelerate its implementation – despite the fact that 83 percent of auto-related emissions are from discretionary, non-commute trips within Palo Alto (i.e., a significant percentage of these trips could be converted to zero-emission walking or biking trips). The *2012 Bicycle + Pedestrian Transportation Plan* incorporates recommendations and, consistent with the CPP, targets increased funding for bicycle and pedestrian projects and programs.

1.4.5 2003 Bicycle Transportation Plan

The 2003 *Bicycle Transportation Plan* identifies existing bikeways; analyzes bicycle and pedestrian accident data; and recommends new bikeways, bicycle education and safety programs, and bicycle support facilities (including bike parking). The recommended bikeway network features bicycle boulevards, bike lanes on arterial streets, new bicycle/pedestrian grade separations, and spot improvements at key intersections. The 2003 Plan also details recommended best practices for bicycle education and outreach programs, bicycle facilities design and maintenance, and enforcement.

Notwithstanding the inclusion of a new pedestrian component, the BPTP 2012 is in many respects an update of the 2003 Plan, which remains a valuable reference document for bicycle planning in Palo Alto. The BPTP 2012 updates the 2003 *Bicycle Transportation Plan* to include a new policy framework, innovative facility design strategies (such as green bike lanes, cycletracks, and intersection through-markings), and a revised bikeway network and priority project list, among other changes.

The BPTP 2012 maintains many of the 2003 Plan recommendations and provides additional project recommendations including Pedestrian facilities to help better integrate facilities such as parks and community trails. The BPTP 2012 Plan provides project recommendations by categories to help prioritize implementation over the next five years, by which time another BPTP planning effort should occur.

1.5 Public Outreach Summary

The 2012 *Bicycle + Pedestrian Transportation Plan* development process included two public open houses and an online survey to solicit input from the general public. Members of the public attended an initial open house in March 2011 to review early project ideas and focus areas. Over 500 respondents completed the online survey, providing significant feedback on a number of bicycle and pedestrian topics. A second open house outreach effort occurred in July 2011 to receive public comment on the Draft BPTP 2012.

A community open house at Terman Middle School solicited public input on a range of topics from trails and innovative bicycle striping to school commute issues and priorities.

The BPTP was developed in coordination with the Palo Alto Bicycle Advisory Committee (PABAC), an 11-member citizen advisory committee with particular knowledge of and interest in non-motorized issues and conditions. In addition to PABAC, two meetings each were held with the City/School Traffic Safety Committee (CSTSC) and the Planning & Transportation Commission. The CSTSC is a partnership between community leaders at each of the public schools in the City, Palo Alto Unified School District (PAUSD) administrators, and City staff. The Planning & Transportation Commission is an appointed commission that provides policy recommendations on development and transportation projects to the City Council. A bicycle tour of one of the City's new planned bicycle boulevards was held prior to a Study Session of the City Council halfway through the BPTP 2012 development process. Presentation materials from these meetings were made available online via the City Planning Department's bicycle and pedestrian webpage.

A more detailed summary of the online survey results and public comments can be found in **Appendix D.** Additional outreach will be conducted during the implementation of this Plan.

1.6 Plan Organization

The remainder of the City of Palo Alto *Bicycle + Pedestrian Transportation Plan* is organized as follows:

Chapter 2 – Objectives, Key Strategies, and Guiding Principles

This chapter provides details on the policy and strategic frameworks that guided the Plan development and will ultimately be used to measure progress and build accountability into the Plan implementation. The chapter presents an assessment of *Comprehensive Plan* policies and programs to assist in incorporating this Plan's recommendations into a future revised *Transportation Element.*

Chapter 3 – Existing Facilities and Programs

This chapter documents the main existing walking and bicycling infrastructure in Palo Alto, including the existing pedestrian and bikeway network, as well as the programs that help deliver and promote both infrastructure and non-infrastructure non-motorized solutions. The programs are organized according to the five "E"s of transportation planning – Engineering, Education, Encouragement, Enforcement, and Evaluation.

Chapter 4 – Travel Demand and Collision Analysis

This chapter summarizes available travel data, distinguishes types of trips made by walking and biking, and assesses the collision history for both pedestrians and bicycles between 2004 and 2009.

Chapter 5 – Needs Analysis and Recommended Programs

This chapter synthesizes existing conditions, recommends focus areas, and identifies new programs and strategies to support specific infrastructure investments.

Chapter 6 – Recommended Facilities and Conditions

This chapter introduces the recommended bikeway network and priority pedestrian areas, and details existing and recommended conditions by sub-area.

Chapter 7 – Implementation and Funding

This chapter proposes a prioritization strategy and list of priority projects to consider for implementation and further analysis in the coming years. This chapter also documents planning level

costs associated with each project and/or facility type along with a short list of potential funding sources and a note on the Plan's environmental analysis.

Appendix A – Design Guidelines and Standards

This section provides facility design guidelines as a reference toolkit for implementing key projects and facilities.

Appendix B – Municipal Code Bicycle Parking Recommendations

This appendix presents recommended insertions and deletions to Palo Alto's Municipal Code bicycle parking requirements and design guidelines to encourage the provision of an appropriate type and quantity of parking for bicyclists.

Appendix C – BTA Requirements Checklist

This section identifies the location of information and analysis required for Bicycle Transportation Account Compliance and presents a demand and benefits model for existing and future bicycling and walking.

Appendix D – Public Survey Summary

This section summarizes public outreach efforts and documents the results of the Plan's online public survey conducted in Spring 2011.

Appendix E – Policy and Plan Framework

This section is a detailed reference summary of federal, state, regional, county, and local plans and programs that influence the 2012 *Bicycle + Pedestrian Transportation Plan*, including a table summary of all relevant *Comprehensive Plan* Goals, Policies, and Programs.

Appendix F – Funding

This section is a more detailed list of potential funding sources, including a summary of the City of Palo Alto's six-year Capital Improvement Project (CIP) Plan.

2 Objectives, Key Strategies, and Guiding Principles

As stated in Chapter 1, the 2012 *Bicycle + Pedestrian Transportation Plan* (BPTP) builds on existing goal statements from the *City of Palo Alto Comprehensive Plan* to provide direction and accountability for Plan implementation. The first section of this chapter outlines five objectives, each with key strategies and benchmarks. The second section introduces the adopted Plan guiding principles, which provide a strategic and interdisciplinary 'filter' to assist project development and prioritization. The last section summarizes relevant goals, policies, and programs from the existing *Comprehensive Plan Transportation Element* and offers recommendations for inclusion in the upcoming revision process.

2.1 Plan Objectives

The following Plan objectives support the goals identified in the *City of Palo Alto Comprehensive Plan* and reflect specific targets and mandates from the *Climate Action Plan*, the state Complete Streets Act and regional Sustainable Communities Initiative, and the December 2009 Palo Alto City Council Colleagues Memorandum outlining desired elements of the *2012 Bicycle + Pedestrian Transportation Plan*.

Objective 1: Double the rate of bicycling for both local and total work commutes by 2020 (to 15% and 5%, respectively).

Rationale

Work commute trips are the primary source of peak period congestion on local streets, and significant shifts to bicycling and walking can reduce the number of cars on streets and increase the efficiency of the existing roadway network. Transportation investments and policies contribute to bicycle commute demand by prioritizing development of commute-focused bicycling and walking routes and by encouraging employer transportation demand management (TDM) programs, among other ways.

Comprehensive Plan Consistency

Objective One supports the existing Transportation Element's *Goal T-1: Less Reliance on Single-Occupant Vehicles* by shifting daily trips to bicycling. Transportation Element Goal T-3: *Facilities, Services, and Programs that Encourage and Promote Walking and Bicycling* supports this Objective, while *Program T-23* encourages the development of sidewalks and bicycle facilities in employment areas, specifically supporting this goal. This Plan recommends incorporating the specific targets of Objective One within the revised Transportation Element.

Key Strategies

- Target employment districts with enhanced bicycle facilities and improved connections to and across major barriers
- Improve planning coordination and physical connectivity with adjacent communities

- Support and expand large employer transportation demand management programs (including the City's and Stanford's) and enforce/update existing transportation management plans
- Implement and promote the Caltrain-focused bicycle share program and seek to expand elsewhere within the city
- Continue to promote Bike to Work Day and related activities

Benchmarks

- U.S. Census / American Community Survey: Mode of Transportation to Work
- Large employer TDM and/or business district surveys including Stanford University's General Use Permit cordon counts; Transportation Management Plan (TMP) reports
- Construction of new Across Barrier Connections within or near employment centers

Objective 2: Convert discretionary vehicle trips into walking and bicycling trips in order to reduce City transportation-related greenhouse gas (GHG) emissions 15% by 2020.

Rationale

The City has a goal to reduce all GHG emissions by 15% from 2005 levels in order to comply with statewide climate action targets. Since non-commute discretionary travel is the single largest source of GHG emissions within Palo Alto (see Chapter 4, **Figure 4-5**), and since the majority of trips tend to be only a few miles in length, conversion to non-polluting walking and biking trips is both a high priority and viable objective. This objective also helps directly link climate action priorities with future non-motorized funding levels and investments.

***Comprehensive Plan* Consistency**

Objective Two is broadly supported by Transportation Element *Goal T-1: Less Reliance on Single-Occupant Vehicles*. Transportation Element *Program T-19* encourages the development of bicycle and pedestrian facilities linking trips to parks, schools, retail, centers, and civic facilities, which enables and encourages residents and visitors to bicycle or walk for discretionary trips. *Programs T-25* and *T-26* also call for progress on trail development, which supports this objective.

This Plan suggests incorporation of a policy into the revised Transportation Element (in addition to potential policies in other *Comprehensive Plan* sections) that specifically targets GHG reductions through measures that reduce drive alone rates and improve walking and biking access for short discretionary trips.

Key Strategies

- Focus investments across and along the Residential Arterial and School Commute Corridor Network to support the Safe Routes to Schools program

- Develop and implement an expanded Safe Routes to School Program with bicycle and pedestrian school route maps and improved education programs
- Expand education and encouragement efforts to include more regularly scheduled street closure events, family bicycle outings, traffic skills training, "teaching rides," pedestrian safety campaigns, and innovative bicycle facility instruction
- Improve non-motorized access to shopping centers, mixed use districts, and grocery stores/farmer's markets; provide sufficient bicycle parking and 'placemaking' opportunities in these locations to support such activity
- Remove and/or upgrade substandard bike lanes and trail crossing barriers to improve safety and convenience

Benchmarks

- School commute mode share; Safe Routes to School (SR2S) hand tallies and parent surveys
- Annual pedestrian and bicycle counts
- Total annual vehicle miles travelled (VMT) and GHG emissions

Objective 3: Develop a core network of shared paths, bikeways, and traffic-calmed streets that connects business and residential districts, schools, parks, and open spaces to promote healthy, active living.

Rationale

Planners and public health officials consistently make the connection between better bicycling and walking facilities, increased physical activity and mental well-being, and reduced rates of obesity, diabetes, asthma, and other chronic diseases. In a related trend to encourage non-motorized travel, many cities are more actively managing their streets to include vehicular closures and special events outside of peak travel periods. Specific to Palo Alto, many school and open space areas are critical links in the (proposed) bicycle boulevard and off-street trail networks, which provide an opportunity to develop a more coherent recreational system for the growing youth and family populations.

Comprehensive Plan Consistency

Objective Three is most directly supported by Transportation Element Goal T-3: *Facilities, Services, and Programs that Encourage and Promote Walking and Bicycling.* In particular, *Policy T-14* and *Program T-19* promote bicycle and pedestrian networks that connect to key destinations, including open space. Transportation Element *Program T-22* calls for the implementation of a bicycle boulevard network, while *Policy T-17* promotes the development of trails, both of which will help promote healthy, active lifestyles.

Key Strategies/Programs

- Prioritize enhancements to the Bay to Ridge Trail corridor; consider designating spur trails and secondary alignments that provide connecting off-street pathways
- Develop, sign, and promote a bicycle boulevard network that incorporates important linkages through and across school and park properties
- Encourage and support the development of neighborhood greenways, linear park features, and "Safe Routes to Parks" projects that utilize the designated bikeway network
- Promote regularly scheduled street closure events as a strategy to encourage physical activity and provide unique non-motorized travel opportunities
- Continue to support, and expand where possible, maintenance programs to repave existing trails and park programs to maintain walkways and perimeter landscaping
- Expand trail networks along creeks through partnership projects with regional agencies including the Santa Clara Valley Water District (SCVWD)
- Evaluate the feasibility of a future potential trail connection between El Camino Park and Caltrain/Palo Alto High School through the Transit Center and/or a pedestrian corridor connection to Stanford Medical and Shopping Center

Benchmarks

- Miles of bicycle boulevards, enhanced bikeways, and trails developed
- Numbers of pedestrians and bicyclists on key facilities, as determined by counts
- Number of annual street closure events

Objective 4: Plan, construct, and maintain 'Complete Streets' that are safe and accessible to all modes and people of all ages and abilities.

Rationale

Pedestrians – especially children, seniors, and the disabled – represent the most vulnerable users of the street network and have a civil right to be able to travel safely and conveniently in the public realm. While certain streets may be more important for regional mobility, all streets should accommodate non-motorized travel unless specifically prohibited under state law.

***Comprehensive Plan* Consistency**

Objective Four supports and expands Transportation Element *Goal T-3: Facilities, Services, and Programs that Encourage and Promote Walking and Bicycling* to include a specific reference to 'Complete Streets' for all users (including transit). This Objective should be considered for addition to the Transportation Element in the update to the *Comprehensive Plan*. Of the current Transportation Element, this Objective is directly related to *Program T-25*, "When constructing or modifying roadways, plan for usage of the roadway space

by all users, including motor vehicles, transit vehicles, bicyclists, and pedestrians," and *Program T-19*, "Develop, periodically update, and implement a bicycle facilities improvement program and a pedestrian facilities improvement program that identify and prioritize critical pedestrian and bicycle links to parks, schools, retail centers, and civic facilities." In addition, the Objective discusses maintenance, supporting *Policy T-17* (related to trail maintenance) and *Policy T-20* (bicycle and pedestrian infrastructure).

Key Strategies

- Accelerate the installation of accessible curb ramps and pedestrian countdown signals in commercial centers, school zones, around senior centers and hospitals, and near key transit stops or stations
- Develop a Complete Streets checklist and formal approval process for all infrastructure projects, including major roadway maintenance, in order to identify and maximize pedestrian and bicycle improvement opportunities
- Improve top collision locations and other high volume pedestrian arterial crossings
- Study the feasibility of 'road diets' on all streets with two or more travel lanes per direction to allow for dedicated bikeways and safer, more frequent pedestrian crossings
- Target transit facilities to enhance mobility and access, especially for seniors and youth
- Develop a focused signage program accessible to seniors

Benchmarks

- Annual installation of Americans with Disabilities Act (ADA) compliant curb ramps and accessible pedestrian signals
- Top pedestrian and bicycle collision locations improved or studied
- Annual pedestrian and bicycle collisions
- Projects with Complete Street checklists completed and approved

Objective 5: Promote efficient, sustainable, and creative use of limited public resources through integrated design and planning.

Rationale

Calls for climate action and renewed fiscal discipline both help to prioritize integrated projects that meet a number of needs efficiently, as opposed to stand-alone single-purpose projects. To be sustainable (and increasingly to be competitive for outside grant opportunities), projects must achieve progress in multiple disciplines so that the whole is greater than the sum of its parts. Such an approach can leverage efficiencies of scale, while reducing construction impacts on neighborhoods and businesses.

Comprehensive Plan Consistency

Objective Five has no direct parallel in the Transportation Element, although it is related to *Goal T-4: An Efficient Roadway Network for All Users*. Related policies include: *Program T-4*, "Consider the use of additional parking fees and tax revenues to fund alternative transportation projects," *Program T-25* "When constructing or modifying roadways, plan for usage of the roadway space by all users, including motor vehicles, transit vehicles, bicyclists, and pedestrians," and *Policy T-28*: "Make effective use of the traffic-carrying ability of Palo Alto's major street network without compromising the needs of pedestrians and bicyclists also using this network."

This Objective should be considered for inclusion in the updated *Comprehensive Plan* to underscore the need for creative thinking and accountability across departments for achieving integrated projects that address sustainability goals, reduce construction impacts, and leverage outside funding.

Key Strategies

- Regularly coordinate scopes and timelines of roadway maintenance, utility, and private development activities to identify potential collaboration opportunities on the bikeway network and within priority pedestrian areas
- Evaluate and develop transportation programs and facilities using the "Five I's" – Integration, Inclusion, Innovation, Investment, and Institutional Partnerships – in addition to the traditional "Five E's" framework (described in Chapter 3)
- Development of "Plan Line Studies" along residential and commute arterial streets to guide design of local projects and identify community improvements

Benchmarks

- Total grant funding awarded for bicycle- and pedestrian-related transportation improvements
- Projects completed involving multiple agency or departmental funding sponsors
- Pedestrian and bicycle facilities implemented by private development

2.2 Strategic Guiding Principles - The "Five I's"

The "Five I's" is a customized set of guiding principles developed for the 2012 *Bicycle + Pedestrian Transportation Plan* that helps strategically organize and focus transportation investments. Used to guide Plan development and prioritization, a brief description of the Five "I's" is presented below:

Integration

In addition to integrating pedestrian needs into the new transportation plan, this principle seeks the integration of non-motorized accommodation into the regular decision-making processes of Palo Alto. It also serves to align the Plan with sustainability and climate action goals that increasingly call for shared accountability and the avoidance of planning "silos" and single-purpose projects. At the project scale, seek integrated design solutions that achieve multiple benefits (e.g., a sidewalk

extension that also provides landscaping or stormwater management opportunities) and avoid or improve abrupt transitions in the public realm.

Inclusion

Acknowledging that the "strong and fearless" cyclists (i.e., adult commuter and recreationists) are reasonably well-served by the existing bicycle network, the principle of inclusion strives for actions and projects that meet the needs of more novice bicyclists and reach a broad spectrum of non-motorized users in Palo Alto. This principle also speaks to the concept of "access for all" for those with mobility impairments or without access to motor vehicles.

Innovation

This principle highlights the role of Palo Alto (and Stanford) as a national leader in good ideas with a historic commitment to experimentation (i.e., learning by doing). These notions are crucial to advancing non-motorized design, where lengthy approval processes and other constraints can unnecessarily hold up the most trivial of advances. With innovation also comes the need for additional education and outreach, which will be especially important as the City introduces types of pedestrian and bicycle facilities/designs that are new to Palo Alto residents.

Institutional Partnerships

Build and utilize relationships with Stanford University, adjacent jurisdictions, the Santa Clara Valley Water District, major employers (such as Space Systems/Loral Inc., Hewlett-Packard, AOL, and Facebook), and the Palo Alto Unified School District to realize the plan's success. Explore private/public partnerships and ways to extend the sense of accountability beyond and across public agencies.

Investment

Attract, leverage, and commit to a fair share of resources for bicycle and pedestrian facilities and programs. Seek to use these resources efficiently, but understand that the quality of the facilities and programs often correlates with the level of investment. As a Plan strategy, maximize the competitiveness of the City of Palo Alto to receive outside grant funding.

A detailed discussion of how these strategic guiding principles are used to help evaluate and prioritize projects is located in Chapter 7.

2.3 *Comprehensive Plan* Policies and Programs Assessment

The 2012 BPTP was developed, and is supported, by numerous goals, policies, and programs within the existing *Transportation Element* of the *City of Palo Alto's Comprehensive Plan*. At the same time, the BPTP responds to and incorporates a number of policies and issues that are not yet included within the *Comprehensive Plan* but may be established with the planned update of the *Transportation Element* in 2012.

Table 2-1 documents the relationship between the existing Comprehensive Plan and suggests where recommendations from this Plan may be incorporated into a future revised Transportation Element.

Table 2-1. *Comprehensive Plan* Policies and Programs Assessment

Goals	Policies and Programs (edited for relevancy)	Plan Relationship/Recommendation
Transportation Element		
Goal T-1:	***Less Reliance on Single-Occupant Vehicles***	
	Policy T-1: Make land use decisions that encourage walking, biking, public transit use.	This policy supports BPTP development. The BPTP includes recommendations for pedestrian districts and design guidelines that can be used to help guide development review. This policy could be strengthened slightly by revising to "Make integrated land use and transportation decisions that help reduce average trip distances and support walking, biking, and public transit."
	Policy T-2: Consider economic, environmental, and social cost issues in local transportation decisions.	This policy provides high-level support for the BPTP's integrated planning approach and inclusion of climate action goals. This policy may be modified or complemented by including specific language from Objectives 1 and 2.
	Program T-4: Consider the use of additional parking fees and tax revenues to fund alternative transportation projects.	Appendix F of the BPTP summarizes ways to fund projects and programs that improve biking and walking, including potential parking management and pricing strategies.
	Program T-5: Work with private interests, such as the Chamber of Commerce and major institutions, to develop and coordinate trip reduction strategies.	The BPTP highlights public/private partnerships as a key implementation strategy, and includes a recommendation to provide enhanced transportation demand management programs that coordinate trip reduction strategies.
	Program T-8: Create a long-term education program to change the travel habits of residents, visitors, and workers by informing them about transportation alternatives, incentives, and impacts. Work with the Palo Alto Unified School District and with private interests, such as the Chamber of Commerce, to develop and implement this program.	The BPTP evaluates existing education and encouragement programs and makes recommendations for new and improved initiatives. This program may benefit from additional references to encouragement efforts, which are critical to developing a culture of biking and walking.
Goal T-2:	***A Convenient, Efficient, Public Transit System that Provides a Viable Alternative to Driving***	
	Policy T-5: Support continued development and improvement of the University Avenue and California Avenue Multi-modal Transit Stations and the San Antonio Road Station as important transportation nodes for the City.	The BPTP includes and prioritizes recommendations within these station areas. Within this goal, a new reference to supporting and expanding the future bicycle share program is recommended as a way to provide "last mile" connections to transit services in Palo Alto.

Goals	Policies and Programs (edited for relevancy)	Plan Relationship/Recommendation
	Program T-14: Pursue development of the University Avenue Multi-modal Transit Station conceptual plan based on the 1993-1994 design study.	The BPTP references the conceptual plan and proposed design, and identifies potential funding sources for improving the station area.
	Program T-15: Improve the environment at the University Avenue Multi-modal Transit Station, including connecting tunnels, through short-term improvements and regular maintenance.	The BPTP recommends roadway and intersection improvements that enhance access to the existing station facilities, including widened underpasses along University Avenue.
	Policy T-9: Work towards integrating public school commuting into the local transit system.	The BPTP prioritizes the School Commute Traffic Corridors Network for improvements and makes recommendations to support the Safe Routes to School program.
Goal T-3:	***Facilities, Services, and Programs that Encourage and Promote Walking and Bicycling***	
	Policy T-14: Improve pedestrian and bicycle access to and between local destinations, including public facilities, schools, parks, open space, employment districts, shopping centers, and multi-modal transit stations.	The BPTP recommends refinements to the bicycle network and prioritizes pedestrian facilities that link schools, parks, open spaces, transit stations and stops, and commercial uses. This is supported by the City's new focus on multi-modal level of service in the pending update to the Comprehensive Plan.
	Program T-18: Develop and periodically update a comprehensive bicycle plan.	This policy directly supports BPTP development; the BPTP recognizes the update process and focuses on developing projects to support strategic near- and medium-term priorities.
	Program T-19: Develop, periodically update, and implement a bicycle facilities improvement program and a pedestrian facilities improvement program that identify and prioritize critical pedestrian and bicycle links to parks, schools, retail centers, and civic facilities.	The BPTP includes bicycle/pedestrian facility improvement programs, and prioritizes them based on proximity to these features and to the relationship with other capital improvement programs.
	Program T-20: Periodically produce a local area bicycle route map jointly with adjacent jurisdictions.	The BPTP includes a revised map of existing conditions to support future updates to the Mid-Peninsula Bike Map.
	Program T-21: Study projects to depress bikeways and pedestrian walkways under Alma Street and the Caltrain tracks and implement if feasible.	The BPTP recommends improvements to existing plans for bicycle/pedestrian underpasses at Alma Street and identifies potential funding sources for implementation. The future Transportation Element should integrate recommendations from this Plan with those from the Joint Rail Corridor Task Force effort taking place concurrent with this Plan.
	Program T-22: Implement a network of bicycle boulevards, including extension of the southern end of the Bryant Street bicycle boulevard to Mountain View.	The BPTP expands the bicycle boulevard program to include a revised network and comprehensive wayfinding protocol. The Plan also prioritizes the extension of the Bryant Street bicycle boulevard route into Mountain View at Mackay Drive/Nita Ave.

Goals	Policies and Programs (edited for relevancy)	Plan Relationship/Recommendation
	Program T-23: Develop public sidewalks and bicycle facilities in Stanford Research Park and other employment areas.	The BPTP recommends working with the Stanford Research Park owners and leaseholders to identify ways of linking the Bol Park Path with Hansen Way among several significant shared use trail and bikeway recommendations. This program could be updated to include these specific recommendations in addition to opportunities for closing sidewalk gaps.
	Policy T-15: Encourage the acquisition of easements for bicycle and pedestrian paths through new private developments.	The BPTP identifies high-priority opportunities that would require an easement through private land, including Stanford Research Park and Palo Alto Unified School District (PAUSD) properties and frontages.
	Policy T-16: Create connecting paths for pedestrians and bicycles where dead-end streets prevent through circulation in new developments and in existing neighborhoods.	The BPTP continues support for this policy and identifies several locations where connecting paths may improve circulation within the bikeway network.
	Policy T-17: Increase cooperation with surrounding communities and other agencies to establish and maintain off-road bicycle and pedestrian paths and trails utilizing creek, utility, and railroad rights-of-way.	The BPTP cites the Santa Clara County Park District's *Countywide Trails Master Plan* (1995) and the *Uniform Interjurisdictional Trail Design, Use, and Management Guidelines,* as well as the Santa Clara Valley Water District (SCVWD) 's *Guidelines and Standards for Land Use Near Streams* (2006). The BPTP also actively pursues trail development opportunities along creeks and utility rights-of-way.
	Program T-25: Evaluate the design of a Bay-to-Foothills path	The BPTP prioritizes the existing Bay to Ridge Trail concept and includes specific recommendations and general design guidance for providing enhanced bikeways and greater separation of traffic along the route. The *Comprehensive Plan* language should be updated to reflect the BPTP recommended design guidelines and the "Bay to Ridge Trail" name.
	Program T-26: Complete development of the Bay Trail and Ridge Trail in Palo Alto.	The BPTP highlights portions of the Bay Trail that remain incomplete or require maintenance and makes specific recommendations to further develop the Bay to Ridge trail concept.
	Policy T-19: Improve and add attractive, secure bicycle parking at both public and private facilities, including multi-modal transit stations, on transit vehicles, in City parks, in private developments, and at other community destinations.	The BPTP supports the continuance of this policy and provides guidance for the placement of bicycle parking facilities, as well as design of on-street bicycle parking corrals.

Goals	Policies and Programs (edited for relevancy)	Plan Relationship/Recommendation
	Policy T-20: Improve maintenance of bicycle and pedestrian infrastructure.	This policy supports BPTP development and implementation, which includes a category of priority projects dedicated to rehabilitation and maintenance of bicycle facilities. This policy could be strengthened by including more specific definition of "improved" maintenance.
	Program T-28: Adjust the street evaluation criteria of the City's Pavement Management Program to ensure that areas of the road used by bicyclists are maintained at the same standards as, or at standards higher than, areas used by motor vehicles.	The BPTP continues support for this policy and has worked with the Pavement Management Program to coordinate priority pavement locations.
	Policy T-21: Support the use of Downtown alleyways for pedestrian- and bicycle-only use.	The BPTP incorporates existing pedestrian and bicycle-friendly alleys into the existing network and prioritizes further development of such facilities in both Downtown and the California Avenue Business Districts.
	Program T-31: Test the Downtown Urban Design Guide emphasis on the use of alleyways for pedestrian- and bicycle-only use. Allow controlled vehicle access for loading and unloading where no alternatives exist.	The BPTP supports the use of alleyways for pedestrian- and bicycle-only use and acknowledges the need for further evaluation and improvement of alleys within both the Downtown and California Avenue Business Districts.
	Policy T-22: Improve amenities such as seating, lighting, bicycle parking, street trees, and interpretive stations along bicycle and pedestrian paths and in City parks to encourage walking and cycling and enhance the feeling of safety.	The BPTP heavily promotes opportunities to integrate connections and investment along and between bikeways, pedestrian paths, and parks, and includes recommendations for improved pathway lighting and a "Safe Routes to Parks" program.
	Policy T-23: Encourage pedestrian-friendly design features such as sidewalks, street trees, on-street parking, public spaces, gardens, outdoor furniture, art, and interesting architectural details.	The BPTP continues support for this policy and includes revised design guidelines for bicycle and pedestrian facilities.
	Program T-32: Improve pedestrian crossings with bulbouts, small curb radii, street trees near corners, bollards, and landscaping to create protected areas.	The BPTP includes a recommendation to develop a formal pedestrian countdown signals and crossings program that supports this program. Consider revising T-32 to include reference to high visibility crosswalks, pedestrian countdown signals, and other pedestrian-oriented traffic control devices.

Goals	Policies and Programs (edited for relevancy)	Plan Relationship/Recommendation
Goal T-4:	***An Efficient Roadway Network for All Users***	
	Policy T-25: When constructing or modifying roadways, plan for usage of the roadway space by all users, including motor vehicles, transit vehicles, bicyclists, and pedestrians.	The BPTP supports the "routine accommodation" of bicyclists and pedestrians in all phases, as proscribed by the California Complete Streets Act. Specific reference to "Complete Streets" is recommended within the revised Transportation Element.
	Program T-33: Develop comprehensive roadway design standards and criteria for all types of roads. Emphasize bicycle and pedestrian safety and usability in these standards.	The BPTP includes a set of innovative design standards/guidelines (Appendix A) to enhance bicycle and pedestrian safety for a variety of roadway conditions and types.
	Program T-34: Establish procedures for considering the effects of street modifications on emergency vehicle response time.	Appendix A of this Plan notes the need to work with emergency service providers when considering traffic calming or street closures/diverters.
	Policy T-27: Avoid major increases in street capacity unless necessary to remedy severe traffic congestion or critical neighborhood traffic problems. Where capacity is increased, balance the needs of motor vehicles with those of pedestrians and bicyclists.	The BPTP assumes no major increases in capacity except as identified in local and regional plans. Although this policy generally supports alternative modes, a revised Transportation Element should consider more specific guidance for when (and/or where) reduced vehicle level-of-service is acceptable to implement priority non-motorized projects.
	Policy T-28: Make effective use of the traffic-carrying ability of Palo Alto's major street network without compromising the needs of pedestrians and bicyclists also using this network.	The BPTP supports the "routine accommodation" of bicyclists and pedestrians in all phases, as is proscribed by the California Complete Streets Act.
Goal T-5:	***A Transportation System with Minimal Impacts on Residential Neighborhoods***	
	Policy T-30: Reduce the impacts of through-traffic on residential areas by designating certain streets as residential arterials.	The BPTP includes several recommendations for residential arterials that are consistent with this policy.
	Program T-41: The following roadways are designated as residential arterials. Treat these streets with landscaping, medians, and other visual improvements to distinguish them as residential streets, in order to reduce traffic speeds. • Middlefield Rd (between San Francisquito Creek and San Antonio Rd) • University Ave (between San Francisquito Creek and Middlefield Rd) • Embarcadero Rd (between Alma St and West Bayshore Rd) • Charleston/Arastradero Rs (between Miranda Ave and Fabian Way)	The BPTP recommends bicycle and pedestrian improvements on these street segments as part of the bicycle network and pedestrian priority areas.

Goals	Policies and Programs (edited for relevancy)	Plan Relationship/Recommendation
	Policy T-31: Evaluate smoothing and slowing traffic flow in commercial areas by reducing through-traffic lanes and trading the area for improved turning lanes, landscaping, and bicycle lanes.	The BPTP recommends further study of bike lanes and enhanced Class II bikeways that may reduce travel lanes and/or traffic speeds in commercial areas to accommodate improved bicycle and pedestrian access.
	Policy T-32: Design and maintain the City street network to provide a variety of alternate routes, so that the traffic loads on any one street are minimized.	Bicycle boulevard and other BPTP recommendations recognize the importance and efficiency of an interconnected, grid-like street network.
	Policy T-33: Keep all neighborhood streets open unless there is a demonstrated safety or overwhelming through-traffic problem and there are no acceptable alternatives, or unless a closure would increase the use of alternative transportation modes.	The BPTP recommendations for bicycle boulevards note the conditions where street closures or partial diverters may be appropriate. The BPTP recommends additional planning with neighborhood involvement prior to implementing any street closures.
	Policy T-34: Implement traffic calming measures to slow traffic on local and collector residential streets and prioritize these measures over congestion management. Include traffic circles and other traffic calming devices among these measures.	This policy supports BPTP recommendations on these streets, particularly for bicycle boulevards where slower traffic speeds are necessary for improved bicycle and pedestrian conditions. Appendix A presents traffic calming treatments, including speed humps/tables/raised intersections, chicanes, and traffic circles.
	Program T-43: Establish a Neighborhood Traffic Calming Program to implement appropriate traffic calming measures. Consider using development fees as a funding source for this program.	The recommendations in Appendix A and the bicycle boulevard network provide support for a Neighborhood Traffic Calming Program.
	Program T-44: Evaluate changing Homer and Channing Avenues to two-way streets with or without redevelopment of the Palo Alto Medical Foundation campus.	The BPTP designates Homer and Channing Avenues as enhanced bikeways, and provides options for developing them with or without conversion to two-way operation. This program should be updated to remove the Palo Alto Medical Foundation (PAMF) language and include reference to the enhanced bikeway designation.
	Policy T-35: Reduce neighborhood street and intersection widths and widen planting strips as appropriate.	Recommendations for bike lanes and enhanced bikeways, as well as bicycle boulevards and intersection improvements, may require lane reductions and/or curb extensions where feasible.
	Policy T-36: Make new and replacement curbs vertical where desired by neighborhood residents.	The BPTP generally supports replacing rolled curbs with vertical curbs, but provides guidance to retrofit existing rolled curbed streets for greater accommodation of pedestrians and bicycles.

Goals	Policies and Programs (edited for relevancy)	Plan Relationship/Recommendation
	Policy T-37: Where sidewalks are directly adjacent to curbs and no planting strip exists, explore ways to add planting pockets with street trees to increase shade and reduce the apparent width of wide streets.	The BPTP recommends curb extensions and potential "bicycle chicanes" that may create space for additional street trees and reduce the width of streets.
	Policy T-38: Continue the current "guard and go" system of having stop signs approximately every other block on local residential streets to discourage through-traffic.	This Plan does not support the use of regular stop signs on identified bicycle boulevard streets. Consider revising this policy to encourage greater use of alternative traffic calming devices (e.g., traffic circles) to develop bicycle boulevards as priority bicycle streets.
Goal T-6:	***A High Level of Safety for Motorists, Pedestrians, and Bicyclists on Palo Alto Streets***	
	Policy T-39: To the extent allowed by law, continue to make safety the first priority of citywide transportation planning. Prioritize pedestrian, bicycle, and automobile safety over vehicle level-of-service at intersections.	This policy provides a high level of support for the BPTP. The BPTP recommendations focus on enhancing safety for all road users and utilize an updated collision analysis to identify top collision locations.
	Program T-45: Provide adult crossing guards at school crossings that meet adopted criteria.	The BPTP supports the crossing guard program as part of the Safe Routes to School program.
	Program T-46: Encourage extensive educational programs for safe use of bicycles, mopeds, and motorcycles, including the City-sponsored bicycle education programs in the public schools and the bicycle traffic school program for juveniles.	The BPTP reviews existing educational programs and recommends additional programs that would support this program.
	Policy T-40: Continue to prioritize the safety and comfort of school children in street modification projects that affect school travel routes.	BPTP recommendations focus on the identified school commute corridors for bicycle and pedestrian recommendations, and prioritize routes to school.
	Policy T-41: Vigorously and consistently enforce speed limits and other traffic laws.	The BPTP notes the importance of enforcement to improve safety and encourage residents and visitors to walk and bicycle more often.
Goal T-7:	***Mobility For People With Special Needs***	
	Policy T-42: Address the needs of people with disabilities and comply with the requirements of the Americans with Disabilities Act (ADA) during the planning and implementation of transportation and parking improvement projects.	This Plan highlights the needs of pedestrians with disabilities, and innovative design guidelines presented in **Appendix A** note ADA requirements where appropriate.

Goals	Policies and Programs (edited for relevancy)	Plan Relationship/Recommendation
Goal T-8:	***Attractive, Convenient Public and Private Parking Facilities***	
	Policy T-45: Provide sufficient parking in the University Avenue/Downtown and California Avenue business districts to address long-range needs.	The BPTP recommends several alternative uses of on-street parking spaces, including bicycle parking corrals and temporary "parklets." A revised set of these policies should, at minimum, further define parking to include bicycle parking. Transportation demand management (TDM) and other recommendations also reduce parking demand in support of this policy.
	Policy T-46: Minimize the need for all-day employee parking facilities in the University Avenue/Downtown and California Avenue business districts and encourage short-term customer parking.	
Goal T-9:	***An Influential Role in Shaping and Implementing Regional Transportation Decisions***	
	Policy T-51: Support the efforts of the Metropolitan Transportation Commission (MTC) to coordinate transportation planning and services for the Mid-Peninsula and the Bay Area that emphasize alternatives to the automobile. Encourage MTC to base its Regional Transportation Plan (RTP) on compact land use development assumptions.	The BPTP's goals promote regional coordination as well as coordination between transportation and land use to support and prioritize bicycle and pedestrian facilities.
Goal T-10:	***A Local Airport with Minimal Off-site Impacts***	
	Program T-57: Provide a planting strip and bicycle/pedestrian path adjacent to Embarcadero Road that is consistent with the open space character of the Baylands.	The BPTP recommends a Class I Multi-Use Path along Embarcadero Road from E. Bayshore Rd toward the airport driveway and Byxbee Park.

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3 Existing Facilities and Programs

3.1 Existing Pedestrian Facilities

The City of Palo Alto, in combination with the Stanford University campus and related properties, includes a wide range of pedestrian conditions. Below are short descriptions of existing facility types and select assets, some of which are depicted in **Map** 3-1.

3.1.1 Dedicated Facilities

Sidewalks

Pedestrian activity is most often accommodated with dedicated facilities separated from motor vehicle traffic (i.e., sidewalks). The majority of Palo Alto contains a connected network of sidewalks, the main exceptions being southwest Palo Alto and other select corridors where residents do not desire them or where feasibility is extremely limited. In some locations, such as along El Camino Real, existing sidewalks are narrow and are in poor condition. In addition to sidewalks, 15 miles of Class I facilities and park paths offer additional separation from traffic.

The new sidewalk constructed along Stanford Avenue adjacent to a faculty housing development includes both a paved and unpaved surface to support utilitarian and recreational (jogging) pedestrian activity. This hybrid walkway extends from Hanover Street to El Camino Real along the Bay to Ridge Trail.

Unpaved Trails and Private Paths

Distinct from sidewalks and shared use paths, many unpaved trails exist both in the regional open space areas and within larger private developments and parcels. These facilities include an extensive trail network opposite the Bol Park Path and VA Medical Center in the Stanford Research Park as well as planned trail connections in and around Sterling Creek. Both areas are shown on Map 3-2 as private paths but are not distinguished from other paved surfaces. Stanford University recently completed an unpaved pedestrian-only path from Page Mill/Deer Creek to the Arastradero Trail.

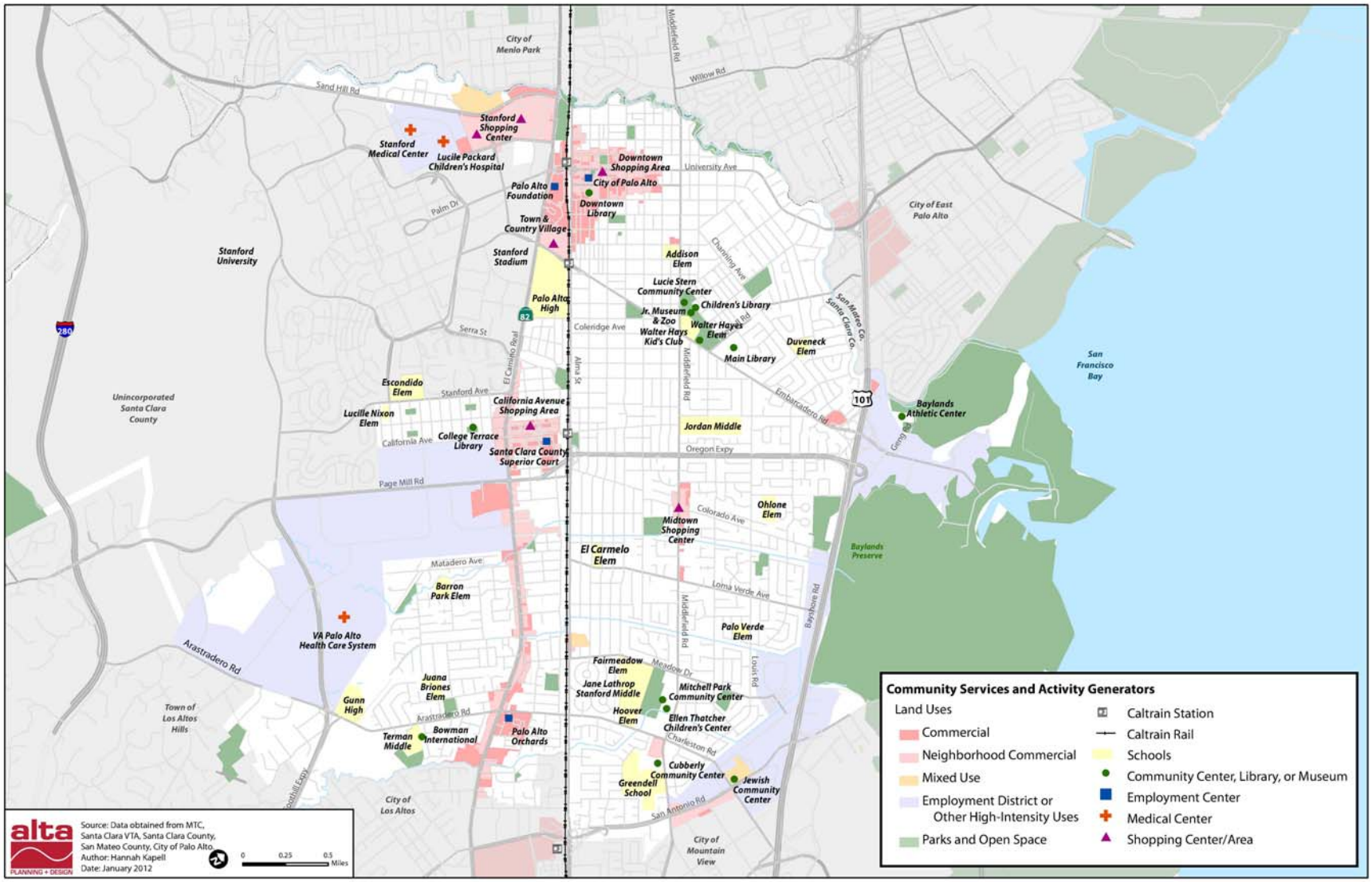
Courtyards, Pedestrian Alleys/Pass-Throughs, and Parks

Courtyards and pedestrian alleys/pass-throughs interior to city blocks also provide important dedicated space for pedestrian refuge and activity. Several well-executed examples are located in Downtown, including the Ramona Plaza development and the Scott Street connection to Heritage Park, while additional pedestrian cut-throughs are located in the California Avenue Business District. Plazas, parks, and other semi-private open spaces (including school grounds) are also particularly important for neighborhood connections and pedestrian activity in Palo Alto.

Several pedestrianized alleys in downtown help maintain an intimate scale while offering refuge and private outdoor spaces away from arterial traffic.

Stanford Pedestrian Zone and Temporary Street Closures

Stanford University's central campus restricts motorized vehicles (except in limited circumstances) to maintain a pedestrian- and bicycle-friendly network of street malls and paths. While several visions have been proposed for a similar pedestrian mall/zone in or near downtown Palo Alto without success, it is worth noting that temporary (and less controversial) dedications of pedestrian space are often made during parades, street festivals, farmer's markets, and other events.



Map 3-1: Existing Community Services and Activity Generators

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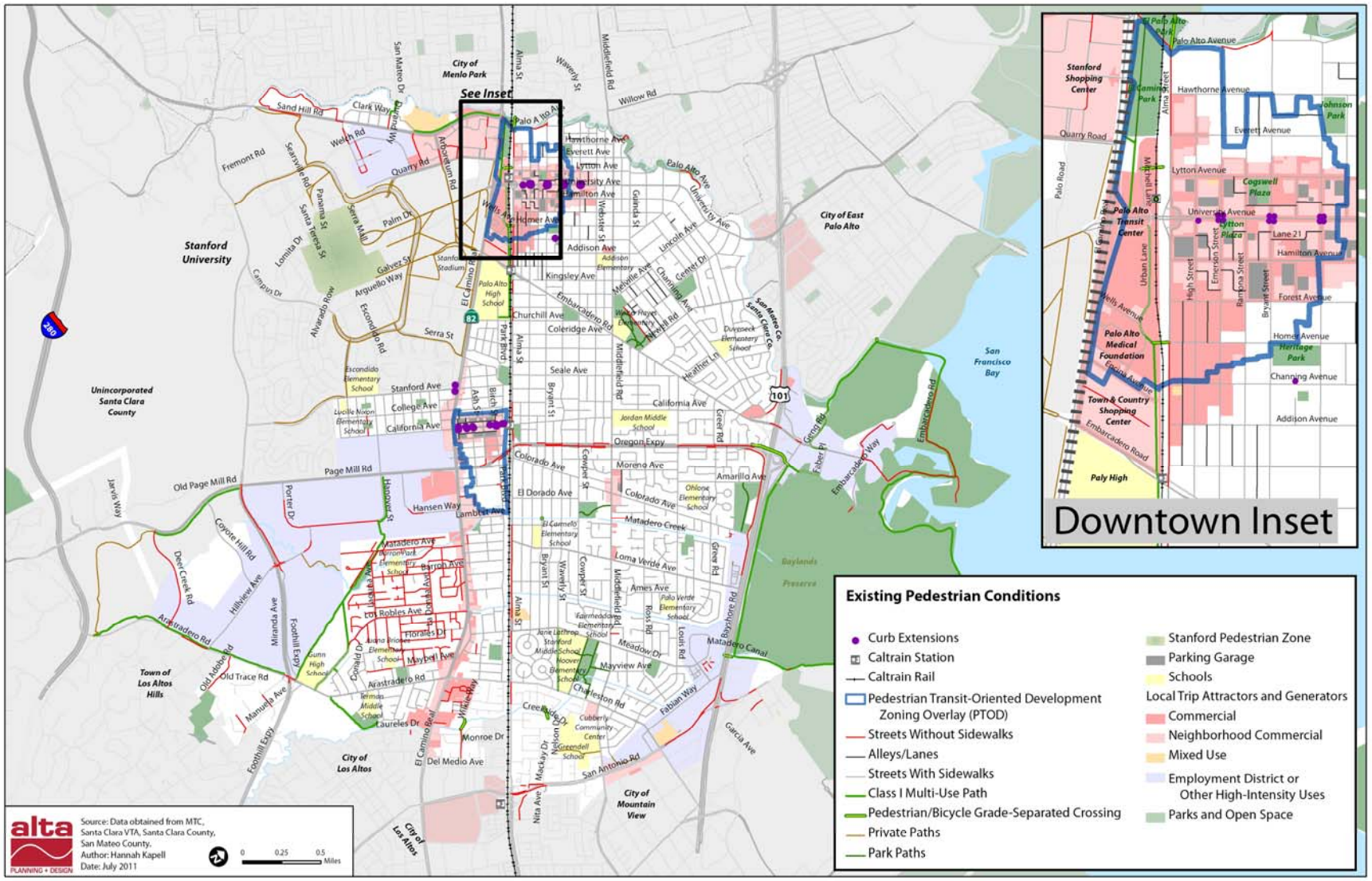

Map 3-2: Existing Pedestrian Conditions

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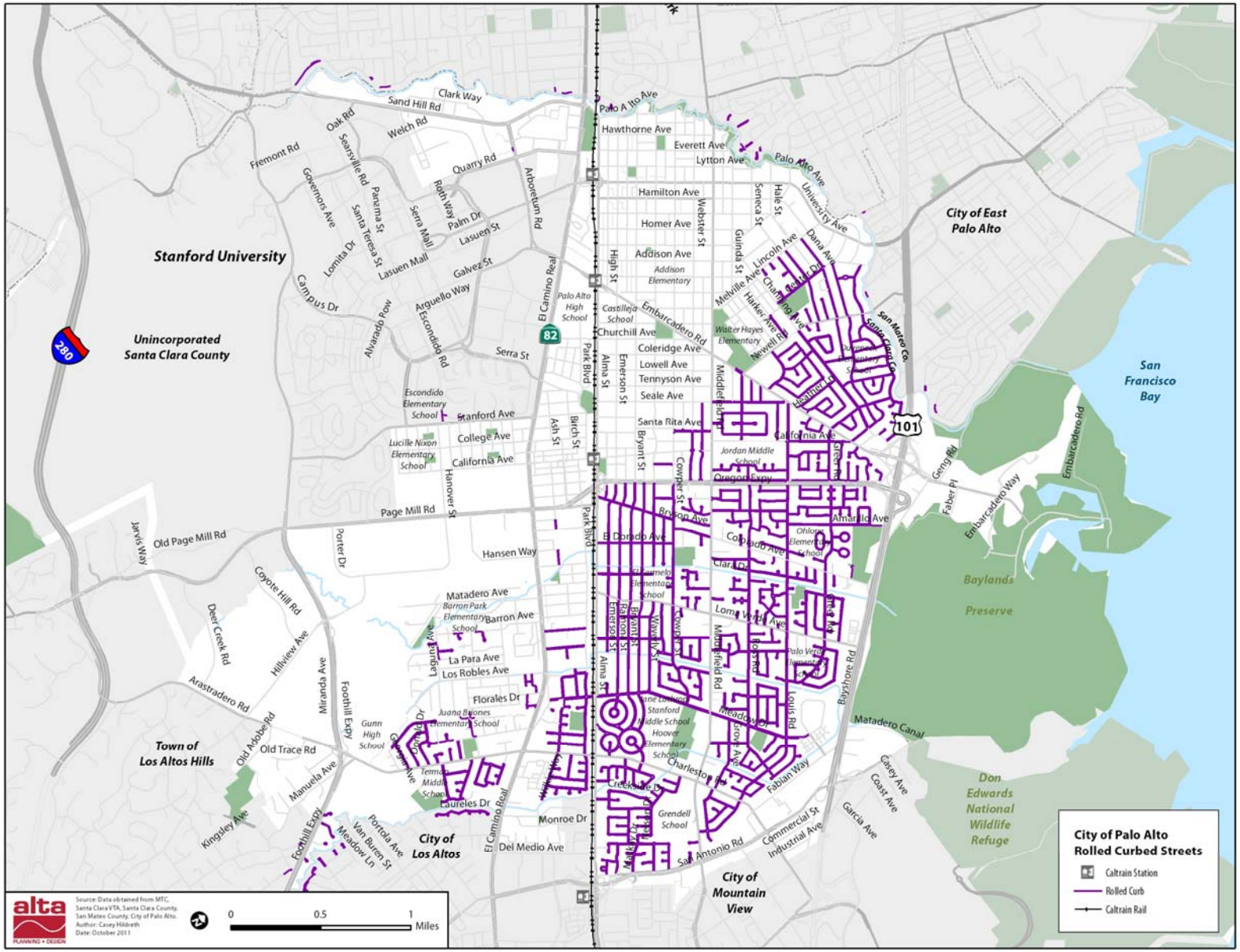

Map 3-3: Streets with Rolled Curbs

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3.1.2 Shared Facilities

Shared-Use Paths and Barrier Crossings

As the name implies, shared-use paths are off-road facilities where bicycle and pedestrian traffic mixes, which at times may cause conflict where bicycle speeds and/or peak volumes are high or where visibility is restricted. These potential conflict conditions are exacerbated where there is insufficient width to meet Caltrans Class I path standards (see **Figure 3-1** on page 3-14), such as in older parks and barrier crossings, and on several Stanford perimeter paths. In these locations barrier devices and/or signage may exist to force bicycles to dismount or take extra precautions.

Laguna Avenue at Matadero Creek, Barron Park Neighborhood.

Streets Without Sidewalks

Despite much of the city having a network of interconnected sidewalks, there are a few significant exceptions. As shown in **Map 3-3** the majority of streets in the Barron Park and Monroe Park neighborhoods have unimproved roadway edges or valley gutters without sidewalks due to the preference for maintaining a distinct rural character. Although in some instances a soft shoulder is available for pedestrian travel, most of these streets lack sufficient width for continuous facilities of any kind outside the travel way. Sidewalks are also not a preferred option for many residents concerned with maintaining neighborhood character, impacting creek riparian areas, or spending significant public resources in low-volume residential areas. Additional streets with significant sidewalk gaps on at least one side of the street include Alma Street (Caltrain side, which has no pedestrian destinations), Oak Creek and Palo Alto Avenues (along San Francisquito Creek), Oregon Expressway, San Antonio Road approaching Highway 101, and several streets within Stanford Research Park.

Service Alleys / Public Parking Lots

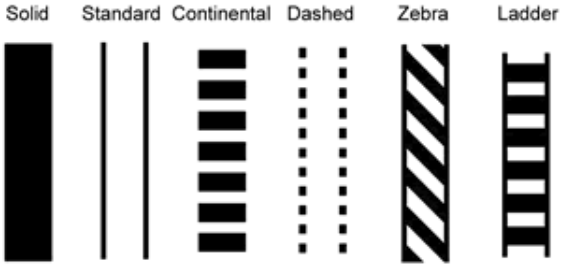
Most service alleys and publicly owned surface parking lots require pedestrians and vehicles to share the travel way. Distinct from streets without sidewalks, these facilities are typically narrower (alleys), next to commercial activity centers, and prone to safety concerns (sight distance issues, personal security) if not well lit or if accompanied by blank facades. Although not typically thought of as pedestrian facilities, the predominance of these features in both the Downtown and California Avenue Business Districts makes them especially relevant to existing conditions and as future improvement opportunities.

3.1.3 Intersection Facilities

Technically, intersection crossings are instances of shared space between motorists and vehicles. Temporary separation is achieved only through careful signing, striping, and/or signalization along with state and local laws that require motorists to yield for pedestrians. While inventory data was not available, specific locations and frequencies of the most prevalent intersection devices and controls are discussed below.

Unmarked Crossings

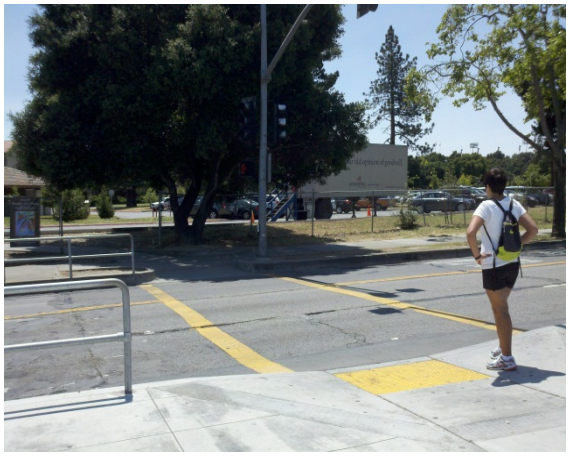
In California, it is legal for pedestrians to cross where any two streets intersect, except at unmarked, uncontrolled locations between adjacent signalized crossings or where crossing is expressly prohibited. In Palo Alto, the most common unmarked crossings are at stop-controlled intersections and between signals along arterial roadways where traffic control and pedestrian markings are not provided at minor street intersections.



Of the major types of crosswalk striping, the "Standard" crosswalk is most prevalent in Palo Alto.

Crosswalks

Marked crossings (crosswalks) reinforce the location and legitimacy of pedestrian crossing activity, and may be provided at either signalized or unsignalized intersections. Marking crosswalks at unsignalized locations with more than one lane of traffic per direction is discouraged without additional treatments. This is due to the "double threat" collision scenario where a near-lane vehicle whose driver yields to the pedestrian hides a far-lane vehicle whose driver does not see or anticipate the pedestrian. Only a handful of such crossings exist in Palo Alto, and several existing locations will be removed/improved with upcoming capital projects. Despite the limited number of multi-lane crossings, there are a number of unsignalized crosswalks across two-lane arterials where motorist compliance remains low (such as at the Churchill Avenue and Castilleja Avenue intersection).



In California, it is a standard that crosswalks are marked in yellow adjacent to school grounds.

The vast majority of crosswalks in Palo Alto are the "standard" parallel transverse stripes. Other less frequent striping patterns include "high visibility" zebra style crosswalks (an example of which is currently at Alma Street and Hamilton Avenue) and ladder striping (Arastradero Road at Terman Middle School and Gunn High School). In most new installations, an advance limit line (a solid stripe similar to those used at stop signs, set back four feet from the crosswalk) has been provided to limit encroachment by stopped vehicles.

Pedestrian Countdown Signals

A pedestrian countdown signal integrates a separate display for pedestrians that uses three phases: "walk," flashing "don't walk" with a countdown, and "don't walk." Pedestrian signals provide additional information regarding the amount of remaining time during the flashing "don't walk" pedestrian interval; the countdown displays may improve pedestrians' judgment about whether is safe to cross the intersection. Legally, pedestrians are prohibited from beginning to cross an intersection when the flashing "don't walk" display is initiated, although in practice this provision is consistently ignored or misunderstood by pedestrians and is rarely enforced. As a peripheral benefit, pedestrian countdown signals can aid bicyclists approaching an intersection in deciding whether or not to speed up to clear an intersection before the light changes.

Pedestrian countdown signals have been installed at various signal locations in Palo Alto, with the majority in commercial areas and business districts and on major arterials. The City has initiated a citywide replacement program. Completed in Fall 2011, the first phase replaced approximately one third of the City's traffic signals. Phase 2 is scheduled for Summer 2012. In addition, many downtown signals do not yet have a pedestrian signal.

Pedestrian Advance Lead and Scramble Signal Phases

Pedestrian Lead phases (a.k.a. "Leading Pedestrian Interval") and "All Pedestrian" phases (a.k.a. "Pedestrian Scrambles" or pedestrian-only phases) are signal options that allow staggered or exclusive pedestrian and vehicle movements to limit conflict at high volume intersections.

"Pedestrian Lead" phases begin the walk phase several seconds before adjacent motor traffic receives a green light, enabling pedestrians to occupy the crosswalk and improving their visibility to motorists preparing to turn. A leading pedestrian interval is deployed by the City of Palo Alto at the intersection of Alma Street and Homer Street, adjacent to the Homer Tunnel. Leading pedestrian intervals should be considered along high-vehicle volume corridors such as Embarcadero Road and San Antonio Road, and on Oregon Expressway-Page Mill Road with coordination from the County of Santa Clara.

"All Pedestrian" phases prohibit all vehicle movements while pedestrians cross, allowing for diagonal walking movements if desired. Targeted to improve safety, these phases can result in longer

University Avenue is one of the only Palo Alto roadways that has multiple curb extensions, among other unique features.

wait times for all modes, including pedestrians. Examples of this treatment currently exist at select intersections along Suggested Routes to School in Palo Alto, including Arastradero Road at Donald Drive-Terman Road and Embarcadero Road at Middlefield Road.

Future traffic signal timing should carefully consider All Pedestrian phases on University Avenue in the Downtown during peak hours, as well as in new streetscape projects to improve pedestrian crossings and maintain vehicle progression.

Curb Ramps

Curb ramps are transitions between the sidewalk and legal roadway crossings that provide a smooth grade change for pedestrians – in particular patrons with disabilities and other wheeled devices – and for bicyclists dismounting or reaching a nearby parking spot. An intersection corner may contain one or two curb ramps depending on the location of signal poles, traffic controller cabinets, drainage inlets, private property boundaries, and other potential complicating factors. Generally speaking, curb ramps must be 'readily accessible to and usable by' persons with disabilities in order to comply with the intent of the Americans with Disability Act (ADA), although best practice guidelines provide specific designs for various curb ramps. Such guidance includes FHWA's *Designing Sidewalks and Trails for Access, Part II* (2001) as well as the pending *Public Rights-of-Way Accessibility Guidelines* from the Access Board (Draft 2011).

The series of non-conforming curb ramps and isolated islands across Palm Drive and the El Camino Real off ramps makes walking or biking to downtown or the transit center much less inviting.

Curb Extensions

Curb extensions, or "bulbouts," are extensions of the sidewalk into the adjacent parking lane(s) that help reduce pedestrian crossing distances and vehicular turning radii, which is a major factor in how fast vehicles are able to turn. Curb extensions also provide more sidewalk space for pedestrian queuing, landscaping, seating, and other amenities. Except along the University Avenue and California Avenue corridors, very few curb extensions exist in Palo Alto. Within these business district corridors, curb extensions exist along all four corners of University Avenue at Emerson Avenue, Bryant Street, Cowper Street,

Clockwise from top right: Pedestrian wayfinding in downtown; art, seating, and outdoor cafe along California Avenue; traffic control cabinet art.

and Waverly Street. A brick low-level wall separates the single curb bulb at the southeast corner of High Street. An additional four or five pairs of curb extensions are located on California Avenue, which will likely see an increase of curb bulbs with the upcoming streetscape design project.

Medians (Refuge Islands)

Center medians and pedestrian refuge islands enable pedestrians to wait after crossing one direction of motor traffic, which are especially valuable on long crossings of busy thoroughfares such as El Camino Real, Oregon Expressway, and San Antonio Road. According to the Department of Public Works, the City maintains 388 medians, islands, gateways, and traffic diverters. Many of these medians are landscaped for much of their length yet still allow pedestrians to wait safely before finding a gap in traffic or waiting for a green signal phase.

Channelized Right Turn, or "Pork Chop" Islands

Commonly referred to as "pork chop" islands due to their shape, these triangular medians separate right-turning traffic from through-traffic in an effort to accommodate pedestrians while maintaining high automobile levels of service. In older designs, narrow islands with curb ramps often force up-and-down movements that can be difficult for mobility-impaired persons. Newer designs provide smoother at-grade pedestrian cut-throughs yet still provide for fast-moving vehicle turns.

The conversion of pork chop islands to widened sidewalks with bulb-outs is an increasingly popular approach to improve the pedestrian realm and create "Complete Streets" for all users. The City of Palo Alto has an active demonstration project at the intersection of El Camino Real and Stanford Avenue that includes the conversion of two pork chop island facilities. Removal of these islands can result in increased delay to vehicles and impacts upon freight mobility where heavy right turn movements exist, and thus should be studied carefully before being implemented. Additional locations for consideration in Palo Alto can include intersections such as El Camino Real at Arastradero Road or Charleston Road.

Pedestrian "Support Facilities"

Trees and landscaping, shelter from rain and wind, wayfinding, public art, pedestrian-scale lighting, seating, newspaper-box corrals, sidewalk cafes, and many other interesting design features are all important components of the pedestrian realm in Palo Alto. These amenities are strongly encouraged in *Comprehensive Plan* policies and programs, many of which are enforced and/or encouraged through design guidelines in the Municipal Code.

3.2 Existing Designated Bikeways

In California, Caltrans designates three facility design types for bicyclists: Class I, II, and III Bikeways. **Figure 3-1** shows their general design standards. Palo Alto also has several enhanced Class III routes known as bicycle boulevards (including Bryant Street, the nation's first). These streets' distinctive characteristics are discussed separately below. In total, Palo Alto has nearly 65 miles of existing bikeways. **Map 3-4** illustrates the location of these bikeways.

The *Santa Clara Countywide Bicycle Plan* identifies Cross-Country Bicycle Corridors (CCBCs) in Palo Alto, which are routes that connect between jurisdictions in the county. The following tables indicate routes that are designated CCBCs.

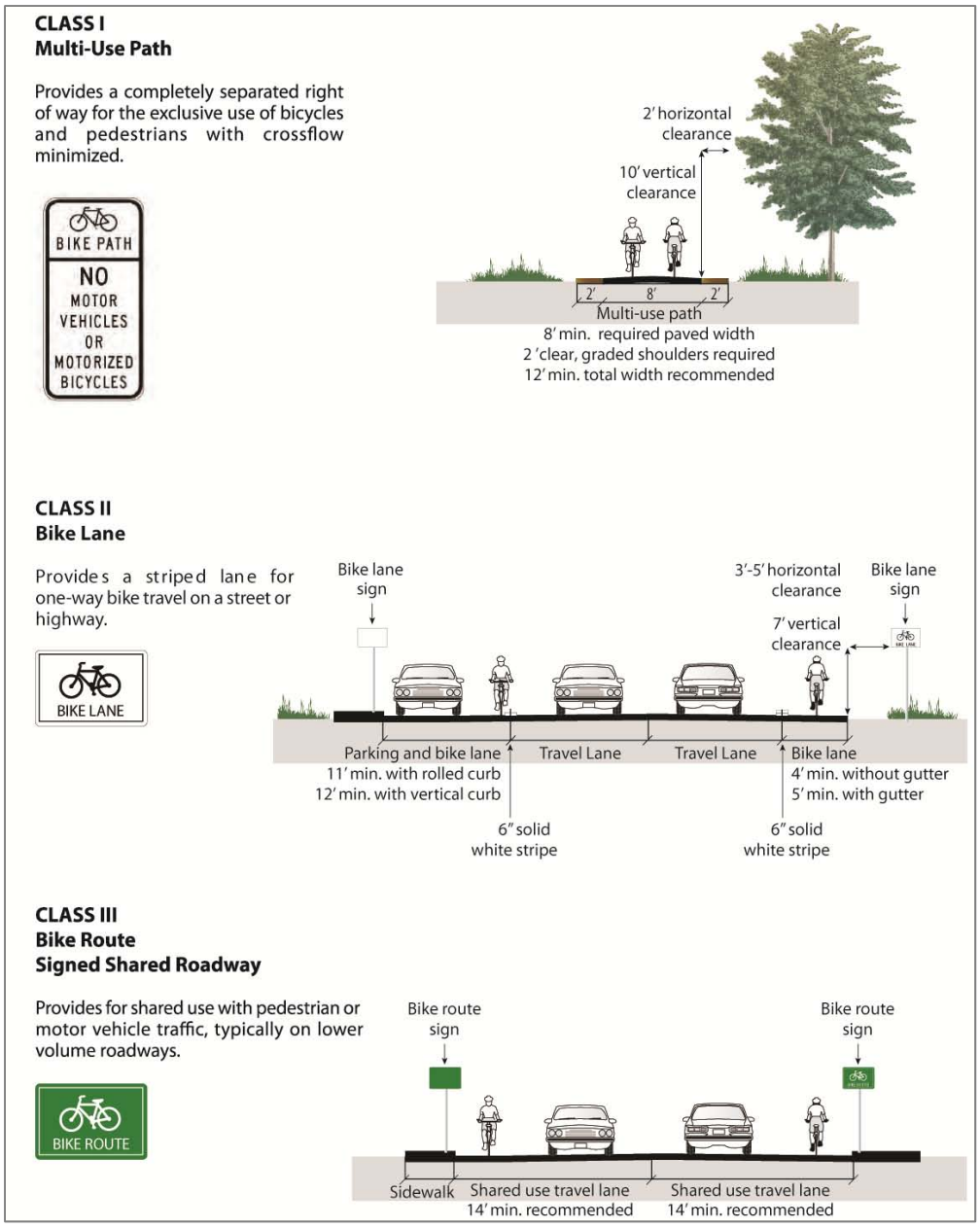


Figure 3-1: Caltrans Bikeway Classifications

Class I Bikeways/Multi-Use Paths

Class I bikeways are also referred to as multi-use or shared-use paths. They are physically separated from a roadway by either at least five feet of landscape or an impact barrier. Class I facilities are for exclusive use of non-motorized transportation modes and must have a minimum paved width of eight feet as well as two-foot wide graded shoulders. Palo Alto has 15.3 miles of Class I paths, as well as many additional paths that are physically separated from traffic but whose narrow widths and/or surface treatments do

not meet Class 1 requirements. Many paths on the Stanford University campus also do not qualify as Class I facilities but are a significant component of the greater Palo Alto area's bicycle and pedestrian network. Although these "private paths" are not included in the existing bikeway table, every effort has been made to include them on the Existing (and Proposed) Bikeways Map.

The *Santa Clara County Trails Master Plan Update* (1995) designates three levels of trails: Regional, Subregional, and Connector, and the Plan discusses all regional and subregional trails. The only regional trail in Palo Alto is the San Francisco Bay Trail (R-4), which incorporates both the Baylands Preserve Path and East Palo Alto Baylands. Sub-regional trail routes provide recreation and transportation benefits, connecting to rail stations, bus routes, park-and-ride facilities, connecting between cities, and providing long-distance loop trail opportunities. The only proposed sub-regional trail in Palo Alto is the Matadero Creek/Page Mill Trail (S1). Finally, Connector routes provide convenient access from urban and developed areas and public lands to Regional and Sub-Regional trails. In Palo Alto, the San Francisquito/Los Trancos Creek trail (C1), Adobe Creek trail (C-2), and the Hetch-Hetchy trail (C-4) are designated Connectors.[12] **Table 3-1** lists the existing multi-use paths and park paths in Palo Alto.

Table 3-1: Existing Class I Multi-Use Paths/Park Paths *

Location	Extent	Mileage
Arastadero Road Path (CCBC 05C-17c/x)	Miranda Avenue - Los Altos Hills	1.3
Baylands Preserve Path	Faber Place - Don Edwards National Wildlife Refuge	1.9
E. Palo Alto Baylands	Santa Clara County Line - Weeks Street	5.5
El Camino Park Path (CCBC 02-2a)	Quarry Road - University Circle	0.2
Caltrain Bike Path (CCBC 02-2b)	University Avenue - Churchill Avenue	0.9
Gunn High School Eastside Path	Gunn High School Path - Arastradero Road	0.7
Bol Park Path	Hanover Street - Arastradero Road	1.2
Hanover Street	Page Mill Road - Gunn High School Path	0.3
JLS and Hoover School MUP	Meadow Drive - Charleston Road	0.4
Page Mill-Arastradero Connector**	Junipero Serra Boulevard - Arastradero Road	1.0
San Mateo Drive Path	San Mateo Drive - Clark Way	0.1
Sand Hill Road Path	El Camino Real - Clark Way	0.6
Terman Park Path	Arastradero Road - Glenbrook Drive	0.4
Total Class I Multi-Use Paths		***13.9***

** Some "park paths" and other trail segments may not conform strictly to Class I width standards, although generally they are of a higher quality than private paths and trails.*
*** Corridor is only partially in the City of Palo Alto.*

[12] *The Santa Clara County Trails Master Plan Update is available here:* http://www.parkhere.org/portal/site/parks/parksarticle?path=%252Fv7%252FParks%2520and%2520Recreation%252C%2520Department%2520of%2520%2528DEP%2529&contentId=d6d18432dca3e210VgnVCM10000048dc4a92

Class II Bikeways

Class II bikeways are striped lanes on roadways for one-way bicycle travel. Class II bike lanes on street segments without parking must be at least four feet wide including any concrete gutter, with at least three feet of asphalt. Bike lanes on streets with parallel parking must be at least five-feet wide, although many communities, including the Valley Transportation Authority's (VTA) Bicycle Technical Guidelines, have adopted wider minimum width standards to reduce potential conflict with the "door zone" and to encourage a wider range of bicyclists.

The City of Palo Alto has over 30 miles of Class II bike lanes, which exhibit a variety of widths and quality. Some of the City's bike lanes are time-restricted and revert to vehicle parking in the evenings and on weekends. More detail on time-restricted, buffered, floating, and green painted bicycle lanes are included in *Appendix A: Design Guidelines.*

Table 3-2: Existing Class II Bike Lanes in Palo Alto

Location	Start	Mileage
Alma Street	Palo Alto Avenue - Lytton Avenue	0.3
Bayshore Parkway	San Antonio Avenue - Garcia Avenue	0.3
California Avenue (CCBC 03-4a)	Middlefield Road - Alma Street	0.6
California Avenue (CCBC 03-4d)	El Camino Real - Hanover Street	0.5
Castilleja Avenue(CCBC 02-3)	Park Boulevard - El Camino Real	0.2
Channing Avenue/Addison Avenue	Bryant Street - St. Francis Drive	1.8
Charleston Road/Arastradero Road (CCBC 01-5/CCBC 05C-17a)	Foothill Expressway - El Camino Real	2.4
Churchill Avenue	Bryant Street - El Camino Real	0.5
Coleridge Avenue	Bryant Street - Middlefield/Embarcadero	0.4
Cowper Street	Loma Verde Avenue - East Meadow Drive	0.6
Deer Creek Road	Page Mill to Arastradero Road/Trail	0.7
East Bayshore Road	Embarcadero Road - San Antonio Avenue	1.9
Embarcadero Road (CCBC 03-1a/ CCBC T-R4-1y)	Embarcadero Way - East Bayshore Road	0.6
Foothill Expressway	Page Mill Road - Los Altos Line	2.4
Hanover Street	California Avenue - Hillview Avenue	0.7
Hansen Way	Page Mill Road - El Camino Real	0.6
Hillview Avenue	Hanover Street - Arastradero Road	1.1
Loma Verde Avenue	Louis Road - Bryant Street	0.9
Los Robles Avenue/El Camino Real	Meadow Drive - La Donna Avenue	0.4
Louis Road	Embarcadero Road - Charleston Road	2.3
Lytton Avenue	Middlefield Road - Alma Street	0.6
Meadow Drive	Fabian Way - El Camino Real	1.6

Location	Start	Mileage
Middlefield Road (CCBC 01-6)	Loma Verde Avenue - Keats Court	1.3
Miranda Avenue	Arastredero Road - Hillview Avenue	0.8
Newell Road	Edgewood Drive - California Avenue	1.1
Page Mill Road (CCBC 03-6)	El Camino Real - Berry Hill Court	1.4
Palo Alto Avenue	Alma Street - El Camino Real	0.1
Pasteur Drive	Sand Hill Road - Loop	0.5
Porter Drive	Page Mill Road - Hanover Street	0.4
Quarry Road	El Camino Real - Quarry Extension	0.7
Sand Hill Road	San Francisquito Creek - El Camino Real	1.6
St. Francis Drive	Channing Avenue - Embarcadero Road	0.1
Stanford Avenue	El Camino Real - Amherst Street	0.8
University Avenue	San Franciscquito Creek - Middlefield Road	1.0
Vineyard Lane	Sand Hill Road - Quarry Road	0.2
Welch Road	Quarry Road - Campus Drive	0.5
West Bayshore Road*	Amarillo Avenue - East Meadow Drive	1.3
Total Class II Bicycle Lanes:		***33.2***
Northbound Bicycle Lanes/Southbound Sharrows		
California Avenue	Louis Road - Middlefield Road	0.4
Colorado Avenue	Middlefield Road - Louis Road	0.4
Total Northbound Bicycle Lanes/Southbound Sharrows Class II Bicycle Lanes		***0.9***

* *On W. Bayshore Road between Amarillo Avenue and Matadero Creek, there is no southbound bicycle lane.*

Table 3-3: Existing Class II Bike Lanes in Unincorporated Santa Clara County

Location	Start	Mileage
Campus Drive	Searsville Road - Sam MacDonald Mall	1.4
Escondido Road	Campus Drive - Stanford Avenue	0.4
Junipero Serra Boulevard	Alpine Road - Page Mill Road	2.4
Palo Road	Palm Dr - Quarry Road	0.2
Peter Coutts Road	Stanford Avenue - Page Mill Road	0.6
Serra Street	Galvez Street - Campus Drive	0.3
Total Class II Bicycle Lanes:		***5.3***

Class III Bikeways

Class III bikeways are signed bike routes where bicyclists share a travel lane with motorists. Typical applications for Class III bike routes include roadways with bicycle demand but without adequate space for Class II bike lanes, low-volume streets with slow travel speeds, especially those on which volume is low enough that passing maneuvers can use the full street width, and as "gap fillers" for breaks in Class II lanes.

Palo Alto has eight miles of Class III bicycle routes, most of which are signed routes only and do not contain shared lane marking ("sharrow") markings. Application of sharrows is discussed in the proposed design guidelines. High-demand Class III bikeway corridors under 2,000 vehicles per day (vpd) and over a half-mile in length may be considered for designation as bicycle boulevards.

Table 3-4: Existing Class III Bikeways

Location	Extent	Mileage
Armarillo Avenue	Bayshore Road - Louis Road	0.5
California Avenue (CCBC 03-4c)	Park Boulevard - El Camino Real	0.3
Campus Drive	Junipero Serra Boulevard - Arguello Mall	0.7
Clark Way	Vineyard Lane - Pasteur Drive	0.6
Colorado Avenue	Cowper Street - Middlefield Road	0.2
Cowper Street	Coleridge Avenue - Loma Verde Avenue	1.4
Cowper Street	Colorado Avenue - El Dorado Avenue	0.1
Durand Way	San Mateo Drive - Sand Hill Road	0.1
Hanover Street (CCBC 03-5)	Stanford Avenue - California Avenue	0.3
Lomita Drive	Santa Teresa Street - Mayfield Avenue	0.2
Mayfield Avenue	Lomita Drive - Campus Drive	0.3
Nelson Drive/Mackay Drive	Adobe Creek - San Antonio Road	0.5
Oregon Avenue	Sierra Court - St. Francis Drive	0.1
Redwood Circle/Carlson Circle/Duncan Place	Bryant Street - Adobe Creek	0.4
San Antonio Road (CCBC 05C-13)	Byron Street - Alma Street	0.5
Santa Teresa Street	Campus Drive - Lomita Drive	0.5
Serra Mall	Via Ortega - Galvez Street	0.6
St. Francis Drive	Embarcadero Road - Oregon Avenue	0.3
Via Ortega	Serra Mall - Campus Dr	0.0
Waverly-Lathrop Connector	Waverly Street - Lathrop Middle School Path	0.1
Wilkie Way*	Charleston Road - Wilkie-Miller Bridge	0.3
Total Class III Bikeways (excluding bicycle boulevards)		8.0

** Wilkie Way lacks signs and pavement markings along this section.*

Bicycle Boulevards

Bicycle boulevards are signed, shared roadways with especially low motor vehicle volume, such that motorists passing bicyclists can use the full width of the roadway. Bicycle boulevards prioritize convenient and safe bicycle travel through traffic calming strategies, wayfinding, and other measures. One key feature is that unwarranted stop signs are "turned" - removed from the boulevard and placed on cross streets, improving bicyclists' average speed by minimizing unneeded stops. Palo Alto's Bryant Street was the first bicycle boulevard created in the U. S. The Bryant Street Bicycle Boulevard was recently renamed the Ellen Fletcher Bicycle Boulevard, after the former Vice Mayor, a local bicycle activist and Holocaust survivor.

Palo Alto defines a bicycle boulevard as a local street with low traffic speeds and volumes that contains several of the following key elements:

- Motor vehicle through-traffic is made aware of bicyclists with shared lane markings and discouraged through traffic calming measures such as speed humps and traffic circles, as well as barriers and diverters.
- Free-flow travel for bicycles is promoted by assigning the right-of-way to the bicycle boulevard at most intersections. To achieve this, unwarranted stop signs are removed for vehicles traveling on the bicycle boulevard but retained for vehicles crossing the boulevard.
- Traffic signals and other crossing enhancements are used at intersections with arterial streets, and wait times for bicyclists are minimized through the use of signal actuators that enable bicyclists to trigger the signal.
- Bridges, tunnels, or bike paths are used along a segment of the bicycle boulevard and may not allow motor vehicles to pass through.
- Reasonably continuous streets with few jogs composed primarily of straight segments at least a half mile in length.

The Bryant Street Bicycle Boulevard is exemplary, as it contains all of the elements of a bicycle boulevard. A 1982 study found that motor vehicle volumes remained consistently under 1,000 vpd along the Bryant Street corridor, despite reorientation of stop signs that also removed restrictions on through-movement for automobiles. In addition to turning stop signs, other common measures in Palo Alto to slow traffic and prioritize bicycle travel include traffic diverters, speed humps, traffic circles, and pedestrian/bicycle-only creek bridges.

Palo Alto currently has 4.2 miles of bicycle boulevards, with another 2.5 miles planned for official designation in 2011 along the Castilleja-Park-Wilkie corridor.

Table 3-5: Existing Bicycle Boulevards

Location	Extent	Mileage
Bryant Street	Redwood Circle - Palo Alto Avenue (CCBC 01-3)	3.8
Maybell Avenue	El Camino Real – Donald Drive	0.6
Total Bicycle Boulevards		***4.2***

3.2.1 Neighboring Community Bikeway Connections

Both the Santa Clara County Valley Transportation Authority (VTA) and San Mateo County have designated bikeways of regional significance that traverse or connect to the City of Palo Alto. Additionally, local bikeways in the cities of Menlo Park, East Palo Alto, Mountain View, and Los Altos/ Los Altos Hills connect at the city border.

Table 3-6 lists bikeway connections from the City of Palo Alto to other Santa Clara County communities, ordered counterclockwise from the northern county line. **Table 3-7** lists the connections between San Mateo County bikeways of countywide significance and the City of Palo Alto, ordered from southwest to northeast. The table includes connections to recreational routes such as Page Mill Road and commute routes such as Middlefield Road and Willow Place Path.

Table 3-6: Connections between Palo Alto and Santa Clara County/Los Altos/Mountain View

Location	Adjacent Community Facility	Palo Alto Facility	Notes
Welch Road	Class II	Existing Class II	Connection to Stanford
Quarry Road	Private path	Existing Class II	Connection to Stanford
Park Boulevard/ Serra Street	Private path	Existing Class II	Connection to Stanford
Stanford Avenue	Private path	Existing Class II; proposed Class I	Bay to Ridge Trail segment
Page Mill Road	Class I and Class II	Existing Class I	Primarily recreational
Foothill Expressway (north)	Class II	Existing Class II	
Arastradero Road	Class I	Existing Class I	Primarily recreational
Hillview Avenue	No facility	Existing Class II	Connection to Los Altos Hills
Foothill Expressway (south)	Gap, then existing Class III	Existing Class II	Connection to Los Altos and Cupertino
Hetch Hetchy easement	Class III on Los Altos Avenue via Class I trail segment	Existing Class I (Palo Alto-Los Altos Bike Path)	Connects to Gunn High School
El Camino Real	Class II on San Antonio Road	Class III arterial bikeway	Adjacent private development may include Class I bikeway
Miller Avenue/ Monroe Drive	Proposed Class III on Del Medio Avenue; Existing Class II on California Street	Proposed bicycle boulevard	Connects north to Castilleja-Park-Wilkie Bicycle Boulevard; connection to Mountain View/San Antonio Road and to Los Altos via the Wilkie-Miller bridge and proposed path behind Palo Alto Bowl
Cesano Court / Palo Alto Bowl	Existing Class III designation along Los Altos Avenue	Proposed Bicycle Boulevard and Class I trail connection	School commute route into Los Altos across El Camino Real

Location	Adjacent Community Facility	Palo Alto Facility	Notes
Alma Street	Connects to Class II on Showers Drive via future Mayfield underpass	Proposed Class III arterial bikeway	CCBC 02-1
Mackay Drive	Gap on Nita Avenue, Class III on Laura Lane	Existing Class III; Proposed bicycle boulevard	Continues north as Bryant Street Bicycle Boulevard
Middlefield Road	Class II	Proposed Class III at San Antonio Road; Existing Class II	Mountain View connection; several block gap around San Antonio Road
Charleston Road	No facility	Gap; Existing Class II; Proposed enhanced bikeway; Proposed Class II from Fabian Way to Mountain View	Mountain View connection
Bayshore Parkway	Class II Bike Lanes	Class II Bike Lanes	Connection to Garcia Avenue

Table 3-7: Connections between Greater Palo Alto and San Mateo County

Location	San Mateo Facility	Palo Alto Facility	Notes
Page Mill Road	Proposed Class III	Existing Class II	Recreational
Sand Hill Road	Class I and II	Existing Class I and II	
San Mateo Drive	Class III	Clark Way Class III	Connects via existing overcrossing
El Camino Real	Proposed Class III	Existing private paths; No existing on-street facilities	Bicycle accommodation TBD
Alma Street	Class II	Existing Class I and II	Creek overcrossing with connecting paths (CCBC 02-1)
Willow Place Path	Class I	Palo Alto Avenue Class III; Bryant Street Bicycle Boulevard	Part of the North-South Bikeway identified by the Silicon Valley Bicycle Coalition
Middlefield Road	Class II	None; proposed Class III	Part of the North-South Bikeway identified by the Silicon Valley Bicycle Coalition
Pope Street	Class III	Proposed Chaucer-Boyce Bicycle Boulevard	Pope-Chaucer Bridge over San Francisquito Creek
University Avenue	Proposed Class II	Class II	Proposed Highway 101 overcrossing near University Avenue
East Bayshore Road	Proposed/ Existing Class II	Existing Class I and II	Bay Trail
Golf Course Path (Bay Trail)	Class I	Class I	Upgrade approaches to existing Highway 101 overcrossing at Oregon Expressway

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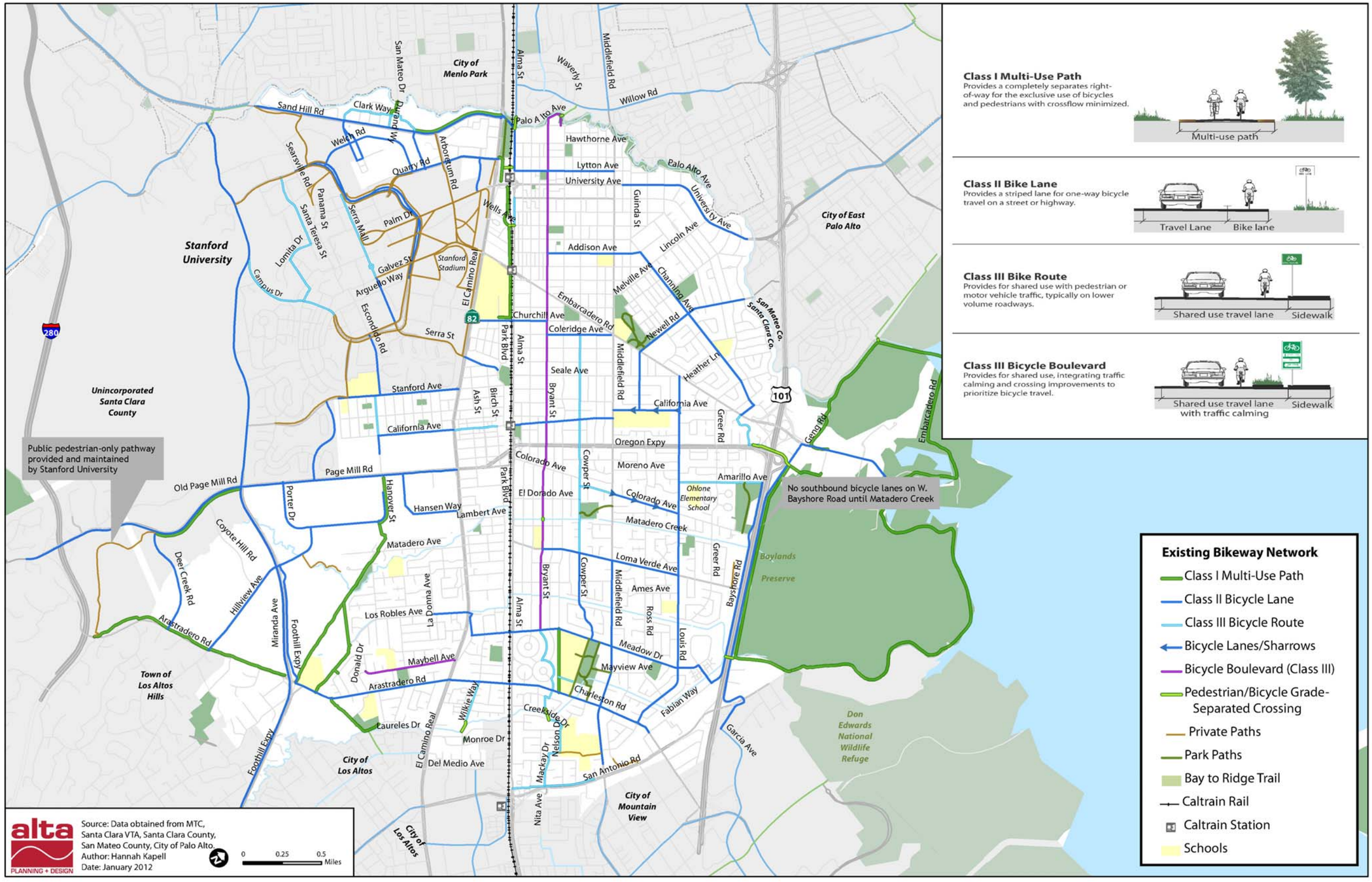

Map 3-4: Existing Bikeways

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3.3 Pedestrian and Bicycle across Barrier Connections

Non-motorized travel within Palo Alto is constrained by several key linear barriers. In the north-south direction these include El Camino Real (State Route 82), Highway 101, and the Caltrain/Alma Street corridors. In the east-west direction these include four creek corridors (San Francisquito, Matadero, Barron, and Adobe). The provision and location of barrier connections is a fundamental consideration for non-motorized travel, and there are currently long stretches where no such crossings exist. Below is a summary of existing pedestrian- and bicycle-only barrier connections. While Highway 280 is outside of the city boundary and is thus not listed as a City facility, the City strongly supports bicycle improvements and is working continually with the County to develop concept improvement plans.

3.3.1 Caltrain Undercrossings

Caltrain bisects Palo Alto in the north-south direction. While the train itself facilitates regional multimodal trips, the tracks and adjacent Alma Street corridor are a barrier to east-west bicycle and pedestrian circulation.

Homer Avenue

The Homer Avenue Caltrain undercrossing for pedestrians and bicyclists opened in 2004. Its well-designed tunnel enables bicyclists to ride their bikes separate from pedestrians between the South of Forest Area (SOFA) neighborhood to the east and the Palo Alto Medical Foundation (PAMF) and Caltrain corridor path to the west side. The structure is 18 feet wide and 70 feet long with lighting and two skylights. The undercrossing roughly aligns with the Palo Alto Medical Foundation signal at El Camino Real, whose western leg has a path connecting to Stanford's Lasuen Mall/path. Because of the potential importance of this axis as a Stanford non-motorized commute corridor, pedestrians and bicyclists would benefit from a more intuitive, signed connection between the undercrossing and signal. On the east side of the undercrossing, making Homer Avenue bidirectional for one or more blocks would create a direct bicycle connection to downtown and areas east of High Street.

The Homer Street Underpass is the most recent barrier crossing improvement in the City of Palo and accommodates both pedestrians and bicyclists.

Palo Alto Transit Center

Two undercrossings are located in the transit center at Palo Alto Station, one along the University Avenue sidewalks under Alma Street and the tracks, the other underneath and across the Caltrain station platforms approximately one block to the north. Because both tunnels are relatively narrow for the peak pedestrian volume they serve, bicyclists are required to walk bicycles through them, although two-way riding is common on the University Avenue sidewalks. Many short- and long-term improvements have

been previously suggested in this area, including a wider sidewalk tunnel on the north side of University Avenue, a new undercrossing facility near Everett Avenue (at the north end of the station complex), and a transformative overhaul of the University Avenue interchanges with Alma Street, El Camino Real, Caltrain, and Palm Drive. The combined usage of the transit center undercrossings is almost certainly the highest among all barrier crossings in Palo Alto, although specific figures are not available.

California Avenue

The California Avenue undercrossing is located at Palo Alto's other Caltrain station and connects the California Avenue business district and Evergreen Park/Ventura neighborhoods with Old Palo Alto and Midtown. It is heavily used due to its central location and the long distances to the next closest surface crossings to the north (Churchill Avenue, 0.6 miles) and south (Meadow Drive, 1.3 miles). The current tunnel should be further evaluated for compliance with ADA standards. The City should pursue opportunities for future compliance such as California High Speed Rail or Caltrain Electrification projects. Because of unsafe speeding by bicyclists and skateboarders, two uninviting but effective "maze" railings force bicyclists to walk their bikes. These mazes render the undercrossing awkward for bicycles towing short cargo and child trailers, and impassible to long bicycle cargo trailers. Bicyclists are asked to walk their bikes, but they do not always do so, which makes the area challenging for pedestrians who are also negotiating through the railings with bicyclists.

The California Avenue undercrossing is frequently used, but it is narrow andchallenging for pedestrians with disabilities.

Major connectivity and bicycle parking improvements are proposed and funded as part of the California Avenue streetscape project, with additional access from the west provided by the Castilleja-Park-Wilkie Bicycle Boulevard. Bicycle lanes and low traffic volumes on N. California Avenue provide good bicycle access from the east, while Jerry Bowden Park and the Oregon Expressway interchange at Alma Street provide mixed conditions for pedestrians. Santa Clara County intends to study the replacement of the Alma Street/Oregon Expressway bridge and should identify opportunities for improved connections from the southeast. The *Santa Clara Countywide Bicycle Plan* identifies the Alma Street Caltrain undercrossing as project 03-4b.

Embarcadero Road

Embarcadero Road's underpass of Alma Street and the Caltrain line has wide sidewalks on both sides. Over 1,600 bicyclists used these sidewalks during a 12-hour period in 1978. In part because of the addition of the Homer Avenue undercrossing, Embarcadero's sidewalks now see only a fraction of this activity, yet they remain an important connection for many residents. The sidewalks in this undercrossing are of a similar design quality to those at University Avenue and they provide direct access to the Town & Country Shopping Center, Palo Alto High School (usually referred to as "Paly High"), and the Caltrain Path. Connectivity on the east side is made especially difficult by the confluence of several skewed

intersections, while high traffic volumes and speeds limit the overall comfort of the undercrossing, particularly from the west.

3.3.2 Highway 101 Over/Undercrossings

Adobe Creek Undercrossing

Despite being open only five months out of the year due to seasonal flooding, the Adobe Creek Underpass carries an estimated 43,000 annual users.

The undercrossing of Adobe Creek at Highway 101 is a popular access point for the Baylands and Shoreline Park levee trails and other destinations, including Twisters Sports Center. It is generally only open for six months (April 15 – October 15) because the path surface is only one foot above dry-season water level and is regularly covered with mud and debris by even moderate storm flows. The undercrossing can be open for only a few months during unusually wet years. In the 2011-12 winter season, the City worked with the Santa Clara Valley Water District (SCVWD) to better accommodate community use by extending the use period of the tunnel to align with weather conditions. This year the tunnel was open for an additional six weeks.

The underpass is accessible from the west side of the highway via Class II bicycle lanes on W. Bayshore Road and from the east via bike lanes on E. Bayshore Road as well as an extensive network of Class I trails that extend to East Palo Alto and Mountain View. Two sets of mazes – one at the E. Bayshore access point and one on the poorly-lit curve under the highway – create low-speed points intended to minimize conflicts between pedestrians and bicyclists, but which seriously deter bicycle trailers and persons with mobility assistance devices (e.g. wheelchairs). An estimated 40,000 bicyclists and 3,000 pedestrians use the underpass during each of its half-year open periods. The *Santa Clara Countywide Bicycle Plan* identifies the Adobe Creek undercrossing as project 02-6.

Embarcadero Road Overcrossing

The overpass at Embarcadero Rd is part of the Bay to Ridge Trail, which provides a connection from the open space preserves of the Foothills through Stanford University and California Avenue business district to the Bay Trail.

The pedestrian/bicycle overpass south of Embarcadero Road near Oregon Expressway spans over 1,000 feet between St. Francis Drive/Oregon Avenue and E. Bayshore Road. Part of the designated Bay to Ridge Trail, it is the only existing year-round non-motorized crossing of Highway 101 in Palo Alto. The bridge is narrower than current Class I standards and technically requires bicycles to be walked. The east and west approaches are both located in relatively isolated locations and are in need of comprehensive upgrades to improve accessibility, visibility, and wayfinding. A recent count effort identified 49 bicycles and 12 pedestrians using the

overpass during a weekday evening peak period, which equates to nearly 100,000 estimated annual users according to a non-motorized travel demand model (Alta's Seamless Travel Demand Model) developed for and used by Caltrans. The *Santa Clara Countywide Bicycle Plan* identifies the Adobe Creek undercrossing as project 03-1b.

3.3.3 Non-Motorized Creek Bridges

Six pedestrian- and bicycle-only bridges help connect important bikeways and pathways within Palo Alto. Three are located along San Francisquito Creek – two at Palo Alto Avenue in Downtown North, and one west of El Camino at Clark Way/Durand Way connecting to San Mateo Drive in Menlo Park. One bridge each across Matadero and Adobe Creeks provides exclusive through-access for bicycles and pedestrians on the unofficial southern end of the Bryant Street Bicycle Boulevard. A second bridge across Adobe Creek connects Monroe Park to Wilkie Way and the soon-to-be upgraded Castilleja-Park-Wilkie Bicycle Boulevard. These bridges are identified on both the existing and future bikeway maps.

3.4 Bicycle Support Facilities

The on-street bicycle parking "corral" at the Coupa Café provides bicycle parking without impeding the sidewalk for pedestrians.

Bicycle Parking

Bicyclists, like motorists, need a place to store their vehicle, whether a sidewalk rack to grab a coffee or a more secure bicycle locker or cage for all-day parking near transit. Vandalism, theft, and inconvenience are all main concerns for bicyclists, who typically expect parking close to their destinations. Where adjacent parking facilities are not available, bicyclists tend to lock their bikes to street fixtures such as trees and sign poles. Use of street fixtures other than bicycle racks is problematic due to impacts to pedestrian facilities, instability of the locked bicycle, and deterioration of the streetscape and Complete Street concepts. Bicycle parking is classified as short- or long-term, each with distinct standards for type, capacity and placement:

- Short-term bike parking is usually a rack on the sidewalk or an on-street corral serving people bicycling for shopping, errands, eating, or recreation. Bicycle racks should support the bicycle at two or more points and should provide a moderate level of security by allowing the bike's frame to be locked with a U-lock without lifting a wheel over the rack.
- Long-term bike parking encloses the bicycle and its accessories, and protects it from precipitation. This category is further divided into "individual-secure" facilities (bike lockers) and "shared-secure" facilities such as bike enclosures ("cages") and bike stations. These facilities provide a high level of security but are often less convenient than racks for errands and shopping because it impractical to site them on public sidewalks.

Bicycle Parking and Shower Facility Development Requirements

Bicycle parking requirements for development ensure that bicyclists have somewhere secure and convenient to park their bicycles at newly constructed buildings. The City's current bicycle parking requirements do not provide clear guidance to developers in terms of design, and location, and the rates of required parking do not address the complexities of the street environment. Private development requirements for provision of bicycle parking facilities are found in Chapter 18.83 of the Municipal Code, "Off-Street Parking and Loading Regulations." Typically, the number of parking spaces required is 10 to 25 percent of the automobile parking requirement.

Wayfinding

Wayfinding signs can help guide casual bicyclists and other users who are unfamiliar with city destinations and can help them follow corridors involving multiple turns (common in Palo Alto). Although "Bike Route" signs are located on most of the existing bicycle network (including all Class III bikeways and the "Ellen Fletcher" Bryant Street Bicycle Boulevard), bicycle wayfinding signs are less comprehensive, located only at strategic places in the bikeway network such as creek bridges and on routes connecting to the Bryant Street Bicycle Boulevard.

Wayfinding signs direct bicyclists to key destinations and assist them with following the designated network.

Source: City of Palo Alto website

3.5 Existing Programs

To shift people to bicycling and walking from other modes, a community must consider not just infrastructure improvements but also programs that support and encourage the choice to bike or walk. Many programs can be categorized according to the "Five E's": Engineering, Education, Encouragement, Enforcement, and Evaluation. The "Five E's" are commonly used to structure Safe Routes to Schools programs and are considered in the League of American Bicyclists' Bicycle Friendly City application.

3.5.1 Safe Routes to School

The City, in collaboration with the Palo Alto Unified School District and parent volunteers from the Palo Alto Council of Parent/Teacher Associations (PTAs), began to coordinate efforts to reduce congestion and improve safety for students on their way to and from school in 1994, using the traditional three E's of engineering, education and enforcement. Since 2000, when this partnership was expanded to include the 4th 'E' of encouraging alternatives to single family driving to school, the City has seen a significant and on-going increase in biking and walking to school as a direct result of these efforts. Several schools now depend on maintaining high levels of non-motorized student commuting to keep their school zones from being overwhelmed by motor vehicle drop-off and pickup activity.

In Fall 2010, the Valley Transportation Authority (VTA) awarded Palo Alto a "Vehicle Emissions Reduction Based at Schools" (VERBS) grant. With this grant the City will increase the reach and content of its existing education, encouragement and evaluation programs by extending their efforts to four "Choice Program" schools and conduct direct outreach to Spanish and Chinese language families. Because the grant was funded through the Metropolitan Transportation Commission (MTC's) Climate Action Initiative, the 5th 'E' of evaluation will also include assessment of greenhouse gas emissions reductions. Each of the following 'E' categories offers additional highlights of the Safe Routes to School Program.

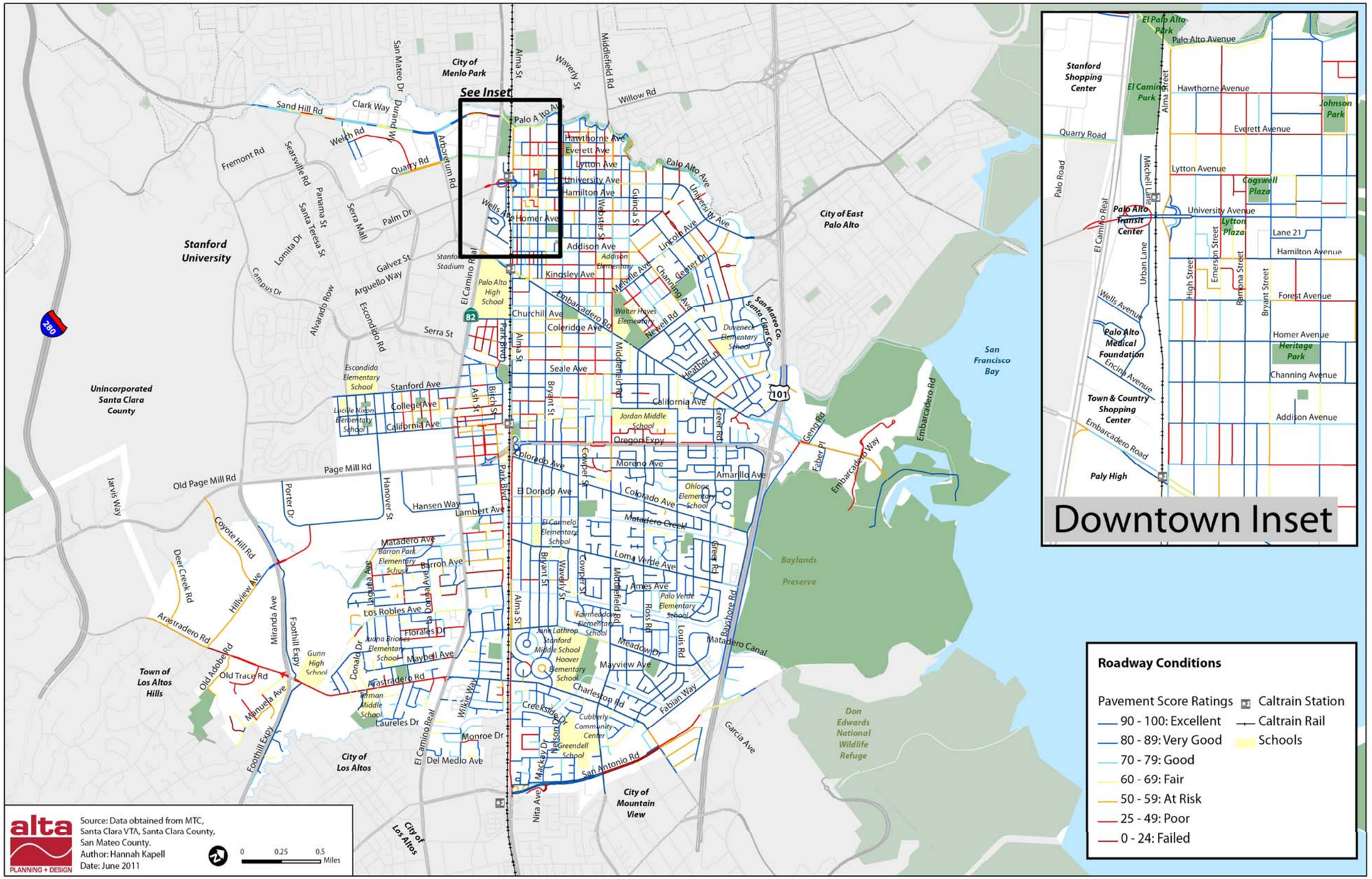
3.5.2 Engineering

Engineering strategies include City programs to provide high-quality infrastructure to support bicycling and walking. A majority of the BPTP includes discussion and recommendations pertaining to engineering strategies, although below is a select list of existing programs.

Pavement Management System (Maintenance Program)

Many bicyclists consider pavement condition when selecting travel route, which includes the quality of pavement markings, signal detection systems, and adjacent curb ramps. **Map 3-5** depicts the latest pavement quality information for Palo Alto streets, based on the Pavement Management System. Note that the map does not reflect recent improvements to Arastradero Road between El Camino Real and Gunn High School.

The pavement condition index report is updated every four years to refine the priority of future street resurfacing and surface treatment programs. Each winter, a list of streets for the annual resurfacing program is prepared with input from the Transportation Manager and Palo Alto Bicycle Advisory Committee (PABAC) to ensure that bicycle priority streets are included. Continued coordination with the resurfacing program provides a unique opportunity to implement recommendations of the BPTP 2012 and allows for efficient coordination of funding sources.



Map 3-5: Roadway Pavement Conditions

Note: map is from 2010 pavement analysis and does not reflect pavement projects from 2011

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Traffic Calming Program

Regardless of whether physical separation is provided for pedestrians and/or bicyclists, the speed and volume of motor vehicles plays an important role in providing a comfortable and safe environment. Palo Alto has specific warrants for implementation of traffic calming:[13] a neighborhood group requests the treatment, and City engineers work with the community to determine if the location is appropriate based on a checklist of factors. Speed humps and traffic circles are the City's most commonly used traffic calming devices, although these treatments are often not considered appropriate for collector arterial streets. Very few of the street closures and diverters that exist in Palo Alto residential neighborhoods were installed by the Traffic Calming Program, although these devices help prioritize certain streets for non-motorized travel and were especially popular among respondents to the BPTP online survey.

The Traffic Calming Program states that an increase of up to 25 percent of existing volumes on an adjacent local street, as motorists seek alternative routes, is an acceptable outcome of a traffic calming installation.[14] However, the resulting total traffic volume on the adjacent local street must not exceed 2,500 vpd. The City would also remove traffic calming treatments if they cause unacceptable delays to emergency services or have other unintended results as determined by City staff.

The City primarily considers traffic calming along designated school routes with 85th percentile speeds (the speed travelled by 85 percent of traffic) exceeding 32 mph. The practice of retaining stop signs at traffic circles should be discontinued (and remedied) along bicycle boulevards (if not at all traffic circle locations) due to the confusing effect of stop signs on all users and to improve local noise and air quality.

3.5.3 Education

Education programs are designed to improve safety and awareness of bicyclists and pedestrians and are geared toward all roadway users. They can include, but are not limited to, adult bicycle handling and traffic skills courses, school-based assemblies that teach children how to safely walk or ride a bike, and citywide education programs that target safety messages to all roadway users.

Youth Bicycle Education

Palo Alto schools currently offer bicycle and pedestrian safety education courses for grades K through three and in fifth and sixth grade. This program reaches over 5,000 students and includes instruction of all sixth graders by a League of American Bicyclists certified instructor (LCI). With the recently awarded Safe Routes to School VERBS grant, the City will update and expand this program.

The Parks and Recreation Department also provides youth bicycle education through the Enjoy Catalog,

Palo Alto has an active Safe Routes to School program that teaches students how to safely walk and bicycle.

13 Available online at: http://www.cityofpaloalto.org/civica/filebank/blobdload.asp?BlobID=6666
14 Based on the Traffic Infusion on Residential Environments (TIRE) index, which shows that most residents do not notice an increase of 25 percent.

which participants can register for online. One popular course provides 10-year-olds and their parents with on-bike instruction on neighborhood streets. A similar program will be included as part of the VERBS grant.

Adult Bicycle Education

Children mimic the behavior of their parents. Safe and lawful riding among children relies on parents modeling appropriate bicycling behavior. To ensure that parents know appropriate behavior, the Palo Alto Parent Teacher Association shows parents of elementary students how to teach bicycle riding skills to their children twice annually. In previous years, the program reached 120 parents annually, which will increase with the VERBS-funded expansion of the program.

Bicycle education for adults helps them communicate safe behaviors to their children and encourages bicycling for work, shopping, and other purposes.

3.5.4 Encouragement

Encouragement programs are essential to institutionalizing bicycling and walking as integral and widely adopted transportation modes. Encouragement programs are geared toward encouraging people to bicycle or walk more in their day-to-day life. They can include, but are not limited to, events such as Bike to Work Day, guided walking tours, school-based mileage contests, and bicyclist discount programs for local businesses.

Palo Alto sponsors Energizer Stations during Bike to Work Day, which provide information and incentives for people who commute by bicycle.

Bike to Work Day

The City currently encourages residents to bicycle and walk by participating in Bike to Work Day and supporting the school district programs, including Walk and Roll Days. Bike to Work Day includes Team Bike Challenges and a Pedaling for Prizes promotion at Gunn High School. The City of Palo Alto, Stanford University, and Hewlett Packard sponsor Energizer Stations, which provide information and encouragement. Many bicyclists cite Bike to Work Day as a key motivator that led them to begin commuting by bicycle.

Walk and Roll/International Walk to School Day

On International Walk to School Day, held on the first Wednesday in October, Palo Alto joins students from around the world in walking to school, with the intent of instilling a healthy commute habit for the remainder of the year. Activities such as Walking School Buses and Art Contests raise awareness about

walking for transportation. Bicycling, skating, scootering, carpooling, and transit are all encouraged to help reduce the number of cars around schools.

Many Palo Alto schools also participate in a Walk and Roll Day for Earth Day every April. This event reminds students and parents that schools support and encourage walking and bicycling to school.

Walk and Roll to School Days provide encouragement for students to try walking and bicycling.

Source: Safe Routes to School Palo Alto

Way2Go Program

The City's Way2Go Program is the foundation for a variety of alternative commute programs at the City and school levels. In addition to encouraging carpooling, Way2Go programs engage City officials and staff to actively participate and provide focused programs aimed at reducing vehicle miles traveled in Palo Alto. The City currently supports school education and outreach programs through a 0.25 full-time equivalent (FTE) staff person, which will be doubled through the VERBS grant. Additional detail related to existing programs is provided in Appendix E. Policy and Plan Framework.

Bicycle Tours

In May 2011, the City hosted a tour of Park Boulevard Bicycle Boulevard with the Mayor and City Council. Community members were invited to ride the corridor and discuss potential improvements. This event was well-attended and allowed members of the public to engage with City Council on bicycle issues.

The Park Boulevard Bicycle Boulevard tour was well-attended and popular with community members.

Bike Palo Alto Event

The Palo Alto Neighborhood Green Teams host this annual family event, which includes local bicycling and safety information, helmet fitting, bicycle maintenance, and a group ride. Participants receive maps of a variety of routes with directions, while local vendors provide free treats. Some bicycle vendors provide bicycles for rent free of charge for the event. In 2011, Bike Palo Alto had over 500 participants.[15]

[15] More information: http://www.pagreenteams.org/bikepaloalto

3.5.5 Enforcement

Enforcement programs enforce legal and respectful use of the transportation network by all roadway users. They can range from formal targeted enforcement and warning stops led by police officers, to informal neighborhood-based signage programs to slow traffic.

Speed feedback signs inform drivers of their speed and encourage them to drive at the posted speed limit.

Speed Limits and Feedback Signs

The Traffic Calming Program allows residents to request a mobile radar speed feedback trailer for qualifying streets. These trailers are mobile units that display a motorists' travel speed adjacent to a speed limit sign. Additional, permanent units have also been installed along the Residential Arterials Network, a series of 25 mph roadways that provide essential access through and across many neighborhoods.

Operation Safe Passage

The Police Department administers Operation Safe Passage, a program to enforce traffic violations committed by motorists, pedestrians, and bicyclists in and around all schools during peak commute hours. Among the violations targeted for enforcement include speeding, failure to yield to pedestrians, stop sign violations, and crossing downtown streets between closely-spaced traffic signals.

Crossing Guards

Crossing guards are critical to ensuring lawful use of roadway crossings by children and to engender respect and yield compliance by motorists. Twenty-nine locations in Palo Alto have crossing guards citywide during school commute periods.

Crossing guards direct traffic during student drop-off and pick-up times, improving safety for students.

Bicycle Licenses

The City of Palo Alto requires residents to license their bicycle. Bicycle licenses help the Police Department return stolen bicycles and identify victims of collisions.

The Fire Department and local bicycle shops issue bicycle licenses for two dollars, while Stanford University encourages all freshman to license their bicycles.

3.5.6 Evaluation

Evaluation programs measure the success of education, encouragement and engineering programs and projects. Evaluation tools may include analysis of collisions, facilities built, activity levels, utilization rates, funding, policy concurrence, and attitudinal surveys. Data collection is a key part of evaluation.

Student Hand Tallies and Parent Surveys

The City currently coordinates classroom tally counts by teachers in grades K-5 each fall to evaluate the effectiveness of its current education and outreach efforts. These tallies also allow a snapshot of mode share over time, which is graphically depicted in Section 4.1.2. Through evaluation of the VERBS grant, a parent survey will be distributed annually to help identify parents' perceptions of barriers to walking and/or bicycling to school, similar to surveys that have been implemented since 1994. Bicycle activity at the four middle and high schools is estimated by counting parked bicycles during the school day.

Bicycle and Pedestrian Counts

In 2010, the City purchased new automated counting equipment (Pyrex Eco-Counters) that will greatly expand the availability of non-motorized data to help track mode share progress and inform the design and priority of future projects. These units are stand-alone, mobile, infrared sensor-based boxes that are best applied along trails, non-motorized barrier crossings, and select screenlines.

Counting capacity will also increase as signals are upgraded to microwave detection, a technology that can distinguish bicycles from motor vehicles, and track bicycle and vehicle movements separately through intersections. A grant from the VTA's Transportation Development Act (TDA) program in 2011 will also fund the deployment of new microwave-based bicycle detection equipment at signalized intersections in the City; these new devices will also allow the City to collect bicycle count data. The City of Palo has dedicated funds to install these devices in future projects. Staff should work with PABAC to outline an implementation strategy that builds toward an annual or semi-annual counting effort consistent with the National Pedestrian and Bicycle Documentation Project guidelines.

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4 Travel Demand and Collision Analysis

This chapter provides background information related to the existing demand for bicycle and pedestrian facilities and conditions that impact bicycling and walking in Palo Alto. The first section addresses travel demand, presenting an overview of work, school, and discretionary trips, as well as transit connections, existing recent count data, and travel demand management strategies. The second section of this chapter presents an overview of collisions involving bicyclists and/or pedestrians, focusing on the causes of collisions and high-frequency locations to target improvements.

4.1 Travel Demand Overview

This section discusses the existing transportation patterns in Palo Alto and neighboring jurisdictions. The data informs recommendations by identifying opportunities to shift trips to walking or bicycling.

4.1.1 Work Commute Trips

Local Commuting within Palo Alto

U.S. Census data provides useful information for understanding bicycling and walking rates, particularly when assessing demographic trends and comparing jurisdictions. While Census data typically provides the best available snapshot of activity for most jurisdictions, it only reports the mode that residents use when commuting to work; the Census does not count trips taken for other purposes such as school trips and shopping. Thus, the Census underestimates the true number of people walking and biking in a community. For the City of Palo Alto, the most recent available Census data with detailed travel information comes from the 2006-2010 American Community Survey (ACS).

Palo Alto's bicycle commuting rate is higher than that of comparable communities and is significantly higher than the local transit commute rate – an unusual characteristic but consistent with other university-oriented communities. Walking rates are higher than other Santa Clara County communities but significantly less than the more transit-oriented City of Berkeley. Combined with work-at-home rates, approximately 21 percent of Palo Alto residents commute by means other than car or transit.

Table 4-1: Journey to Work Mode Split by Place of Residence

	Palo Alto	Berkeley	Mountain View	Santa Clara County	San Jose MSA	California	United States
Drove Alone	67.7%	40.6%	73.1%	77.1%	76.9%	73.2%	76.3%
Carpooled	6.3%	7.1%	9.6%	10.3%	10.5%	12.0%	10.4%
Transit	4.6%	17.8%	4.7%	3.3%	3.3%	5.1%	5.0%
Bike	6.9%	7.6%	3.4%	1.4%	1.4%	0.9%	0.5%
Walk	5.4%	16.5%	2.6%	2.2%	2.2%	2.8%	2.9%
Other/ Work at Home	9.2%	10.4%	6.6%	5.7%	5.7%	5.9%	5.0%

Source: American Community Survey, 2006-2010

Residents of Palo Alto generally have shorter commutes than residents of other cities in Santa Clara County and California. The sizable gap between walking and bicycling rates and the 31 percent of residents within 15 minutes of work suggests there are significant opportunities to increase non-motorized commuting rates of Palo Alto residents.

All Work Trips into Palo Alto

Palo Alto has approximately twice as many jobs as households. Thus, the travel patterns of workers from outside communities are a critical component of overall travel demand on Palo Alto roadways and non-motorized facilities. Just under two percent of all workers in Palo Alto (residents and non-residents) bicycle to work, while 1.3 percent walk.[16]

The vast majority of Palo Alto workers come from outside the city, with the majority coming from San Mateo County, as shown in **Table 4-2.** Nearly 15 percent of all workers have commutes of less than 15 minutes, and another 14 percent have commutes between 15 and 19 minutes.

Table 4-2: Origins to Work Trips in Palo Alto

From	Number	Percent of Total Palo Alto Commuters
Palo Alto	18,100	17%
Mountain View	8,100	8%
Los Altos/Los Altos Hills	3,900	4%
Sunnyvale, Cupertino	7,400	7%
San Jose	14,400	14%
Other Santa Clara County	7,000	7%
Santa Clara County Subtotal	**58,900**	**57%**
San Mateo County	23,600	23%
Alameda County	11,300	11%
San Francisco County	5,100	5%
Other Bay Area	1,700	2%
Bay Area Subtotal	**100,600**	**97%**
Non-Bay Area	3,400	3%
Total Palo Alto Commuters	**104,000**	**100%**

Source: Santa Clara Valley Transit Authority, 2007

[16] *Census Transportation Planning Package*

Nearly 30 percent of all workers live within 20 minutes of their work, despite only 17 percent living within the city limits. This data confirms that significant opportunities exist to encourage commuters living in adjacent communities to shift to bicycling to work. Additionally, improved pedestrian and bicycle access to and from major transit stops can encourage additional transit usage and transit-bicycle trip chaining for the high number of workers with commutes of 45 minutes or more.

4.1.2 School Trips

For Palo Alto, school commuting represents a significant and important component of overall travel patterns and issues. The Palo Alto Unified School District (PAUSD) serves approximately 11,000 students who mostly live in the City of Palo Alto, certain areas of Los Altos Hills and Portola Valley, as well as the Stanford University campus. The District includes 12 kindergarten-fifth grade elementary schools, three middle schools (grades 6-8) and two high schools (grades 9-12), as well as vocational and pre-school services at an additional campus (Greendell). Of the 12 elementary schools, two are currently "choice" schools that do not have enrollment boundaries. Expanding enrollment and upgrades to existing school campuses funded by the 2008 Strong Schools Bond continue to be priorities for the District.

Thanks to the City/School Traffic Safety Committee, in concert with a broader coalition that includes the City/School Liaison and Safe Routes to School Task Forces, data on student and family travel modes is available. The data, shown in **Figure 4-1** through **Figure 4-4**, indicate a clear trend toward more walking and biking to school.

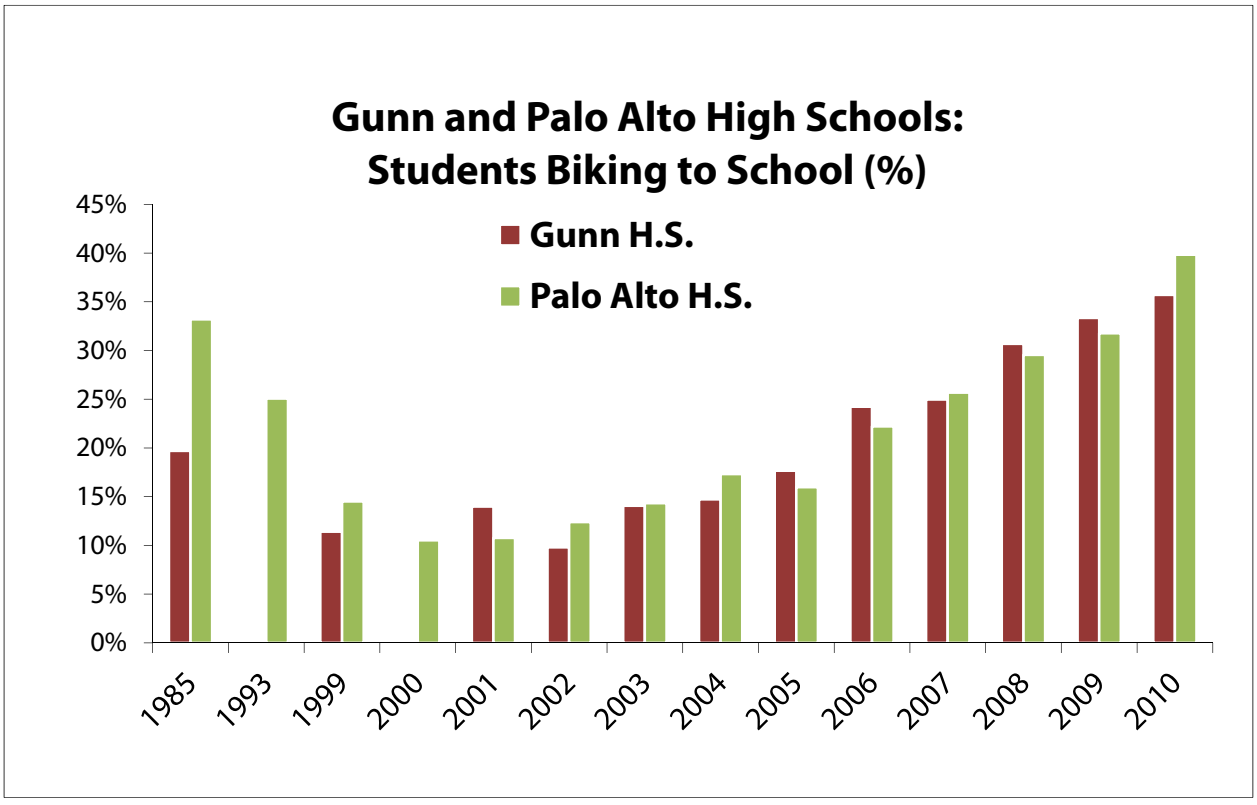


Figure 4-1: High School Bicycling Rates, 1985-2010

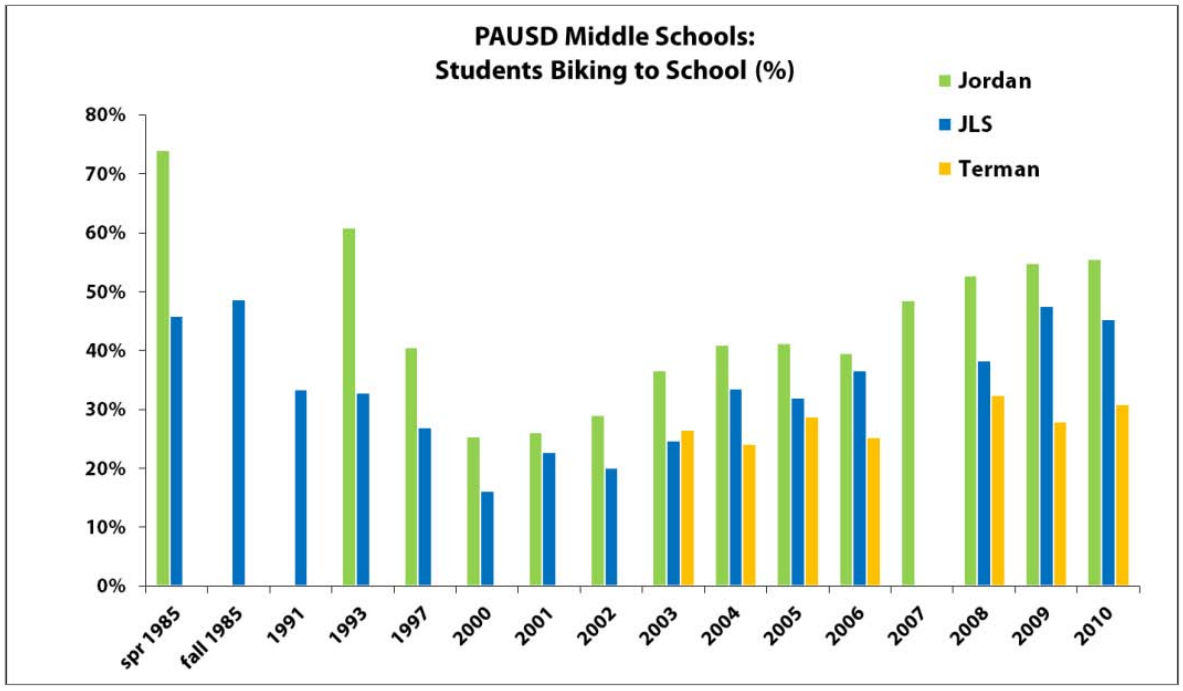


Figure 4-2: Middle School Bicycling Rates, 1985 – 2010

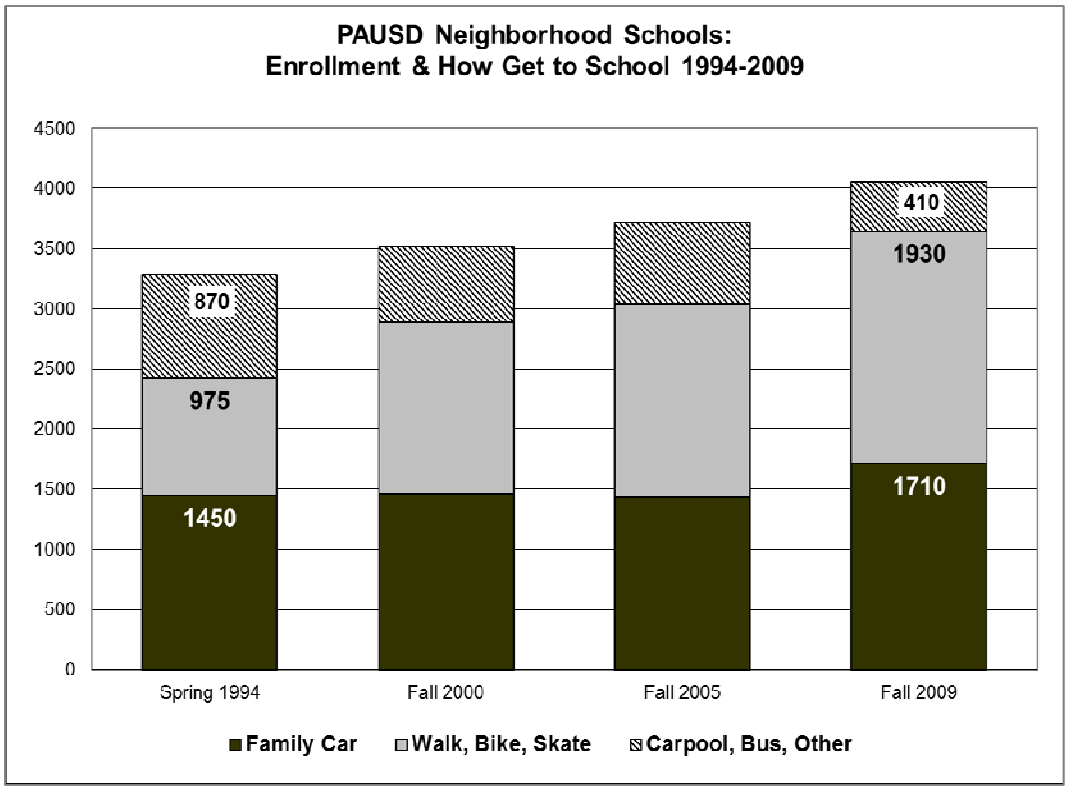


Figure 4-3: Travel Mode Snapshot and Trends, Neighborhood Elementary Schools

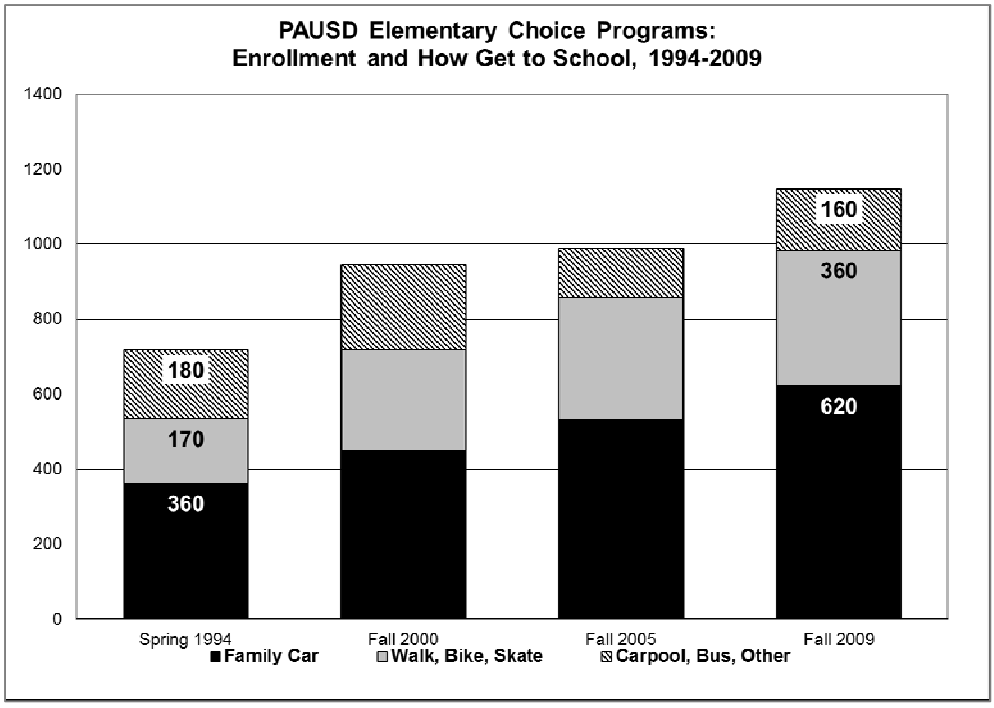


Figure 4-4: Travel Mode Snapshot and Trends, "Choice" Elementary Schools

4.1.3 Discretionary Trips

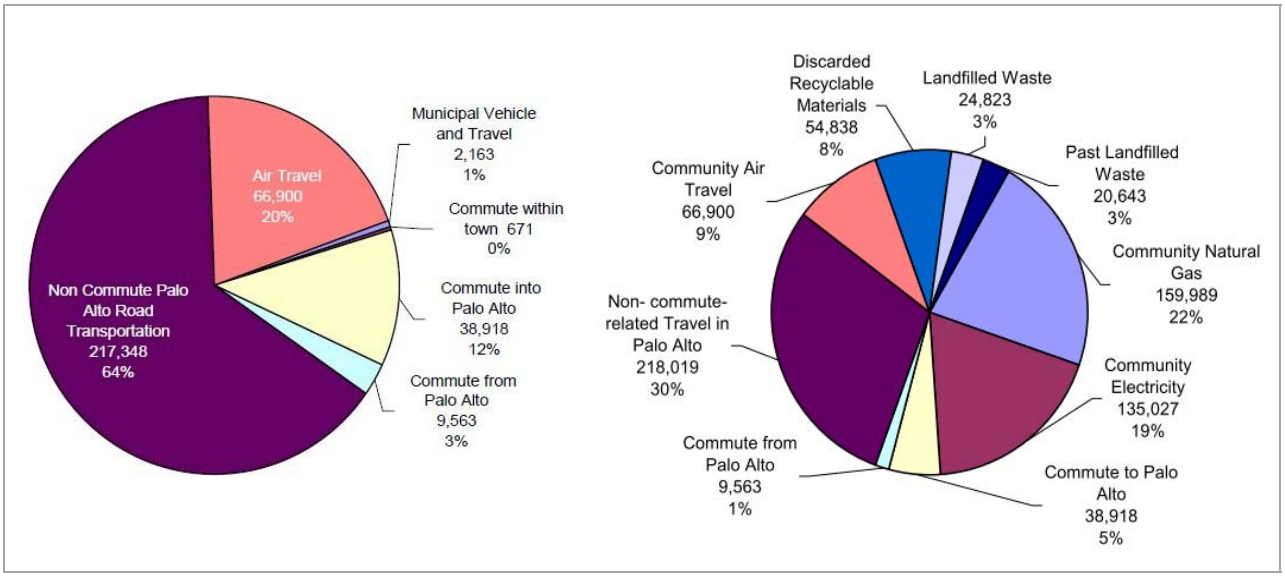
Discretionary trips are all trips that are not commute trips, including recreational and social trips as well as trips to the store, services, or other non-work or school purposes.

Discretionary Trip Generators

In addition to schools, regional commercial activity centers (like the Downtown and California Avenue Business Districts), neighborhood shopping centers, and public parks/community centers generate the majority of non-commute travel. These trips often differ from work commutes in that they are less routine and have more dispersed origins and destinations but also have a shorter average distance travelled. To encourage people to walk and bicycle more for discretionary trips, it is essential to provide targeted strategies for improving access to these discretionary trip generators. In particular, Foothills Park and Arastradero Preserve generate bicycle and pedestrian trips, but they are currently hard to access by bicycle or transit, as the main access road is Page Mill Road.

Greenhouse Gas Emissions

The City of Palo Alto 2007 *Climate Action Plan* provides information on travel-related greenhouse gas emissions (GHGs) that originate in Palo Alto. According to the *Climate Action Plan*, non-commute trips within the city account for roughly 30 percent of total emissions and nearly two-thirds of transportation–related GHGs (shown in **Figure 4-5**). Since nearly all of these trips are under a few miles in length, a significant number of them are targeted for conversion to walking and bicycling. As non-motorized improvements have a significant potential for reducing the single largest source of GHGs in Palo Alto, funding and planning for bicycle and pedestrian projects should receive greater attention as a primary climate action strategy in future plan revisions and City budgets.



Source: City of Palo Alto 2007 Climate Action Plan

Figure 4-5: Travel-Related Greenhouse Gas Emissions within Palo Alto

A Note on Discretionary Trip Needs

In order to carry family passengers or move possessions on a bicycle, people often must attach trailers, racks, and baskets or otherwise ride a larger "non-standard" bicycle. These bicycles require additional space to maneuver around obstacles and often have a larger turning radius than more traditional bicycles.

Bicycles such as tandems, tag-alongs, cargo bikes, recumbent bicycles, bicycles with trailers, or bicycles with long wheelbases are growing in popularity. In an effort to accommodate these vehicles, particularly for family travel, shopping, and other utilitarian trips where hauling and larger bicycles may be required, the City should prioritize the removal of outdated safety corrals and design for wider bicycles in future projects.

4.1.4 Transit Connectivity

While the City cannot directly improve bicycle accommodations on public transit vehicles, it can improve on-street access and recommend accommodations to transit agencies, as discussed below.

Caltrain

Palo Alto has two Caltrain stations at University and California Avenues, the first of which (Palo Alto Station) is the rail line's second busiest in terms of average daily passenger boardings and average bicycle boardings behind only the San Francisco station. A third Caltrain station just across the southern city limit in Mountain View near San Antonio Road also serves residents and workers in Palo Alto, albeit with much lower activity levels (Table 4-3). Caltrain currently runs 86 weekday trains plus weekend service. Service cuts are expected to help close a significant budget deficit; however, they will likely reduce this schedule as well as the number of trips serving the California and San Antonio Stations on weekends.

Table 4-3: Caltrain Ridership/Bicycle Counts, 2010

Station	Daily Passenger Boardings		Daily Bicycle Boardings		
	Total	*System Rank**	*NB*	*SB*	*System Rank**
Palo Alto	3905	2	209	113	2
California Avenue	891	12	76	38	8
San Antonio Road (Mountain View)	545	18	42	10	15

**29 Total Stations*

Source: Caltrain 2010 Annual Counts

The ability to accommodate more patrons with bicycles has been a focus issue for Caltrain, which allows bicycles on designated bicycle cars only. Most weekday trains have a single bicycle car with a capacity of 40 to 44 bicycles, and Caltrain tries to provide two bicycle cars (80 bicycle capacity) when rail car maintenance schedules allow. In 2008, Caltrain completed a *Bicycle Access & Parking Plan* that documents conditions at and around the Palo Alto Station area. Recommendations from that Plan include converting existing individual bicycle lockers to electronic, on-demand spaces; improved information and management of the Palo Alto Bikestation (described below); a widened tunnel underneath the tracks on University Avenue; and on-street bicycle facility improvements to Alma Street and Lytton Avenue.

At the California Avenue Station, the well-used pedestrian and bicycle underpass does not meet current ADA standards and people with bikes must dismount and walk around a safety corral. Class II bike lanes along California Avenue to the east provide good access, although the Oregon Expressway/Alma Street ramp area limits pedestrian access from the south. On the west side, Park Boulevard and the California Avenue business district generate strong pedestrian and bicycle demand. Both roadways are slated for improvements, with California Avenue set to receive a major overhaul that will include a reduced number of vehicle lanes, raised crosswalks, repaving, new bicycle parking, shared lane markings, and other improvements.

Palo Alto Transit Center

The Palo Alto Caltrain Station is part of a larger transit center that includes dedicated bus bays on the west side of the tracks north of University Avenue for the Valley Transportation Authority (VTA), San Mateo County Transit (SamTrans), the Alameda-Contra Costa Transit District (AC Transit), and local shuttle services. A Bikestation is located at the Palo Alto Caltrain Depot, which provides secure, long-term parking for 96 bicycles. As bicycles are not allowed on Caltrain cars when they are at capacity, the presence of the Bikestation enables transit riders to ride to the station and leave their bicycle at peak hours.

The transit center can be accessed via shared use trails from the north and south, as well as from bicycle lanes on Quarry Road and Palm Drive from Stanford University. Bicycle lanes on Alma Street and Lytton Avenue connect to the station from the east. The Palo Alto Bikestation provides long-term secured bicycle parking, individual bike lockers, and 61 "U-racks." Non-motorized connections within the transit center include an underpass beneath the platforms and on University Avenue, although the current configuration of on and off ramps (and insufficient lighting) limits the convenience of this connection. The long-range plan for the transit center calls for an ambitious $60+ million overhaul that would realign the interface of University Avenue, El Camino Real, the Caltrain tracks, and Alma Street and increase the separation between non-motorized and vehicular traffic.

Nearly all transit vehicles serving the station – including the free shuttles – are equipped with two-bike front-mounted racks that allow independent insertion and removal. VTA policy allows two additional bikes inside the bus subject to driver's discretion; this policy enables more bicyclists to use buses at times when the bus is partly empty but there are already two bicyclists aboard. SamTrans also allows two additional bikes aboard, space permitting. In all future fleet purchases and rehabilitation efforts by transit agencies, Palo Alto should support the procurement of three-bike front-mounted racks for additional transit-bicycle trip chaining capabilities. Such support may require advocacy to change existing state laws that limit the size and location of projections from bus vehicles (but that do not exist in other states).

El Camino Real Bus Service and Bus Rapid Transit (BRT)

VTA is currently planning upgrades to El Camino Real for the development of Bus Rapid Transit (BRT), "light rail-like" service from the Palo Alto Transit Center south and east to the HP Pavilion and Eastridge Transit Center in San Jose. To maintain fast, reliable service with buses every 10 minutes, a key component of the overall project is to revise the cross section of El Camino Real to include dedicated, center-running transit lanes with split island boarding. This treatment is known as the "4+2" option by VTA in reference to the remaining four travel lanes (not including turn lanes nor the proposed six-foot bike lanes). Service is expected to begin in 2016 with construction starting in 2014 and environmental review/preliminary engineering beginning in late 2011.

Due to a lack of expected travel time savings, the proposed "4+2" configuration will not likely extend into Palo Alto. Instead, VTA will retain the bus service in the outside travel lanes with mixed flow and upgrade the two bus stop pairs (at California Avenue and Charleston/Arastradero Road) that will service BRT. Upgrades will generally consist of "bus bulbs" that allow for in-lane stops that minimize delay and provide sufficient sidewalk width for related station amenities, including real-time information.

VTA projects that the enhanced service, in conjunction with forecasted development around the stations, will attract three to six times more passengers than the existing 522 Rapid (which BRT will replace). As such, pedestrian and bicycle improvements at and near the proposed BRT stations will be an important strategy for ensuring its success.

Stanford/Palo Alto Shuttles and 2008 Community Transit Study

The Palo Alto Shuttle is a free shuttle that runs approximately hourly on weekdays to connect residential neighborhoods, senior services, libraries, recreation centers, shopping districts, and Caltrain. There are two routes: the Crosstown shuttle runs from the University Avenue Station through downtown to the Stevenson House. The Embarcadero Shuttle runs from the University Avenue Station along Embarcadero Road to serve employers in the East Bayshore area. Stanford University also offers a free shuttle service to students, faculty, staff, and the general public. Its 15 routes serve destinations on campus and in nearby cities. Front-mounted racks accommodate two bicycles on both the City of Palo Alto and Stanford University shuttle services.

The *2008 Community Transit Study* identifies a high "brand value" of the Palo Alto and Stanford Marguerite shuttles. The Study also notes the poor transit demand and performance of the Stanford Research Park shuttle. The first finding contributes to the *Transit Study* recommendation for prioritizing pedestrian access upgrades at existing shuttle stops, while the latter finding suggests an opportunity for bicycles – especially as part of an expanded Caltrain-focused bicycle share program – to better serve Stanford Research Park commuters as part of a "last mile" solution.

Caltrain Corridor Bicycle Share Program

Bicycle share programs are essentially public transit programs aimed at providing "last mile" transit and other short connections for populations who may not otherwise choose to own or ride a bicycle. The Safe Routes to Transit (SR2T) program provided $500,000 to the VTA Pilot Bike Sharing program. In 2010, $4.3 million was secured through MTC's Climate Initiatives Program to develop an initial bike share program with 1,000 bicycles along the Caltrain corridor in the cities of San Francisco, Redwood City, Palo Alto, Mountain View, and San Jose. A hundred bicycles (out of 1,000) are earmarked for Palo Alto, which will consist of large "hub" stations at the Palo Alto Transit Center and California Avenue Caltrain stations. A small number of "pod" stations at select sites will be determined by the VTA and the City of Palo Alto.

4.1.5 Transportation Demand Management and Parking

While the bulk of transportation planning considers the "supply" of facilities and resources to accommodate existing travel demands, it is important to recognize that the "demand" for such facilities is also sensitive to fluctuation and outside factors. At a national level, this has been highlighted in recent years by the large spike in gas prices (which are again reaching their peak levels from 2008) and resultant decrease in total vehicle miles traveled and shift to transit, as well as by roadway pricing strategies and formal transportation demand management (TDM) programs. The latter are forms of encouragement and education aimed to assist individuals interested in shifting away from single-occupant vehicle use.

Transportation literature and analysis increasingly highlights the direct relationship between travel demand and the supply of parking. Although this is a famously sensitive subject throughout U.S. communities, it is important to recognize the policy and physical trade-offs between free and abundant parking availability and increasing pedestrian and bicycle demand and safety.

Beginning January 2012, employees of Stanford Hospital & Clinics and Lucile Packard Children's Hospital will receive free Caltrain passes through the Caltrain GO Pass program. New developments including Birch Plaza have also participated. TDM programs should continue in Palo Alto and, where possible, new developments should participate in the Caltrain GO Pass program.

4.1.6 Stanford University General Use Permit Agreement and Medical Center Expansion

Any discussion of travel demand in Palo Alto is not complete without reference to the enormous influence Stanford University has on all aspects of local travel. A General Use Permit (GUP) agreement with the County Development of University property essentially caps the number of peak period trips to and from campus at 2001 levels. As the campus has sought to expand, this agreement has helped focus new investments in transit (of which the Marguerite Shuttle is a highlight), bicycle facilities, and the development of a comprehensive and successful Transportation Demand Management (TDM) program with a half-time TDM coordinator for the Research Park area.

The agreement, however, does not include the Stanford Research Park or Stanford Medical Center, both of which generate high travel demand that is primarily auto-oriented. A traffic mitigation and public benefit package approved in May 2011 as part of the Stanford Medical Center expansion identifies nearly $5 million in direct spending on pedestrian and bicycle improvements. This amount does not include significant expenditures for the expansion of the Stanford TDM and Marguerite shuttle programs.

4.1.7 Existing Pedestrian and Bicycle Counts and Traffic Volumes

The City of Palo Alto does not regularly conduct bicycle or pedestrian counts nor are private developments or capital projects required to provide counts. As such, there is limited data on existing activity for particular streets or bikeway segments and on overall pedestrian or bicycle activity trends in the city. The recent purchase of electronic pedestrian counters and plans for the installation of "smart" signals that can detect bicycles will dramatically improve the City's ability to collect and analyze activity levels. However, these efforts are too recent to provide sufficient data for the *Bicycle and Pedestrian Transportation Plan* (BPTP) development process.

The *2003 Bicycle Transportation Plan* does provide a useful, but limited, snapshot of bicycle activity through historic counts at key over/underpasses and bridges along with a count map. The Plan shows the results of 12-hour bicycle counts in 1997 conducted at a larger set of screenline locations. The University and California Avenue undercrossings, along with the Bryant Street Bicycle Boulevard at California Avenue, exhibited the highest volumes in 1997 with between 830 and 898 total bicycles counted. San Francisquito Creek bridge crossings, the Bol Park Path at Arastradero, and Galvez Street at El Camino Real also stood out with between 411 and 543 bicyclists.

Additional activity assumptions and count information was derived from several other documents, including the *Stanford Hospital Expansion Environmental Impact Report* (EIR), the *South Palo Alto Safe Routes to School Plan*, the *El Camino Real Master Planning Study*, and City of Palo staff memos related to specific project studies. In helping identify, develop, and prioritize bicycle and pedestrian facilities and recommendations, the BPTP 2012 considers the City's traffic volume data map from 1999 (**Figure 4-6**). Due to the age of this data, it is recommended that the City conduct counts and develop a new volume data map for future planning.

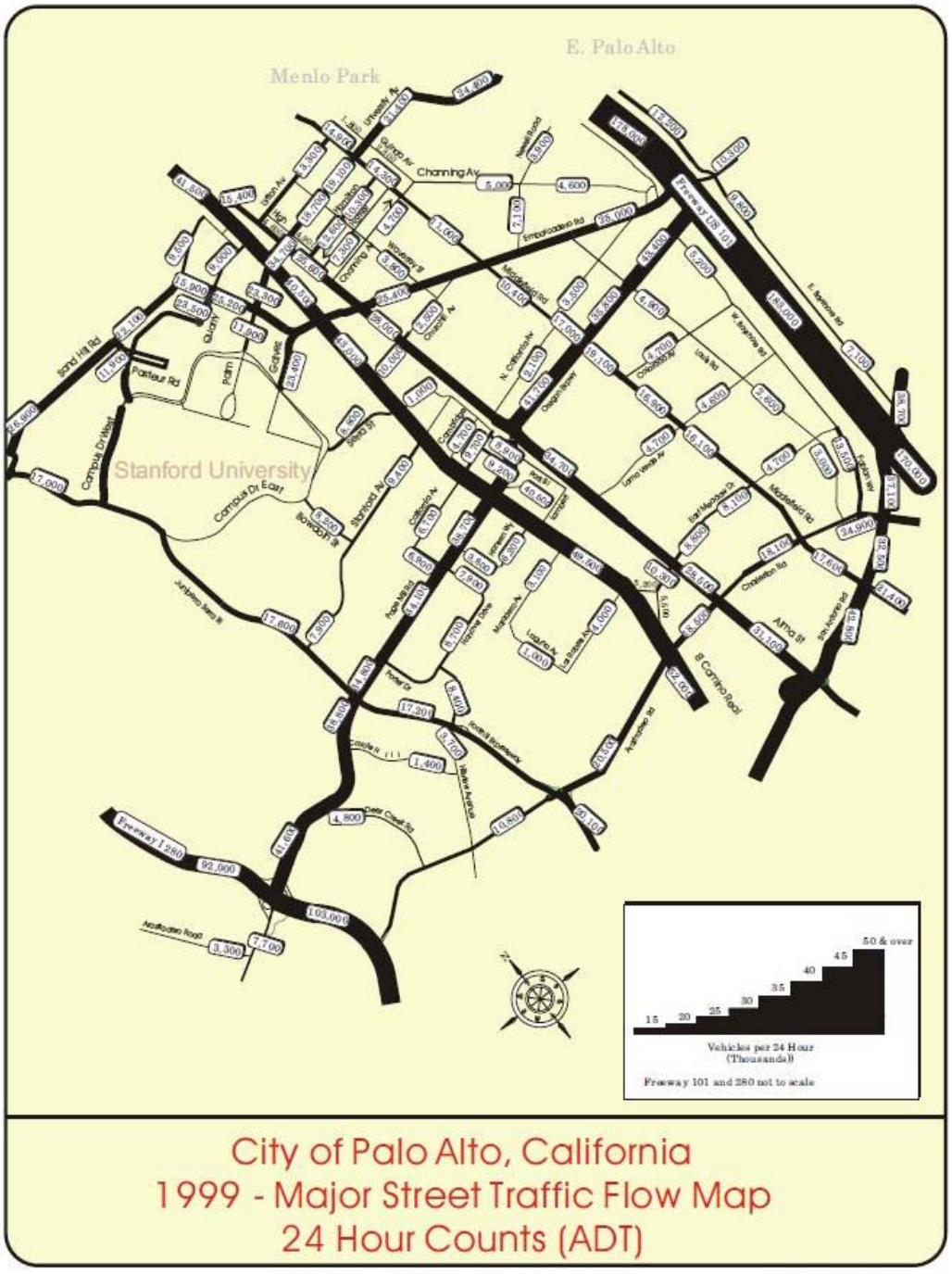


Figure 4-6: Citywide Traffic Volume Map

4.2 Collisions Documentation and Assessment

Analysis of bicycle and pedestrian collision data provides the City with a basis for infrastructure and programmatic recommendations that can improve safety of bicyclists and pedestrians. Collision data comes from the Statewide Integrated Traffic Records System (SWITRS). Because SWITRS is a repository for all police departments to submit traffic records, data is sometimes incomplete due to varying reporting methods. While collision data is sometimes incomplete and does not capture the safety performance of trails nor the frequency of "near misses," it does provide a general sense of the safety issues facing bicyclists and pedestrians in Palo Alto.

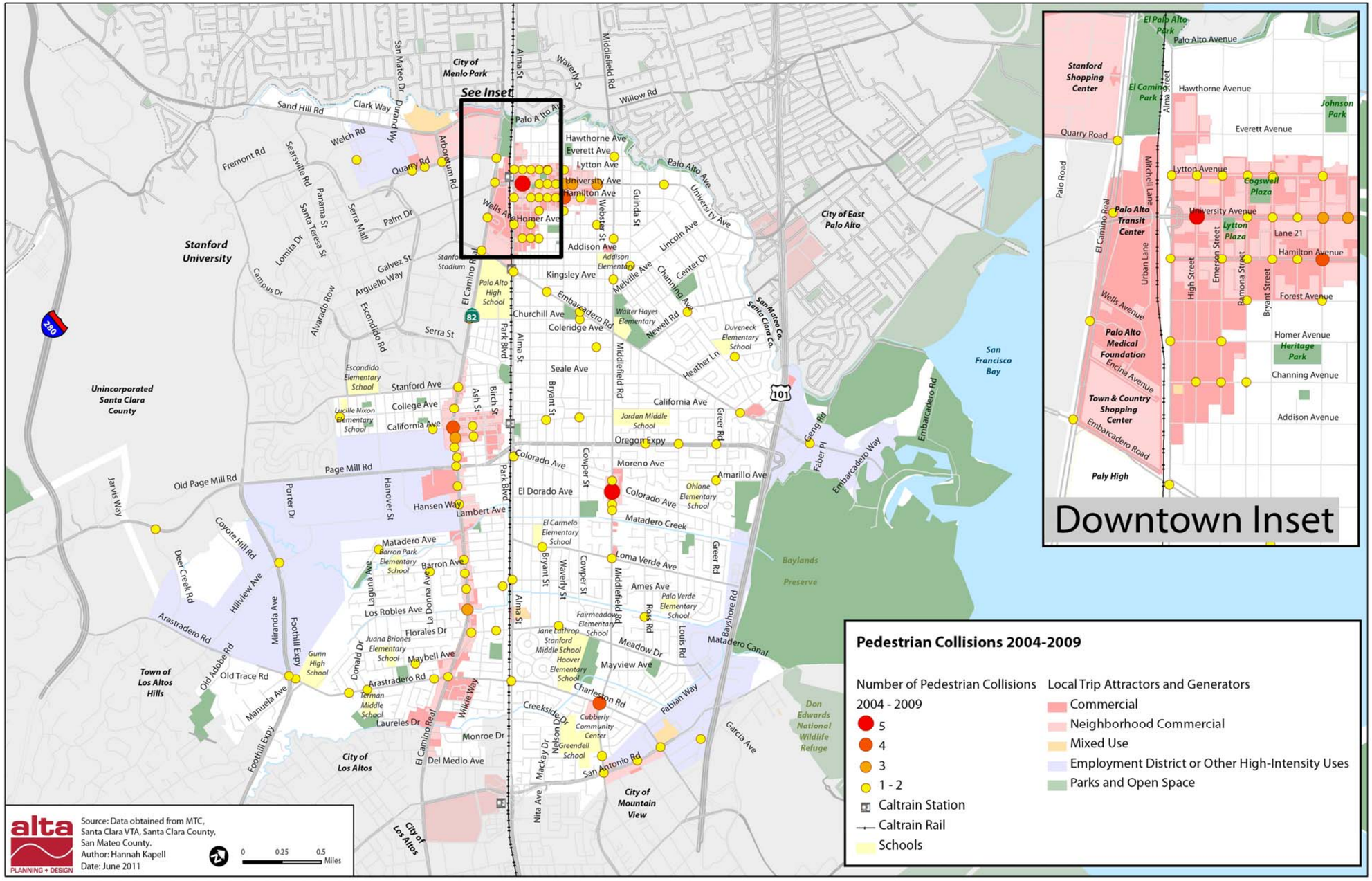
4.2.1 Annual Collision Totals

Analysis of bicycle and pedestrian related collisions for the 2004 through 2009 reveals the number of bicycle and pedestrian collisions remained relatively consistent, with a few exceptions. The number of collisions increased significantly in 2008 for pedestrians and in 2005 and 2009 for bicyclists. Without additional information concerning bicycle and pedestrian activity levels (i.e., count data), it is extremely difficult to distill any safety trends or risk.

Table 4-4 provides the annual totals for bicycle and pedestrian collisions in Palo Alto from 2004-2009. Map **4-1** and **Map 4-2** illustrate the locations and frequencies of these collisions. Note that the map orientation is tilted to simplify discussion of "N/S/E/W" bikeways and other linear features.

Table 4-4: Bicycle and Pedestrian Collisions by Year

Year	Pedestrian Collisions	Bicycle Collisions
2004	25	59
2005	21	92
2006	23	64
2007	26	67
2008	36	64
2009	14	80
Total	***156***	***420***



Map 4-1: Pedestrian Collisions 2004-2009

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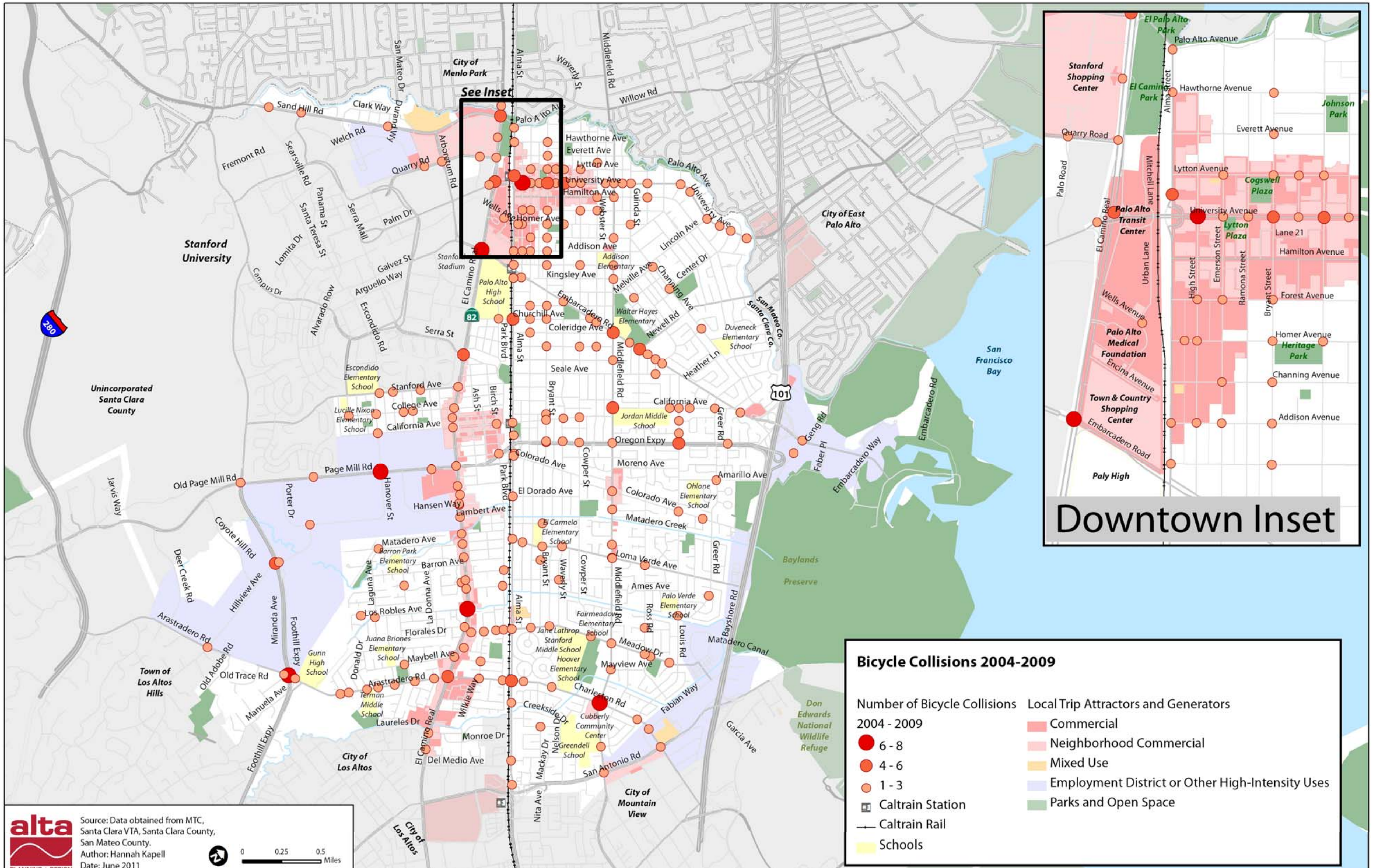

Map 4-2: Bicycle Collisions 2004-2009

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4.2.2 Trends in Bicycle and Pedestrian Collisions

Decline in Total Bicycle Collisions 1990's versus 2000's

The 2003 *Bicycle Transportation Plan* shows that the total number of bicycle collisions recorded for 2004-2009 (420) is significantly less than the total collisions from 1993-1998 (504). While a lack of count data makes comparing collision rates difficult, there is reason to believe that collision risk has also declined over the same period. This assessment is based on the increased rates of school commute bicycling documented in **Figure 4-1** (page 4-3) and **Figure 4-4** (page 4-5), and is consistent with findings from other cities where increases in bicycling and safety are associated with expanded installation of dedicated bicycle facilities.

Time of Day

Many collisions (one-third of the totals for both modes) occur between 2 pm and 6 pm, which is the peak travel time in the afternoon. This time period combines the afternoon school commute and job commute time periods, limiting further analysis regarding impact to school-age populations. There are significantly fewer pedestrian collisions in the morning peak as compared to the evening peak, while bicycle collisions are similar over the same time periods.

Party at Fault

The reporting officer determines the party at fault for bicycle and pedestrian collisions. Motorists were at fault for 44 percent of collisions, although 29 percent of collisions did not identify a party at fault. Motorists most commonly violated pedestrian right-of-way, while pedestrian collisions were most commonly categorized into "pedestrian violation," which likely includes pedestrians crossing at a location other than the crosswalk, against a light, or otherwise breaking the law.

No trend was apparent regarding party at fault for collisions involving bicyclists. Bicyclists were reported as being at fault for 39 percent of collisions, compared to motorists being at fault for 31 percent of collisions. Twenty-nine percent of collisions did not have an assigned party at fault. The data show a high rate of wrong-way riding. Variations in the quality of Class II bikeways may explain this finding, as well as lack of good connections to or from trails and the need for additional education for bicyclists and motorists of all ages.

Injury Severity

Pedestrians are the most vulnerable street users and are more at risk of suffering a severe injury during a collision. In Palo Alto, pedestrians most often suffer low-grade injuries (i.e., visible injury or complaint of injury) while walking in a crosswalk.

Unlike pedestrian-related collisions, where SWITRS records if a collision occurred in a crosswalk, SWITRS data does not record if bicycle related collisions occurred in bikeways, (e.g., if a collision occurred in a bike lane). However, SWITRS collects the action responsible for a bicycle related collision. At the top 10 collision locations, most bicycle-related collisions are broadside collisions, of which 91 percent resulted in injury and was the cause of one fatality.

High Frequency Collision Locations

Under the current protocol, the reporting officer estimates the nearest intersection to record the collision location. Locations with the highest frequency of collisions provide insight into problem areas and problematic behaviors. Cause of crashes at these locations indicates potential solutions that would decrease collisions involving bicyclists and pedestrians in Palo Alto both at these key locations and citywide. While these 'hot spots' are important for analysis and 2012 BPTP recommendations, it should be recognized that this is a relative term; one collision per year was the average for high pedestrian crash locations, while high bicycle crash locations had 1.6 collisions per year, on average.

El Camino/Los Robles Avenue at El Camino Real is a high-frequency pedestrian and bicycle crash location, likely due to its unusual geometric design and importance as a school commute and neighborhood route.

The vast majority of collisions that occurred at the locations with the highest frequency of pedestrian collisions were identified as motorist at-fault incidents. Almost half of these (45 percent) involved motorists colliding with a pedestrian in a crosswalk. The locations that experienced the most frequent **pedestrian** collisions include:

- University Avenue and High Street (5)
- Middlefield Road and Colorado Avenue (5)
- Charleston Road and Middlefield Road (4)
- California Avenue and El Camino Real (4)
- Hamilton Avenue and Waverley Street (4)

At high-frequency bicycle collision locations, three intersections had six collisions each with reported parties at fault. Broadside collisions accounted for 64 percent of collisions. Locations that experienced the most frequent collisions involving bicyclists include:

- Middlefield Road and Charleston Road (8)
- El Camino Real and Los Robles Road (8)
- El Camino Real and Embarcadero Road (8)
- University Avenue and High Street (7)
- Foothill Expressway and Arastradero Road (7)
- Page Mill Road and Hanover Street (7)
- El Camino Real and Charleston Road (6)
- El Camino Real and Sand Hill Road (6)
- Alma Street and Churchill Avenue (6)
- University Avenue and Bryant Street (5)
- Embarcadero Road and Middlefield Road (5)

5 Needs Analysis and Recommended Programs

This chapter outlines priority issues for improving bicycling and walking in Palo Alto based on analysis of existing conditions and key opportunities. The first section describes programs and project types that address deficiencies and/or result in benefits to both bicyclists and pedestrians. The subsequent two sections are organized according to specific mode, while the final section includes a summary of programmatic recommendations organized according to the "Five E's" as outlined in Chapter 3.

5.1 Promoting Nonmotorized Transportation

While bicyclists and pedestrians have different facility and support needs, several programs/projects can substantially benefit both modes. These include a robust data collection effort to support project evaluation; a "Complete Streets" planning and design process (checklist) to better integrate pedestrian and bicycle upgrades with street maintenance activities; new Across Barrier Connections (ABC's) that provide shared pathways over major facility gaps; additional urban design and placemaking strategies; and more regularly occurring temporary street closures and community events. Each of these is discussed in greater detail below.

5.1.1 Data Collection

Addressing the lack of existing bicycle and pedestrian count data and updating the citywide traffic volume data (the current map dates back to 1999) are two of the highest priority needs identified in this Plan. Regularly documenting and assessing actual bicycle/pedestrian activity will help Palo Alto target investments where they are most beneficial and measure progress towards achieving stated goals for bicycling and walking rates as established in Chapter 2. Where projects recommend potential significant changes to roadway configuration and/or circulation patterns, being able to assess specific traffic conditions (both general "screenline" volumes and key turning movement locations) for both modes is critical to final design and approval. Furthermore, having verified pedestrian and bicycle counts can make an important contribution for improving future activity level estimates (i.e., non-motorized demand modeling).

A quality data-monitoring program can also help Palo Alto obtain funding for new projects. Most grant programs require awardees to monitor the results of funded projects, including a baseline count and usage over time. Cities with established bicycle and pedestrian monitoring programs have an advantage over other cities when pursuing funding, especially where they are able to suggest a relationship between rising activity levels and new investment(s) over a substantial period of time. Data collection, including traffic speeds and volumes, crashes, compliance, delay, or other factors is also an essential tool for analyzing the success of any project, particularly projects that employ innovative or new treatments.

In addition, the pending update to Palo Alto's *Comprehensive Plan* includes a focus on Multi-Modal Level of Service (MMLOS), which is a tool for assessing how well a street serves the needs of all users, including automobiles, busses, bicycles, and pedestrians. This methodology requires considerable data about infrastructure and walking and bicycling activity, which can be collected as part of this effort.

As noted in Section 4.1.7, the City of Palo Alto has purchased (and plans to purchase additional) electronic pedestrian counters for trails and specific screenline locations; and has funding to install "smart" signals that can count bicyclists and pedestrians at key intersections. While the City will be strategically deploying these devices at school locations as part of the Safe Routes to School program, it should also develop a citywide program to collect baseline/trend line activity and begin requiring counts for new public and private projects. All regular (annual, semi-annual) citywide count efforts should be planned in accordance with the National Pedestrian and Bicycle Documentation Project methodology[17] and include organizing/training of local volunteers to help maximize the number of count locations. By establishing and dedicating staff resources to a formal count program or initiative, Palo Alto can begin to document progress on increasing walking and biking rates via a 'Report Card' and build community support and awareness for future projects.

5.1.2 Major Maintenance Projects and Complete Streets

Palo Alto's high expectation for the maintenance and preservation of existing assets helps keep many on-street bikeways, multi-use paths, and sidewalks in a reasonably safe and attractive condition. Particularly for bicyclists and other users of wheeled devices (i.e., wheelchairs and strollers), the presence of smooth and regular surface conditions can be a major factor in choosing one's route and reaching it comfortably. The City should thus continue to support, and expand where feasible, existing maintenance programs aimed at sidewalks, curb ramps, multi-use paths, and roadways.

Alma Street between the Mountain View border and El Dorado Avenue is tentatively planned for repaving in 2012. Future paving and bicycle/pedestrian priorities should be coordinated as far in advance as possible to maximize design and funding opportunities for new and improved facilities. (Image from Google Streetview)

Roadway resurfacing and reconstruction projects provide special opportunities to reconfigure arterial and other roadways for improved pedestrian and bicycle facilities that may otherwise be infeasible due to their scale. Leveraging these opportunities requires significant planning and coordination years in advance of project implementation. This is due in part to the fact that large projects require multiple review cycles, but also because outside grant funding and/or traffic analysis is often necessary. A good example of project coordination is Santa Clara County's Oregon Expressway repaving project, to which the City of Palo Alto is contributing funding for the inclusion of a bicycle-only signal treatment at Ross Road (similar to those installed on the Bryant Street Bicycle Boulevard). Similar early coordination

[17] *The National Bicycle and Pedestrian Documentation Project Website has more information: http://bikepeddocumentation.org*

within the City has provided for a future bikeway facility on San Antonio Road between Charleston Road and Middlefield Road, planned for implementation in 2012. The City's on-going coordination efforts along the Caltrain corridor and with VTA's El Camino Real Bus Rapid Transit may also present opportunities to reconfigure multiple intersections and/or create new Across Barrier Connections by leveraging other projects to the benefit of non-motorized users.

Palo Alto has an aggressive paving schedule over the next several years, which includes significant stretches of the Lytton Avenue, Channing Avenue, California Avenue, Arastradero Road (west of Gunn High School), and Alma Street arterials. Although coordination between the Planning and Public Works Departments takes place on an annual basis to help prioritize on-street bicycle maintenance, it may be helpful to develop more explicit bicycle prioritization criteria and provide a three- to five-year tentative project list to maximize coordination opportunities. Other proposed bikeways planned or potentially eligible for paving priority in the near future (as identified by the pavement condition map in Chapter 3) include:

- Park Boulevard (multiple segments): proposed bicycle boulevard
- Emerson and Ramona Avenue (downtown): proposed Class III bikeways / "shared streets"
- Everett Avenue: proposed bicycle boulevard
- Webster Street and Kingsley Avenue (multiple segments): proposed bicycle boulevards
- Middlefield Road (segments): Class III shared arterial
- Embarcadero Road (east of 101): existing Class II bike lanes, potential buffered bike lanes and proposed trail maintenance/extension (Geng Rd, municipal golf course frontage)
- Laguna and Barron Avenue: Proposed Class III bikeways in the Barron Park neighborhood

This Plan identifies Ramona (above) and Emerson Streets as desirable shared (Class III) bikeways that should be high priority candidates for maintenance funding and Complete Streets planning in the near future.

To ensure compliance with both the letter and intent of the state's "Complete Streets" mandate, the City should also develop a project checklist for all significant capital and maintenance projects. While MTC has developed such a checklist and has made it a requirement for several grant programs[18], no form is currently required of locally funded projects to formalize a coordination and decision-making process. A customized Palo Alto Complete Streets Checklist might also request additional information and activities (such as conducting counts or reviewing utility and Parks Department *Capital Improvement Plan* priorities) that go beyond the minimum MTC requirements.[19]

[18] *See http://www.vta.org/bike_information/library/btg/Update_07_Jan_11.pdf.*
[19] *Sample of a more comprehensive localized checklist: http://www.seattle.gov/transportation/docs/ctac/2011_04_19Final%20Draft%20Checklist.pdf*

5.1.3 Interjurisdictional Connections

Due to the large number of commuters entering and leaving Palo Alto on a daily basis, as well as the major recreational opportunities afforded by nearby open spaces and trails, it is crucial for this Plan to address connections across the official City boundary. As pedestrians or bicyclists enter and leave Palo Alto, they should be able to ride on similar bicycle facilities and be directed toward activity centers, rather than having a bike lane or shared roadway connection end abruptly at the boundary without any sort of bikeway through the neighboring jurisdiction. **Table 3-6** and **Table 3-7**: Connections between Greater Palo Alto and San Mateo County document the existing and proposed bikeways that cross jurisdictional boundaries, both within Santa Clara County and between San Mateo County.

Key barriers between Palo Alto and neighboring jurisdictions include San Francisquito Creek to the north, San Antonio Road to the east/south, and Foothill Expressway/Highway 280 to the south and west. Some of these barriers are discussed in the following section. Other connections will require ongoing collaboration and coordination with neighboring jurisdictions.

5.1.4 Across Barrier Connections (ABC's)

Palo Alto has multiple linear barriers that present challenges for bicycling and walking, including Highway 101, Caltrain/Alma Street, and several creek water bodies. These barriers require large, expensive construction projects such as bridges or tunnels. The following is a short summary of the major barrier connection priorities and opportunities for the Palo Alto area, termed "ABC's" by the Santa Clara Valley Transportation Authority (VTA).

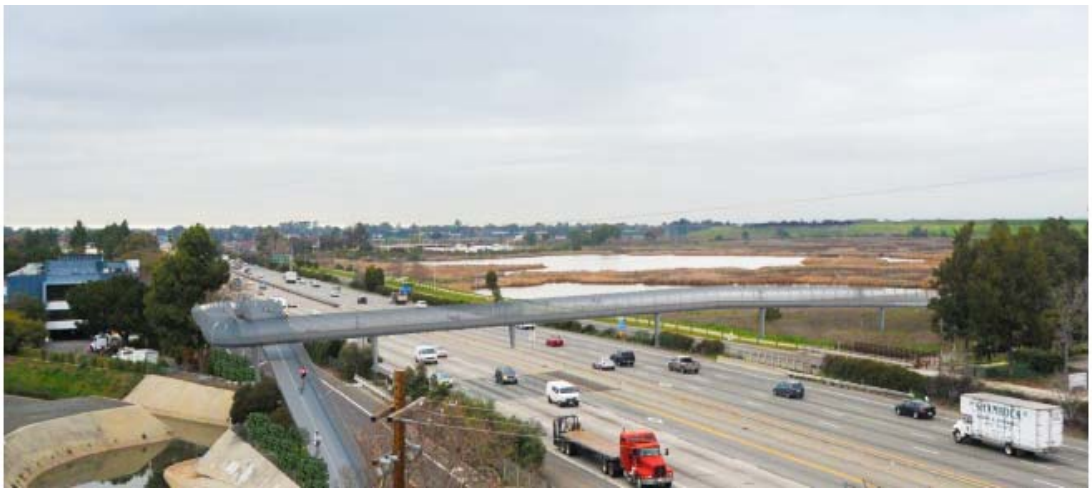


Photo simulation of the preferred conceptual design of a year-round overcrossing of Highway 101 at Adobe Creek (Image by Bellomo Architects)

Adobe Creek Highway 101 Overcrossing

The recent *City of Palo Alto Highway 101 Over/Undercrossing Feasibility Study* identifies a pedestrian and bicycle overcrossing at Adobe Creek as the preferred alternative for improving connections across Highway 101 from South Palo Alto to the Baylands and Bay Trail. Such a connection would provide a year-round alternative to the seasonal undercrossing and nearby San Antonio Avenue highway overpass (whose

conditions are much less favorable to walking and bicycling). Based on the preliminary outcomes of the feasibility study, the City of Palo Alto is actively pursuing funds for the environmental review and permitting, design, and construction of the proposed structure. Total projected cost is estimated between $6 – $10 million. An estimated 100,000 bicyclists and pedestrians would use the bridge each year, a figure that would rise as adjacent bicycle connections improve and area land uses adapt.

Matadero Creek Caltrain/Alma Barrier Connection

The 1.3-mile distance between the existing Caltrain undercrossing at California Avenue and the surface crossing at Meadow Drive represents the longest stretch of track barrier in Palo Alto. The lack of east-west connectivity is a major issue for the Cal-Ventura area, a mixed-use neighborhood with potential for new residential and mixed-use development near the Fry's Electronics site and along El Camino Real. To the east of Caltrain lies the Matadero Creek maintenance road and proposed creek trail that extends through Midtown and eventually to the Baylands. This Plan recommends the City undertake a feasibility study to determine the specific alignment and phasing opportunities for the Matadero Creek Trail. The study's scope should include an alternatives analysis of the potential undercrossing options near the creek (or overcrossing compatibility pending Caltrain/High Speed Rail plans).

University Avenue/Palo Alto Transit Center Undercrossings (Enhanced)

The 2008 Caltrain Comprehensive Access Plan includes a recommendation to widen the sidewalk along the north side of University Avenue under Caltrain, an existing undercrossing that experiences high volumes of pedestrians and bicyclists. A wider undercrossing with better lighting would allow for safer passage by bicycle and for transit patrons coming to and from the staircase directly underneath the station. Despite a second non-motorized undercrossing approximately one block to the north within the transit center, improved University Avenue undercrossings (the other sidewalk undercrossing experiences similar demand) would yield a more visible and direct linkage for both transit and downtown-related trips. Likely competitive for federal and state funding, this medium-term improvement concept should be studied for its compatibility with the longer-term vision of a completely reconfigured Palo Alto Intermodal Transit Center in coordination with Caltrans.

The University Avenue/Palo Alto Transit Center undercrossing is narrow and has poor visibility.

California Avenue Caltrain/Alma Undercrossing (Rebuild or Retrofit)

Reconstruction of the existing tunnel to be more accommodating is a long-term citywide priority due to its importance as a regional transit and business district connection and proximity to expected growth. The location of existing underground utilities, unfortunately, would force a much deeper and more expensive tunnel than similar proposed facilities. In the short-term, the City will be improving lighting, signage, and bicycle access to the west entrance of the undercrossing as part of the upcoming California Avenue streetscape improvement project.

Matadero Creek Highway 101 Seasonal Undercrossing

The existing Santa Clara Valley Water District (SCVWD) maintenance road along Matadero Creek under Highway 101 is not a legal, bicycle and pedestrian undercrossing. With reconfiguration of the approaches and addition of lighting, railings and signage, however, this road could be upgraded to a seasonal public trail similar to the existing Adobe Creek undercrossing. The recent *Highway 101 Over/Undercrossing Feasibility Study* estimates the cost of these improvements at approximately $1 million in 2010 dollars. Public use of the facility, which could be further studied as part of a Matadero Creek Trail Feasibility Study, would require an approved joint use agreement between the City and SCVWD.

The existing SCVWD maintenance road along Matadero Creek could be upgraded to provide a seasonal undercrossing of Highway 101 toward the Baylands. Its design should be further explored as part of a Matadero Creek Trail Feasibility Study.

Page Mill Road/Interstate 280

While Page Mill Road and Highway 280 are technically under the purview of Santa Clara County and Caltrans, respectively, the City of Palo Alto strongly supports bicycle improvements in this area and is actively working with these agencies to improve access to the Arastradero Open Space Preserve and other recreational destinations west of Highway 280. This interchange has double (two lane) ramps both to and from the highway, and experiences particularly high vehicle volumes and speeds. Although Class II bicycle lanes are provided in the westbound direction along Page Mill Rd, bicycle and pedestrian crossings of these ramps can be dangerous and there is limited opportunity for improvement with the current lane and ramp configuration. Potential improvements include reconfiguring the highway ramps for slower speed, yet efficient, vehicle travel or grade separation of non-motorized and vehicle traffic.

Peers Park Caltrain/Alma Street Barrier Connection at Seale Avenue

This Plan proposes a new Caltrain barrier connection concept at Peers Park between the Churchill Road surface crossing and California Avenue undercrossing. This connection would link the Serra Street/Park Boulevard and Stanford Avenue east-west bikeways (along with the north-south Castilleja-Park-Wilkie Bicycle Boulevard) across Caltrain to Seale Avenue, a low-volume residential street. With direct access across Middlefield Road to the Community Center and Jordan Middle School complexes, such a route would provide an inviting alternative to the Churchill/Coleridge Avenue corridor for school commutes and other trips, and if established should trigger the implementation (or further development) of Seale Avenue as a bicycle boulevard.

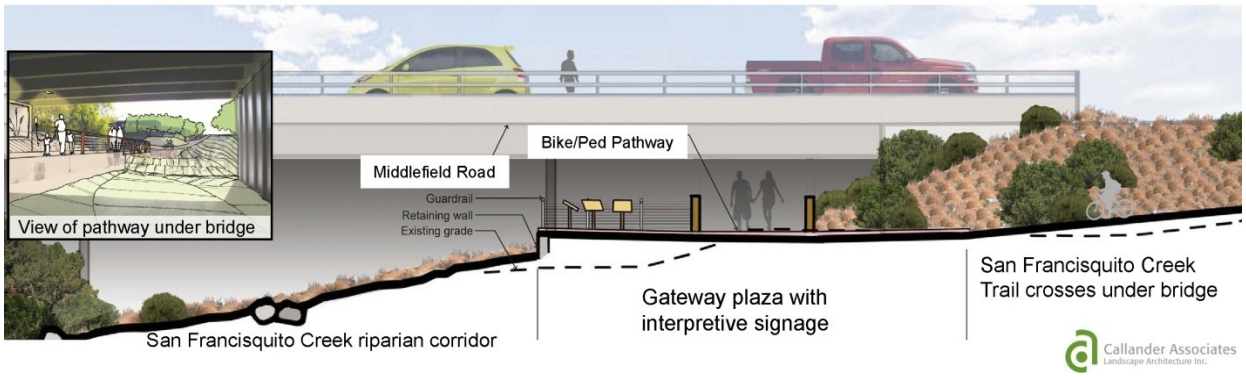


Figure 5-1: Concept for a pedestrian and bicycle path under Middlefield Road Bridge
(Source: San Francisquito Creek Joint Powers Authority).

El Camino Park Caltrain/Alma Barrier Connection at Everett Avenue

This undercrossing was proposed as part of the 2003 Bicycle Transportation Plan and potential (partial) funding for its construction was identified as part of the Stanford Medical Center expansion project. Further analysis through the 2012 BPTP has revealed significant utility conflicts and higher priority improvements to an adjacent facility (University Avenue undercrossing). Regardless, this connection would further reduce the barrier effect of the Caltrain corridor at a key location and should be considered a potential long-term ABC project.

Creek Barrier Crossings

Several additional barrier-crossings are proposed along or across creek corridors that are appropriate to highlight as ABC's. The first is under Middlefield Road at the border with Menlo Park, where the San Francisquito Creek Joint Powers Authority (SFCJPA) is championing a new bridge undercrossing as part of a shared-use creek path from Alma Street to East Palo (Woodland Avenue). Although not identified as a high priority for bicycle commuting, this project would nevertheless provide an attractive grade-separated crossing of a busy four-lane arterial (Middlefield Road) where there is a long stretch without a signal.

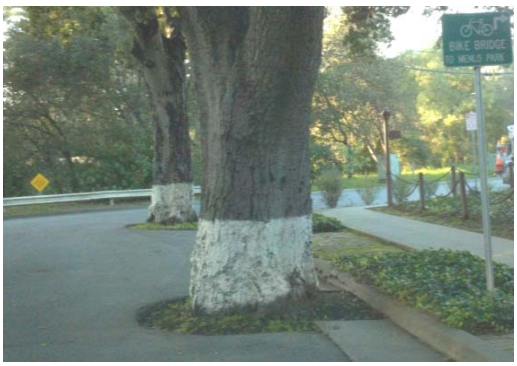
A second creek barrier crossing is at Newell Road bordering East Palo Alto, where the City has identified funding from Caltrans and the SFCJPA to replace the existing, narrow roadway bridge. Considered functionally obsolete and a flood hazard by these agencies, the new bridge is expected to include pedestrian and bicycle facilities but should be carefully studied for compatibility with the nearby Highway 101 overcrossing proposal (see above section) and enhanced bikeway opportunities identified by this Plan.

Two pedestrian-bicycle only creek bridges are also proposed as part of the Sterling Canal Trail concept just west of highway 101. These new crossings would connect Class I trail segments across Barron and Matadero Creeks to provide a continuous north/south recreational corridor from Greer Park to the fast-growing southeast corner of Palo Alto.

Other Jurisdiction Across Barrier Connections

Although not technically in Palo Alto or proposed as high priorities by City staff, two other planned barrier connections are important to document in this Plan. The first is a proposed overcrossing of Highway 101 in East Palo Alto, which was the highest bicycle priority identified in the City's *2012 Bicycle Transportation Plan*. With an option for a touchdown at Newell Road near Woodland Avenue, there is potential for direct linkage to the Gateway 101 Shopping Center and the Bay Trail from Palo Alto's Community Center and adjacent neighborhoods. The City of Palo Alto should support East Palo Alto's efforts to improve the creek and provide a crossing.

The other anticipated barrier connection is at the former Mayfield Mall site in Mountain View. The City recently approved a large residential development proposal that includes a dedicated bicycle and pedestrian undercrossing of the Central Expressway at the San Antonio Caltrain Station. This connection could directly improve connections for South Palo Alto residents headed to the transit station or San Antonio Shopping Center via the Miller Avenue and Mackay Drive proposed bicycle boulevard connections.



Streets without sidewalks or with rolled curbs can benefit from the use of shared space concepts. Trees or other strategically placed obstacles in the roadway, such as this example from the Bryant Street Bike Boulevard, communicate the need for drivers to slow down and may be an effective substitute for sidewalks where they are not desired or feasible.

A successful shared space application within a private shopping center in Marin County. Yellow ADA rumble strips differentiate travel lanes from exclusive walking areas for persons with sight impairments, while overhead catenary lighting helps maintain and enhance a pedestrian character.

5.1.5 Intentionally Designed Shared Spaces

Roadways and parking lots intentionally designed without curbs separating pedestrians and vehicular traffic are increasingly popular in the U.S. These may include slower-speed residential streets and private courts where sidewalks may not be desirable due to aesthetics (as with the Barron Park neighborhood). With the goal of making the street comfortable for living and playing (and uncomfortable to drive faster than 10-15 mph), shared space elements often include special roadway paving materials and intentional obstructions (e.g. trees, staggered parking stalls, etc.) to differentiate them from traditional roadways.

Shared space can also help define and activate public gathering spaces while retaining vehicular access. Many successful contemporary, or "lifestyle," shopping centers

Special treatments that visually knit together vehicle and pedestrian spaces can help calm traffic and distinguish areas for recurring events and closures.

(of which Town and Country is an example) employ this strategy for parking lots abutting retail services. In higher traffic commercial applications, color-contrasting detectable (a.k.a. rumble) strips are an important feature to ensure proper accommodation for sight-impaired users.

5.1.6 Temporary Spaces and Recurring Events

Festival Streets

Festival Streets are public places or a portion of a public roadway that are officially designated – and specifically designed – for repeated temporary closure to vehicular traffic and use by pedestrian-oriented special activities. Typically considered for non-arterial streets near parks, plazas, transit stations or commercial areas, festival streets might also include surface parking lots that have similar qualities and/or already host special events.

Palo Alto's collection of public parking lots, side alleys, and non-arterial streets in the California Avenue, Downtown, and Midtown commercial areas are all candidates for festival street designation. The blocks between University and Hamilton Avenues on Ramona and/or Emerson Street are especially intriguing since they are non-arterials that link downtown with the South of Forest Area; contain (virtually) contiguous surface parking, alley and plaza public spaces; and are proposed bikeways that could benefit from reduced weekend parking activity and recurring destination events. Also identified as a priority for maintenance, the City should explore in the short-term whether Ramona and Emerson Streets have future potential as festival and/or shared spaces.

Alternative Use of On-Street Parking Stalls (aka 'Parklets' or 'Flex Zones')

Several communities, including San Francisco and Mountain View, have unique streets or programs designed to provide flexible use of the parking areas adjacent to sidewalks for commercial or open space use. This strategy increases sidewalk width for amenities, improves the business environment, and provides intriguing and special experiences for pedestrians and passing observers. Often, these activities may be allowed under existing café permits or with minor changes to such regulations. Properly designed temporary structures, often referred to as 'parklets', can last for years and are low-cost alternatives to permanent bulb outs. Because they are temporary, cities can also remove or relocate unsuccessful uses with little consequence.

Other strategies to manage the right-of-way for pedestrian priority include permitting the alternative (temporary) use of on-street parking spaces, which can help provide amenities like café seating, landscaping, and bicycle parking while clearing up the sidewalk to provide a wide travel path relatively free of obstacles.

San Francisco's Pavement to Parks program recommends parklets only in areas that have limited public space, narrow sidewalks, or no parks. The areas should have existing conditions that attract people to the space, such as retail and high pedestrian activity. Generally, community benefit districts, storefront business owners, non-profit institutions, and community organizations sponsor and implement parklets.

'Ciclovias' or Sunday Streets

Sunday Streets events provide an opportunity for a community to come together around bicycling and walking.

"Ciclovía" is a term for temporary, recurring events in which multiple streets are closed to traffic and opened up for citizens of all ages and backgrounds to interact with each other through exercise, entertainment, and fun. Originally developed in Bogotá, Colombia, these events have quickly and recently spread throughout the U.S. as a strategy to promote active lifestyles, increase access to parks and recreation facilities, and celebrate/support local merchants and artists. Often customized with a more straightforward name such as "Sunday Streets", these events are free to the public and generally occur a handful of times over the summer (if rotating routes) or on a weekly/monthly basis if recurring on the same streets. Some of the proven benefits/successes of Ciclovía-style events include:[20]

- Focused public attention on active transportation and physical fitness
- Focused economic development that celebrates downtown and/or neighborhood eateries, merchants, and culture
- Opportunities for residents to explore areas of the City that they may not frequent, including areas that may otherwise be uncomfortable to walk/bike/jog during normal operation

5.1.7 Public/Private Partnerships

Cities throughout the country have utilized a variety of alternative partnerships with public organizations to develop facilities and encourage non-motorized transportation use. Whether with developers, planners, or individual members of the public, such partnerships could leverage City resources to promote bicycling and walking.

Bike Rack Program

The City currently offers free bike racks to businesses in Palo Alto. Businesses are responsible for installation of the racks. However, the program is not well-publicized and few businesses take advantage of it. This program should be better marketed to local businesses, potentially through brochures and/or information about the benefits of bicycle parking.

Development Certification Programs

The City could encourage designs that promote bicycling and walking by prioritizing or requiring that projects meet established standards in bikeability and walkability. One example is the Leadership in Energy and Environmental Design - Neighborhood Development (LEED-ND) program, which recognizes developments that are environmentally responsible and sustainable. To qualify for LEED-ND, the development's location and design must reduce environmental impacts and promote proximity between

[20] *From Ciclovias Recreativas of the Americas Fact Sheet, 2008.* http://cicloviarecreativa.uniandes.edu.co/english/index.html

housing and jobs, enabling alternative transportation choices. However, due to the extensive checklist of qualifications, few infill developments can meet the standards of LEED-ND.[21]

An alternative to the LEED-ND designation, the emerging Sustainable Transportation Analysis and Rating System (STARS) is a performance-based, agency-driven, and transportation-focused program. Projects can be certified for improving access to jobs/schools, housing and goods; reducing petroleum use and greenhouse gas emissions, and reducing transportation capital and operating costs. Palo Alto could require that plans meet one or more of STARS' "core credits," such as Access, Climate and Energy, and Innovation. Alternatively, for a particular project, the City could prioritize proposals that would meet one or more of these credits, or offer incentives to developments that meet the criteria.[22]

Parking District Fees

Palo Alto could consider developing a Community or Transportation Benefit District (TBD), which would implement a parking tax to fund transportation improvements within the district. The City would be required to develop a plan specifying the transportation improvements to be funded by the TBD. The plan should determine whether the funds will be used on an ongoing basis for smaller projects such as bicycle parking, or if they will be collected for a specified period to fully fund a large project or to serve as a match for state or federal grant funds.

A TBD can fund any transportation improvement that is necessitated by existing or reasonably foreseeable congestion levels. This can include maintenance and improvements to city streets, investments in transportation demand management, and other transportation projects identified in a regional transportation planning organization plan or state plan.

Palo Alto currently has two existing Parking Assessment Districts in the Downtown and California Avenue business districts. These are set up to repay previous bonds for garage projects and to fund on-going maintenance projects, but do not include bicycle facility improvements.

Volunteer Groups

Residents and community members are excellent resources for garnering support and enthusiasm for bicycle and pedestrian facility improvements. The City could work with volunteers to substantially reduce implementation and maintenance costs, particularly for unpaved paths on City-owned land. Local schools, community groups, or a dedicated neighbors group may help sponsor projects, possibly by working with a local designer or engineer. Work parties can be formed to help clear right-of-way where needed. Local construction companies can donate or discount services. Potential volunteers include neighborhood and other community groups, including Eagle Scouts for a community-service project. A great example of such a partnership is the SWTrails group in Portland, Oregon, who build and maintain trails, organize group hikes, and advocate for bicycling and walking resources.[23]

[21] *More information is available online at: http://www.usgbc.org/DisplayPage.aspx?CMSPageID=148*
[22] *Additional information is available at: http://www.portlandonline.com/transportation/index.cfm?a=319882&c=34749*
[23] *More information is available at: http://swtrails.org/*

Tourism Maps

The City could look into partnering with the Chamber of Commerce or the Palo Alto Downtown Business and Professional Association to print bicycle maps or walking maps of downtown. These could be funded by local businesses and include advertisements and coupons, as well as identifying shopping opportunities and other tourist destinations. Such maps are often made available free of charge at downtown businesses and transit centers, and they encourage tourism, walking, and bicycling. An example is a map made for St. Louis, Missouri, which uses symbols to indicate services and shows attractive illustrations of key destinations.[24]

Attractive walking and bicycling maps can be developed in coordination with downtown businesses or tourist services.

"Friends of" Groups

A "Friends of Palo Alto Bicycles" advocacy organization could be formed to ask local businesses for incentives or discounts to give to bicyclists or pedestrians at events. The group could help support and conduct outreach for bicycle-related projects, maximizing public-private funding opportunities. For trail projects, the group could hold a fundraiser in which individuals finance a small portion of the trail. Jackson County, Oregon had a "Yard Sale," in which the Bear Creek Greenway Foundation sold symbolic "yards" of the trail and placed donor's names on permanent markers that are located at each trailhead. At $40 a yard, the organization raised enough money in private cash donations to help match their $690,000 Transportation Enhancements program award.

One notable opportunity for public involvement is support for an Open Streets or Sunday Parkways type event (discussed in **Section 5.1.6**). While the City should lead programming for such an event due to the need for permitting, outreach, and other tasks, strong public support and volunteer availability will help make such an event a success. Information about such partnerships is available on the Open Streets Project website (openstreetsproject.org), including advocacy manuals and volunteer training.

5.2 Bicyclist Needs and Recommendations

The bicycle network should accommodate all types of bicyclists, from confident, experienced users who would rather ride in traffic and minimize travel time, to others who would rather travel a little out-of-direction or wait longer to cross a street in order to avoid riding on streets with large numbers of motor vehicles or high vehicular speeds. This section identifies types of bicyclists as well as specific bikeway facility and supporting facility types appropriate for different bicyclists.

Bicyclists' needs and preferences tend to vary by the purpose of their trip; utilitarian trips are made by commuter bicyclists going to and from work or school as well as by people who use bicycles to go shopping or run other errands, while recreational trips can range from a short family outing to a local park to a long distance group ride or something in between. Less-experienced recreational riders or riders with children tend to prefer riding on multi-use paths or on streets with low motor vehicle speeds

[24] *The map is available online at: http://www.smart-trips.org/downloads/smart_trips_highland_park_map.pdf*

and volumes. Other recreational riders may prefer riding on a major street that provides signalized street crossings, minimizing their need to stop.

Palo Alto has existing facilities for bicyclists making both recreational and utilitarian trips. While experienced bicyclists may not require significant infrastructure, providing high-quality off-street facilities and bicycle boulevards is likely to attract recreational bicyclists from around the Bay Area.

5.2.1 Accommodating "Interested but Concerned" Bicyclists

Recent developments in bicycle facility planning and design have focused largely on one principle: separating bicyclists – visually, psychologically, and physically – from automobile traffic, or on mixing bicyclists with low volumes of traffic traveling at low speeds. This focus stems from the popularity of national programs such as Rails to Trails, planning research of bicycle-friendly cities in Europe and Canada, and from the common finding that fear is the number one reason people do not bicycle more in the U.S.

According to the bicycle coordinator with the City of Portland, OR:

> "Riding a bicycle should not require bravery. Yet, all too often, that is the perception among cyclists and noncyclists alike... Survey after survey and poll after poll has found again and again that the number one reason people do not ride bicycles is because they are afraid to be in the roadway on a bicycle. They are generally not afraid of other cyclists, or pedestrians, or of injuring themselves in a bicycle-only crash. When they say they are "afraid" it is a fear of people driving automobiles."[25]

Based on a theory developed in Portland and corroborated elsewhere in the U.S., planners often refer to four types of bicyclists (and their general prevalence in society) when targeting bike facilities and programs aimed at reducing fear. As depicted in **Figure 5-2,** a majority of people are considered "interested but concerned" with respect to bicycling, a target audience that typically includes females, young families with children, and active seniors less confident at sharing the road with motor vehicle traffic. Cultivating these potential bicyclists demands both engineering solutions that reduce motor vehicle interactions and education/encouragement efforts to proactively engage and support reluctant populations.

By developing and sustaining a model Safe Routes to School program and inventing the prototype for a bicycle boulevard (Bryant Street), Palo Alto has made significant efforts to attract the "interested but concerned" demographic. Higher than average rates of bicycling – and increased rates of bicycling concurrent with new facilities and expanded programs – indicate these efforts have been successful. They will also be essential if the city is to double the share of work commutes by bicycle and convert a sufficient number of car trips into bicycle trips for reaching climate action targets. Like most other U.S. cities, however, existing design and funding constraints have thus far limited opportunities for substantially expanding trail and protected on-street networks (and education/encouragement programs) to attract even more bicyclists.

[25] *Roger Geller, "Four Types of Cyclists," available at: www.portlandonline.com/transportation/index.cfm?a=237507&c=44671*

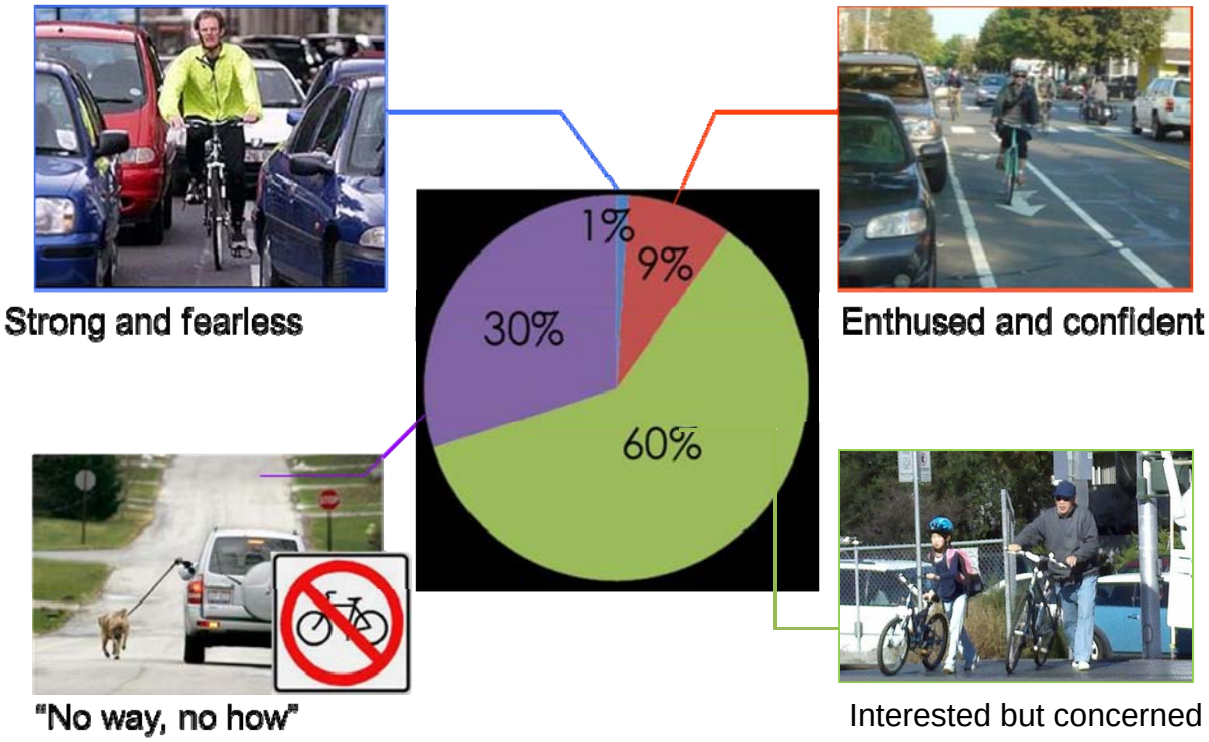


Figure 5-2: Four Types of Bicyclists

In response to the need for innovation and advocacy on behalf of cities, the National Association of City Transportation Officials (NACTO) recently developed the *Urban Bikeway Design Guide* (April 2011). This online resource includes strategies for increasing separation between motor vehicles and bicyclists and bicyclist visibility using relatively low-cost treatments such as colorized bike lanes, intersection markings, and physically separated bike lanes (e.g., cycletracks). These facilities represent the most recent treatments being implemented in cities throughout the U.S. and the NACTO guidance provides best practices and considerations for situations in which innovative or non-traditional facilities may be appropriate or beneficial.

All of the facilities included have been implemented in the U.S. and none are expressly prohibited under or contrary to the current versions of the American Association of State Highway and Transportation Officials (AASHTO) *Guide to Bikeway Facilities* or the California *Manual on Uniform Traffic Control Devices* (CAMUTCD). While none of these facilities are illegal, many state and federal funding sources cannot be used to fund their implementation, including the Bicycle Transportation Account (BTA) and Transportation Development Act (TDA) funds.

Customized guidance on relevant NACTO and other innovative treatments is included in this chapter and **Appendix A** of this Plan, while **Chapter 7** includes recommendations to utilize local spending for bikeway facilities not eligible for other funds. Another concern with implementing non-traditional facilities is the potential for additional liability. The City of Palo Alto has committed to following experimentation approval process for treatments that may be implemented in ways not specifically allowed by AASHTO or the CAMUTCD.

Along with Palo Alto Bicycle Advisory Committee (PABAC) and City/School Traffic Safety Committee (CSTSC) review, the City should consider updating existing bicycle facilities that do not meet NACTO and other state and local standards, including locations where a five-foot bike lane is adjacent to a seven-foot parking lane.

5.2.2 Defining a Core Network of Crosstown and Recreational Routes

To take full advantage of existing on-street facilities, off-road trail and park segments, and other strategic "cut-through" routes requires substantial prior knowledge of Palo Alto. This is due in part to numerous "T" intersections that require turns and the need for anticipating network barriers, although it is also inherent to a relatively dense and varied bikeway network. This is particularly true along shared lane bikeways and bicycle boulevards, which follow local streets and often "jog" or turn onto another street. At the same time, the most popular bike routes experience heavy usage during peak periods to the point that crowding is or will soon become an issue. As a method to improve existing legibility and future capacity of the system – particularly as the number of new and more casual users continues to grow – Palo Alto should begin to identify and improve a core network of bicycle facilities that includes the following:

- **Wayfinding**. Basic and enhanced wayfinding will help inform users of important destinations, facilitate route selection, and brand the core system. The *BPTP 2012* includes a custom signage and on-street markings package to help establish and more easily identify bicycle boulevards (see following section and **Appendix A** for more discussion).
- **Bay Trail and Bay to Ridge Trails**. An important component of wayfinding is hierarchy, or the clear relationship of regional, citywide, and local routes and destinations. Including and enhancing the Bay Trail and Bay to Ridge Trails as the backbone of a core Palo Alto network is an essential strategy for ensuring compatibility and hierarchy of regional and local facilities. The BPTP 2012 identifies California Avenue as a unique on-street component of the Bay to Ridge Trail that should be improved through further separation from traffic and/or increased visibility of roadway markings and signage.
- **The Civic Loop.** This loop concept would promote a continuous loop in the city's center, to help people navigate by bicycle. It would link the existing Embarcadero/Caltrain trail, the Castilleja-Park-Wilkie Bicycle Boulevard, and the California Avenue Enhanced Bikeway with consistent wayfinding.
- **Connectivity of On- and Off-Road Facilities**. Just as transit planners seek to build "seamless" connections where multiple transit modes and routes converge, so too must the bicycle network reduce conflicts and improve connectivity between trails, paths, and on-street facilities. This is especially important where barrier connections funnel and disperse a variety of routes.

5.2.3 Bicycle Boulevards

A network of bicycle boulevards is the most direct and cost-effective way to increase bicycle mode share, safety, and mobility. A well-connected, flat, and relatively dense street grid along with numerous pedestrian and bicycle–only barrier crossing opportunities makes Palo Alto an ideal setting to further develop the bicycle boulevard concept. This Plan proposes several new additions to the bicycle boulevard network and includes a design toolbox that emphasizes integrated wayfinding, speed limit reductions, actuated arterial crossings, and greater use of traffic circles as a replacement for stop signs (especially where bicycle boulevards intersect other bikeways). New "soft" innovative traffic calming tools such as bicycle-friendly chicanes and narrow queuing street segments (see **Appendix A**) are also provided where "hard" traffic diversion is not feasible or desirable. These latter features may be especially relevant for rolled curbed streets and streets without sidewalks to improve bicycle (and pedestrian) comfort and increase the potential for landscaping.

This Plan proposes a custom wayfinding protocol, including street signs and pavement markings, for an expanded network of bicycle boulevards in Palo Alto. ***Chapter 6*** *and* ***Appendix A*** *provide more details.*

It must be noted that Palo Alto has made very little progress outside of the Bryant Street corridor, which is problematic since bicycle boulevards work best as part of a system of bikeways. Although many proposed boulevard corridors function reasonably well today, they are not yet "implemented" and available for promotion. Significant plans to improve (implement) the Castilleja-Park-Wilkie corridor are actively moving forward concurrent with this Plan. As a tandem high priority strategy, the City should establish much of the network quickly without diluting the high standard of bicycle boulevards through the use of Bike Route signs. As physical traffic control improvements and more substantial spot upgrades are provided, streets can be formally designated bicycle boulevards, and distinct wayfinding signs can replace the Bike Route signs on the existing sign poles. To assist the pace of implementation, this Plan includes a customized signage and wayfinding protocol for bicycle boulevards. This recommendation is consistent with BPTP 2012 survey results that indicate strong support for expanding the bicycle network as the City's highest bicycle priority (see **Appendix D**).

(Above): Shared use path and roadway intersection with "cross bike" pavement markings and pedestrian lighting – Ohlone Greenway, Berkeley, CA. (Left): Urban trailhead, San Rafael, CA. Note high visibility signage, a lack of unnecessary barriers, and inclusion of a "mixing zone" gateway feature as elements of this successful path terminus.

5.2.4 Trail Crossings and Accessibility

Access to the existing trail network is poor in many locations throughout Palo Alto, including the Bol Park/Gunn High School paths as well as to/from important barrier crossings like the Embarcadero Highway 101 overpass. Many (not all) existing substandard barrier devices meant to block motorcycles and/or protect pedestrians have dubious safety benefits and overly impede existing user convenience and accessibility.

Standard or nonexistent roadway crossing treatments also limit visibility of the trail/path system and connectivity to on-street bikeways. The BPTP 2012 includes several project recommendations and design guidelines aimed at improving and extending trails and trail crossings. These include new pedestrian lighting and a series of trail connection enhancements along Bol Park path to increase school commute safety and general connectivity, as well as lighting the Lefkowitz Tunnel as a short-term improvement for park connectivity due to the Highway 101 skylight displacement.

Two of the proposed trail extensions will require extensive property owner coordination/support; the first is at the back entrance to the VA Medical Center parking lot, which would create a trail bypass route around the existing steep slopes and arterial bike lanes on Hillview Avenue within the outer Stanford Research Park Area; the second would extend Bol Park Path to Hansen Way (and El Camino Real) through the Research Park along an old railroad easement. More detail on the highest priority trail projects is located in **Chapter 6**.

Gunn High School Path at the terminus of Los Robles Avenue. This barrier design is typical of many existing trail intersections, and complicates use by people with disabilities, strollers, and bicycles with trailers.

5.2.5 Enhanced Bikeways

The BPTP 2012 generally identifies enhancements to existing corridors – in particular, bicycle stencil markings carried through intersections as described in the NACTO Urban Bikeway Design Guide – as the most effective strategy to improve arterial bicycling conditions in Palo Alto. Many existing bike lanes are dropped at approaches to major intersections, leaving bicyclists and motorists with little guidance at the points of greatest potential conflict. Such markings do not impact traffic capacity, are relatively inexpensive, and can be implemented throughout the city. Improved and comprehensive wayfinding signage as depicted in **Appendix A** should also be prioritized on enhanced bikeways, which together with bicycle boulevards and trails represent the core bicycle network.

Other recommended improvements to enhanced bikeway corridors include the use of green colorized pavement markings to denote potential conflict zones or exclusive bike facilities, improved bicycle detection, and the conversion of substandard bike lanes to well-designed shared roadways. For the latter, lead-in bicycle lanes with bicycle boxes (see **Appendix A**) are strongly encouraged to promote bicycle priority in locations with high numbers of bicycle left or vehicle right turn movements.

The enhanced bikeway designation also prioritizes corridors for potential conversion from time restricted bike lanes to two-way cycletracks and/or the addition of Class I sidepaths. These corridors and their issues are discussed in greater detail in the following sections.

Intersection through markings (far left) and colorized bike lanes (left) are two examples of potential enhancements to existing arterial facilities.

5.2.6 Time Restricted Bike Lanes

Palo Alto has many bike lanes that are possible only by restricting parking on one side of the roadway (typically from 7am-7pm). This practice results in the presence of bike lanes during the heaviest periods of use (morning and evening weekday commutes) while allowing homeowners the use of the public street for evening and weekend parking for themselves and their guests. Due to constrained roadway width, however, most of these facilities result in an imbalanced cross-section that forces bicyclists too close to the parking lane "door zone" and/or encourages wrong-way riding. As many are school commute corridors and important access routes to major civic destinations, the BPTP recommends improvements to these corridors as a high priority to help distinguish a core bicycle network.

At minimum, streets with existing conditions shown in **Figure 5-3** should be restriped to provide two 9.5-foot travel lanes and two 5-foot bike lanes. Additional enhancements such as green colorized lanes and intersection through-markings should also be considered. Despite helping reduce the potential for "dooring" where parking is permitted and increasing visibility, both the minimum bike lane widths described above and loss of the bicycle lane during evenings/weekends are not desirable conditions

according to best practices. For this reason, the BPTP 2012 presents additional design options for existing time-restricted bike lane streets in **Chapter 6** and in **Appendix A**. These options include consideration of full-time parking restrictions in order to "stack" dedicated bicycle space to one side of the street (i.e., build cycletracks). These facilities are more attractive to novice bicyclists, can help develop a core bicycle network integrated with trails and barrier crossings, and, when properly designed, may reduce wrong-way and sidewalk riding. They also require a limited number of major intersections and careful design attention to reduce potential vehicle conflicts, and thus may be appropriate only for a small number of corridors.

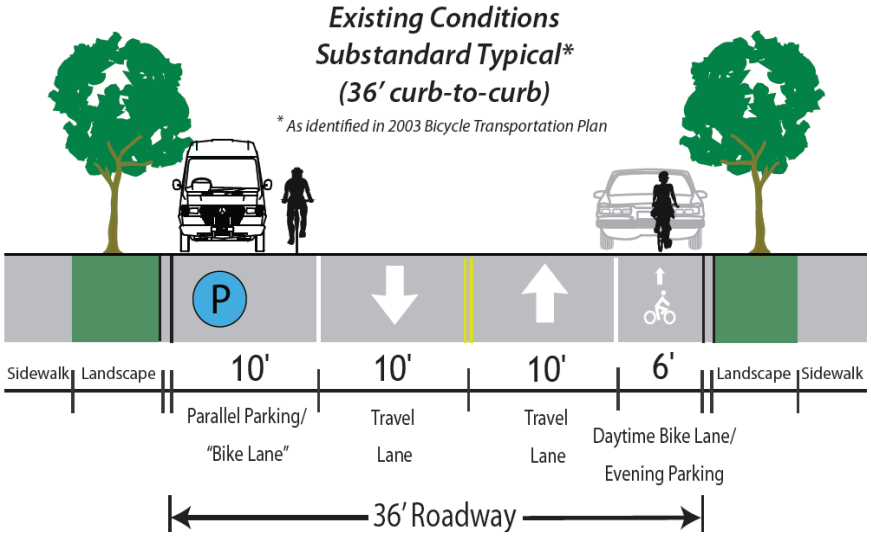


Figure 5-3: Typical Cross Section of Substandard Time Restricted Bicycle Lanes

5.2.7 Sidewalks vs. Sidepaths and Cycletracks

The *2003 Bicycle Transportation Plan* was instrumental in helping establish clear City policy prohibiting and/or discouraging riding bicycles on sidewalks in most situations (see also Chapter 10.64 of the Municipal Code). This policy is based in part on a 1994 Palo Alto study that concludes on-street bicycling is two times safer on average than sidewalk riding, as well as from similar findings/theories such as

Adult bicyclists should be discouraged from bicycling on sidewalks. However, well-designed separated facilities such as cycletracks and sidepaths can be appealing for a wide range of bicyclists.

John Forester's influential book "Effective Cycling." While this conclusion and the existing city policy remain valid, it is important to distinguish sidewalk riding from newer types of facilities recommended for consideration under this Plan. These include the potential provision of two-way cycletracks and conversion of existing sidewalks into Class I shared use paths (known as sidepaths when running parallel and adjacent to roadways).

The main issue identified with sidewalk riding, just as with cycletrack and sidepath design, is the identified safety risks at roadway crossings (intersections and to a lesser extent, driveways). Without proper geometric design standards, signal controls, signage, markings, or associated education and outreach to motorists, existing intersections where sidewalk riding occurs are often ill equipped to handle conflicts with turning vehicles. Modern guidance on the design of cycletrack and sidepath facilities considers a number of suitability criteria and includes measures that reduce potential intersection conflicts. More information on cycletrack and sidepath design guidance is provided in **Chapter 6** and in **Appendix A**.

In Palo Alto, sidewalk and wrong-way riding activities are due to a combination of factors, including the element of fear. Other factors include the presence of imbalanced bike lanes (mentioned previously), the need to access sidewalk parking, and barrier connections (under/overcrossings) that require access from one side of a street or crosswalk. Understanding reasons for sidewalk riding, as well as the differences between newer protected facility types, is important for developing community support for protected facilities – and ultimately, communicating their proper function to users and motorists. Where opportunities may exist to meet modern guidelines, the BPTP 2012 recommends consideration of sidewalk upgrades to Class I sidepaths and re-striping of roadways to include two-way cycletracks.

5.2.8 Arterial Bicycle Facilities

Arterial streets remain important routes for bicyclists because they are fast, direct, bridge many barriers, and serve many destinations. As with the 2003 Plan, this *Bicycle and Pedestrian Transportation Plan* did not conduct a Bicycle Level-of-Service or similar assessment, relying instead on existing plans (including the 2003 plan), near-term paving priorities, public input, and qualitative analysis to identify facility opportunities and their importance. The potential for bicycle and pedestrian "Complete Street" opportunities also greatly influences this Plan's assessment of arterial corridors.

Class III Arterial Shared Roadways

Some major arterial routes have high traffic speeds and volumes and may not be comfortable for 'interested but concerned' bicyclists even with shared lane marking treatments. Nevertheless, the 'strong and fearless' bicyclists prefer these routes because of their directness and signalized crossings. In order to accommodate this type of rider, "Share the Road" signage may be sufficient along with strategically located shared lane "sharrow" pavement markings.

These accommodating roadways include Alma Street, El Camino Real, Embarcadero Road, San Antonio Road, and Oregon Expressway. Several of these corridors are currently or likely to be the subject of separate corridor studies, which should consider bicycle and pedestrian access. For example, Embarcadero Road is the subject of a priority corridor study that will focus on safety and mobility improvements.

5.2.9 Improving Access to Neighborhood Commercial Centers

The City has placed a "dismount zone" stencil in front of City Hall to deter people from bicycling through commercial areas.

Outside of the two business districts, the remaining commercial centers are served primarily by arterial vehicle lanes and infrequent local bus service. Improving non-motorized access to these neighborhood centers is a key strategy for increasing bicycle commute rates and the share of discretionary trips made on foot or by bicycle.

As part of ongoing planning for Bus Rapid Transit (BRT) along El Camino Real, the City of Palo Alto, Caltrans, and the VTA should assess opportunities to provide bicycle lanes through the commercial area south of California Avenue and north of Charleston/Arastradero Roads, as well as connecting to the south. Such facilities were recommended for consideration by the 2003 *El Camino Real Master Schematic Design Study* and would greatly improve transit and commercial access in a dynamic, fast-growing area of the city.

Further east in Midtown, the City is actively seeking funds for a comprehensive study of Middlefield Road to identify Complete Street improvement opportunities. Recently added to the county's transportation plan (VTP 2035), this effort should assess (along with new potential crosswalk and curb extension locations) the feasibility of extending bike lanes north from Loma Verde Avenue into the Midtown Shopping Center. Additional opportunities to improve Midtown bicycle access include new potential east-west bicycle boulevard (Amarillo/Moreno Avenue) and trail (Matadero Creek) connections, upgrades and extensions of Colorado Avenue bike facilities, and design enhancements and programming of Midtown Court.

A more detailed account of proposed arterial improvements that contribute to better commercial access is provided in **Chapter** 6. It is important to note that all projects with potentially significant impacts on traffic service levels will be studied independently from this Plan.

5.2.10 Bicycle Parking

Bicycle parking and end-of-trip facilities can be a determining factor in whether someone decides to make a bicycling trip. A majority of respondents to the BPTP 2012 public survey indicated a desire for more bicycle parking in the California Avenue and Downtown business districts. Additional parking needs were also noted in the Midtown, Town and Country, and Stanford Shopping Centers. In response to demand, the City recently deployed new bike racks in Midtown and is actively planning and installing on-street bicycle corral and sidewalk rack facilities in Downtown. California Avenue will also receive significant bicycle parking facility improvements as part of the streetscape improvement project between El Camino Real and Park Boulevard.

Additional, well-placed bike parking in combination with more visible on-street facilities (sharrows) may help reduce the frequency of sidewalk riding in business districts.

Palo Alto Municipal Code requires that all new buildings, additions or enlargement of existing buildings, or change in a use that results in the need for additional vehicle parking provide bicycle parking. Section 18.54.060 discusses the design of bicycle parking facilities. The code specifies short- and long-term bicycle parking as follows:

- Short-term bicycle parking is intended for shoppers, customers, and visitors who require bicycle storage for us to several hours. Acceptable racks enable the bicyclist to lock the frame and one or both wheels with a user-provided U-lock or cable and support a bicycle by its frame in a stable upright position without damage to the bicycle or its finish.
- Long-term bicycle facilities are intended for bicyclists who need to park a bicycle and its components and accessories for extended periods during the day, overnight or for a longer duration. Long-term bicycle storage is typically for employees, students, residents and commuters. The facility frequently protects the bicycle from inclement weather. The four design alternatives are: bicycle lockers, restricted-area bicycle enclosure, multifamily dwelling unit storage locker, and school bicycle enclosure.

Locally designed Bike Arc bicycle racks as well as custom public art racks are planned for installation in Downtown. (Source: Bellomo Architects)

Lightning Bolt Racks are frequently used on Stanford campus and support the bicycle from the frame and the wheel.

The 2003 Plan conducted an inventory of existing bicycle parking facilities. The inventory found a considerable number of bicycle racks at major shopping areas, transit centers, public schools, and in other locations.

The provision of longer term, secured bike parking for major transit facilities (the Palo Alto Transit Center) and new development (including shower facilities for office/commercial) is addressed in detail within other existing documents. These include the 2008 *Caltrain Bicycle Access Study* and City of Palo Alto Municipal Code, Chapter 18.5.

Bicycle Parking Design

Well-designed bicycle parking provides the user with a secure and easy-to-use place to store his or her bicycle and helps prevent improperly parked bicycles from impeding pedestrian activity or obstructing the path of travel for persons with disabilities.

The design of the rack itself should be intuitive to use and provide security against theft. Racks with moving parts or complicated designs may confuse users. Unacceptable racks include wheel benders, toaster racks, and wave racks, which do not support the bicycle at two points or allow for the frame and at least one wheel to be locked to the rack. A standard inverted-U style rack is recommended for Palo Alto, although post-and-loop racks are acceptable and artistic racks may be used but are subject to review and determined by zoning administration. The "Bike Arc" racks and other art racks will be installed in Downtown Palo Alto in 2011 and 2012. The shape of the Bike Arc rack is compatible with existing tree wells along University Avenue and limit intrusion on the existing sidewalk. See **Appendix A** for additional bicycle parking guidance.

A conventional inverted-U style rack supports the bicycle on two points of contact and provides easy-to use bicycle parking.

Palo Alto's Municipal Code Section 18.54.060 discusses specific guidance for types of bicycle facilities, differentiating short-term and long term parking. Short term parking consists of bicycle racks, while long-term may include bicycle lockers or restricted-access enclosures. **Appendix B** suggests insertions and deletions to the Municipal Code in order to simplify the language and allow a variety of innovative bicycle parking types while specifying the key elements that are required for formal bicycle parking. For example, the current code does not specify that a rack should provide two points of contact with the bicycle, which is recommended by the Association of Pedestrian and Bicycle Professionals (APBP) in the 2010 *Bicycle Parking Guidelines* (2010).

Location and Placement of Bicycle Parking

Placement of bicycle racks determines how useful they are to bicyclists; if short term parking is not readily apparent at the entrance of the building, bicyclists may lock informally. Accessible and visible long term parking may make the difference between whether or not an employee bikes to work.

For short term parking, bicycle racks can be placed on the sidewalk (shown in **Figure 5-4**) or on-street, known as a bike 'corral' (see **Figure 5-5**). Palo Alto's first bicycle corral has been installed on Ramona Street and provides space for 10 bicycles in a single automobile stall. The provision of on-street bicycle "corrals" located at corner and midblock locations can be an effective strategy for efficiently using limited space where high parking demand and/or high demand for other sidewalk uses is clustered.

The Municipal Code outlines standards for bicycle parking location, layout, paving, lighting, and signage. **Appendix B** makes recommendations for updating the Municipal Code to require sufficient space for and between bicycle racks to allow access to the rack as well as maintaining pedestrian circulation. The text specifies how far from the building entrance short- and long-term parking may be, as well as placement of long term parking within a parking garage, and other recommendations.

A pilot installation of high visibility, well-located on-street bicycle "corrals," or grouped bicycle parking, took place in summer 2011 on Ramona Street at the Coupa Café. Up to ten additional corrals are planned for Downtown within the next year.

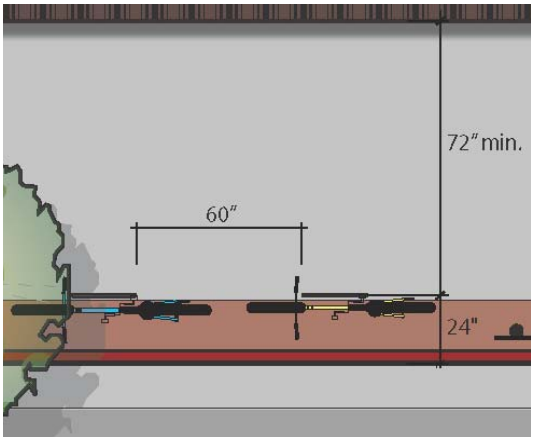


Figure 5-4. Recommended configuration of a staple bicycle rack on the sidewalk

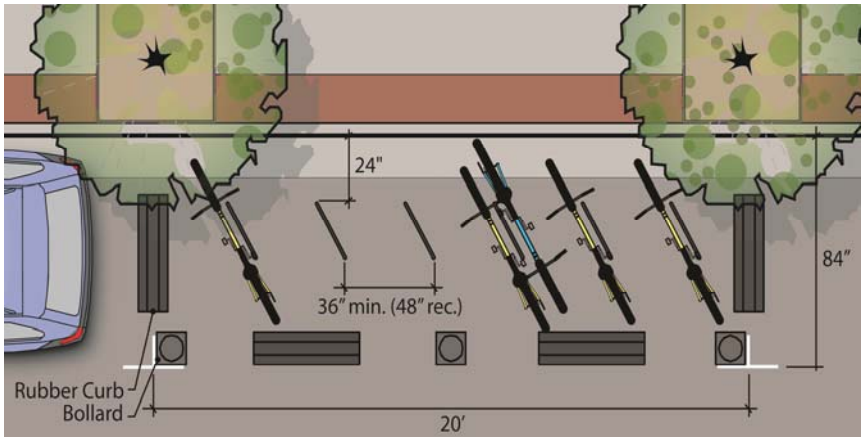


Figure 5-5. Recommended configuration of an on-street bicycle corral

Development Requirements

Because land use is closely linked to people's transportation decisions, promoting bicycle- and pedestrian-friendly infill development and new developments is a critical element of encouraging bicycling and walking. Palo Alto's Municipal Code requires bicycle parking based on land uses, to enable bicyclists to rely on suitable accommodation at all destinations. Table 1 of Palo Alto Municipal Code Section 18.52.040 presents the required quantity of bicycle parking by land use.

In general, a mix of short and long term parking is required at commercial and retail uses. Multiple family residential uses also require long-term parking. Spaces for schools should be identified as being enclosed in bike cages. In Community Commercial uses, employee shower facilities are required in new buildings and additions based on square footage, with no shower required below a certain area based on building use (18.43.070 [e]). The City's Context-Based Design Criteria also requires the provision of bicycle facilities and sidewalks in many types of development.

A number of incentives could further encourage improved bicycle parking and end-of-trip facilities:

- Providing motor vehicle parking relaxations where bicycle parking is provided beyond the minimum requirements.
- Providing motor vehicle parking relaxations where complete end-of-trip facilities are provided, e.g., long- and short-term parking coupled with showers, washrooms, and clothing lockers.
- In space-constrained applications, such as redevelopment of an existing building, allow for the conversion of motor vehicle parking spaces into long-term bicycle parking to meet the bylaw requirement (typically five bicycle parking spaces can be achieved per motor vehicle parking space).
- Extending or introducing payment-in-lieu of parking programs to allow funds to be collected in-lieu of vehicle parking and placed in a sustainable transportation infrastructure fund to fund active transportation projects, which may include a centralized bicycle parking and end-of-trip facility (e.g. a bike station). Note: this should not replace bicycle parking and end-of-trip facility requirements.

Palo Alto could also create a Bicycle Rack Program that works with interested land owners to supplement the existing supply of bicycle parking. The City could help pay for racks and/or installation costs for bicycle racks installed on private property. The program should provide information for businesses regarding the benefits of bicycle parking.[26]

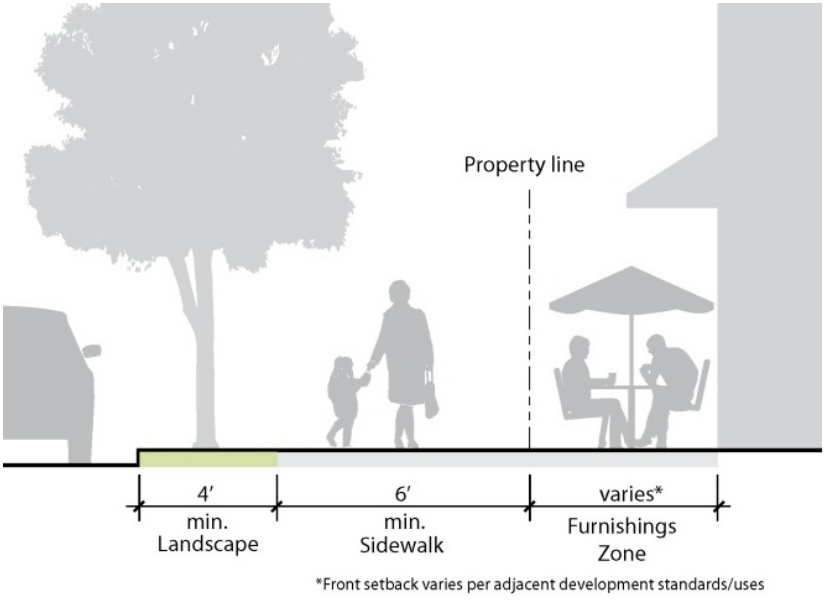
[26] *The 2010 report, Bike Corrals: Local Business Impacts, Benefits, and Attitudes found widespread support for bike corrals from local businesses, while The Employer Guide to Bicycle Commuting: Establishing a Bike-Friendly Workplace for your Baltimore Region Employees compares the initial cost of 12 automobile parking spaces ($40,000 to $100,000 USD) to the cost of 12 bike rack spaces and one automobile space ($4,600 - $9,600 USD).*

5.3 Pedestrian Needs and Recommendations

The following section describes relevant citywide issues pertaining to pedestrian travel and safety. Additional pedestrian facility recommendations for specific areas of the city are provided in **Chapters 6** and **7**.

5.3.1 Sidewalk Zones and Width

The 2003 VTA *Pedestrian Technical Guidelines* document contains an extensive discussion of sidewalk standards, promoting a minimum four-foot sidewalk width and the consolidation of driveway curb cuts to reinforce traffic separation. The City of Palo Alto standard is to build five-foot wide sidewalks and five-foot landscaping/furnishing zones where feasible. The BPTP 2012 proposes a new requirement that all new sidewalks include a minimum six feet of unobstructed, linear sidewalk space free of street furniture, street trees, planters, and other vertical elements such as utility poles, signs and fire hydrants. Segments less than six feet do not allow pedestrians to pass each other comfortably, particularly when mobility assistance devices and/or baby strollers are used. Additional width may be required and/or encouraged under the Municipal Code or through Architectural Review Board review.



Recommended widths for sidewalk "zones" or sections.

The VTA guidelines also recommend a landscape/furnishing/edge zone to limit walkway encroachment by trees, signs, poles, and other features and for added separation from traffic. This zone, where feasible, should be a minimum of four or five feet to accommodate roadway clearances and tree root growth. Exceptions to minimum roadway clearance standards should also be considered for constrained sites where pedestrian accommodation is a priority over the preferred placement of signs and poles.

Rolled Curbs

The widespread use of shallow 36-inch wide gutters with rolled curbs on arterial and residential streets complicates pedestrian separation and travel in Palo Alto. Parked vehicles commonly utilize all or portions of the gutter and sidewalk, encroaching upon what is already a limited space for walking (especially where private vegetation is adjacent). The integrated nature

Although artistic sidewalk designs are encouraged, weaving or irregularly patterned edges should be avoided due to their difficult navigation by persons with disabilities and approved wheeled devices.

of the rolled curb/sidewalk also discourages landscaping elements or other buffers between the sidewalk and travel/parking lanes. The *Comprehensive Plan* includes specific policy language that encourages retrofitting streets and sidewalks with vertical face curbs where desired. The BPTP design guidelines for queuing streets in **Appendix A** include an alternative option to retrofit rolled curbed residential streets (in particular, bicycle boulevards) for improved pedestrian accommodation.

Sidewalk Gaps

Although much of the city contains adequate sidewalks where they are generally desired (i.e., outside of Barron Park and creek riparian corridors), a few significant sidewalk gaps remain. These include areas immediately fronting Rinconada, Robles, and Monroe Parks; the west side of Alma Street heading north from the Palo Alto Transit Center; portions of Hanover Street, Porter Drive, and Hansen Way in the Research Park; and the approach to the San Antonio overpass. Other notable sidewalk deficiencies include the El Camino Real approach from Matadero Avenue, and the west approach to Middlefield Avenue from Colorado Avenue.

Steps from the Palo Alto Transit Center, and with parking adjacent to the curb, Alma Street north of Lytton Avenue is a priority sidewalk (or shared use path) gap closure project.

5.3.2 Curb Ramps, Extensions, and Turn Radii

Most Palo Alto intersections with sidewalks provide curb ramps, typically a one-ramp or "diagonal" design that may or may not have ADA-compliant detectible warning strips, ramp slopes, landing area dimensions, and joint smoothness. Retrofitting curb ramps to ensure compliance with ADA requirements should be a high priority for high-volume locations and where requested by individuals with mobility impairments. It is also a requirement for all new roadway and development projects that affect intersections.

Major maintenance and spot improvement efforts should consider curb extensions to the maximum extent practical, namely where on-street parking and the lack of significant drainage infrastructure make them viable. (Note: The prevalence of curbside bike lanes makes curb extensions difficult in many areas.) Four out of the top five pedestrian collision locations appear to meet this standard and could each

In Palo Alto, El Camino Real BRT will not include center-running transit lanes, but instead utilize widened sidewalks at bus zones – or bus bulbs – to improve transit access, amenity space, and passenger comfort. In addition to the improvements at California Avenue (above), VTA is planning for bus bulbs at the Charleston/Arastradero intersection. (Source: VTA)

benefit from new curb extensions that improve pedestrian visibility. New curb extensions should provide two-ramp or "perpendicular" configurations to facilitate more direct and convenient travel to/from crosswalks for wheelchair users, families with strollers, and persons with limited mobility.

Minimizing curb radii – or the angle at which a curb wraps into an intersecting roadway – is essential to reducing vehicle turn speeds and reducing pedestrian crossing distances. The removal or mitigation of high-speed channelized right turns, particularly along El Camino Real, remains a citywide priority. The Stanford/El Camino intersection – under construction during the development of this plan - will likely set the standard for similar reconfigurations at Charleston/Arastradero Road, Churchill Road, Hansen Way, and potentially Embarcadero Road. In other areas of the city, curb radii should be minimized to the maximum extent feasible, with 25-feet for residential arterials (actual radii) and 20-feet for non-arterial intersections used as a general standard except where specific truck or bus movements occur.

5.3.3 Traffic Calming and Speed Limits

Vehicular speeds have significant impacts on the pedestrian environment because of the likelihood of injury resulting from a crash, as well as turning, passing, and other potential conflicts with motor vehicles at intersections. **Figure 5-6** shows the impact of automobile speed on the likelihood a fatality will result from a crash.

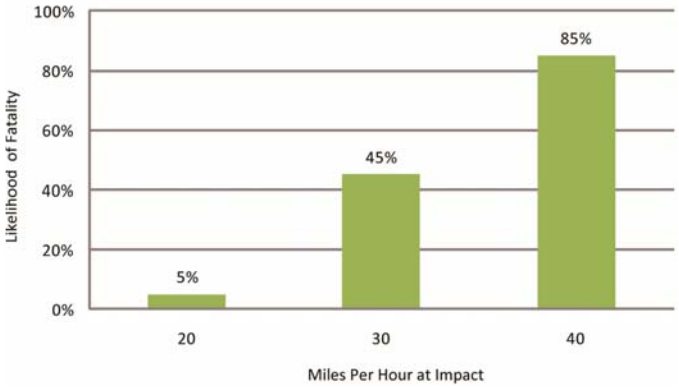


Figure 5-6. Likelihood of pedestrian fatality resulting from crash based on automobile speed.
(Source: U.K. Department of Transport)

In addition to traditional traffic calming, such as speed humps and traffic circles on neighborhood streets, many cities are protecting the most vulnerable road users by implementing strict speed limits around schools. San Francisco has designated 15 mile per hour speed limit zones within 500 feet of the City's elementary schools.

5.3.4 Signalized Crossings

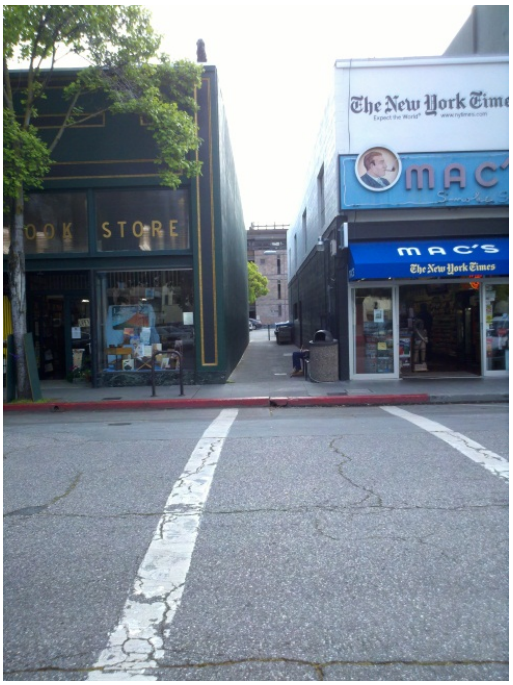
Plan survey respondents overwhelmingly identified more visible crosswalks and pedestrian countdown signals as the highest priorities to improve walking conditions in business and commercial areas. Anticipated roadway projects along Lytton and California Avenues should increase the number and consistency of pedestrian countdown signals and high visibility crosswalks. Many other intersections, however, including those along University and Hamilton Avenues, could benefit from a targeted pedestrian crossing program.

All new striping at signalized intersections should include an advanced limit line, or stop bar, set at least four feet back from the crosswalk to discourage vehicle encroachment. Both stop bars and bicycle boxes **(Appendix A)** may require relocation of in-pavement loops and/or utilization of remote sensors such as microwave detection.

A typical signalized crossing in Palo Alto (left) compared to. a best practice crossing treatment (right). Differences include a higher visibility "continental" striping pattern and "advance stop bar" to limit encroachment by vehicles; pedestrian countdown signals; curb extensions or "bulb outs" to reduce crossing distances and vehicle turn speeds; and curb ramps with color contrasting detectable warning strips. For more detail on specific pedestrian crossing treatments, see ***Appendix A.****A*

5.3.5 Midblock and Un-signalized Crossings

Marked, unsignalized crosswalks on roadways with two or more travel lanes per direction are generally discouraged, and few exist in Palo Alto. Capital projects on corridors that currently include such crossings, such as Oregon Expressway and California Avenue, are planning to remove and/or modify these facilities. The City is encouraged to identify all existing locations and conduct a similar assessment of improvement opportunities.



Improving midblock, un-signalized crossings is important for linking public parking lots, plazas, and pedestrian alleys in the business districts, such as between University and Hamilton Avenues across Emerson and Ramona Avenues.

While promoting safe pedestrian crossings, this policy can also result in long distances between available arterial crossings. On Embarcadero Road between Waverly Avenue and Middlefield Road, for example, is an approximately 3,000-foot stretch without a marked crossing – despite four additional intersections. Locating a new marked crosswalk either with a new signal, protected center median, or pedestrian hybrid signal (see **Appendix A**), is a high priority for additional analysis. A new crossing of Embarcadero Road is also critical for establishing a successful Webster Street Bicycle Boulevard. Another location with a major crosswalk gap is along Middlefield between Colorado and Loma Verde Avenues, which is why consideration of a road diet should assess the potential benefits to both bicycles and pedestrians.

Un-signalized crosswalks of roads with only one travel lane in each direction (not including a two-way left-turn lane)

are an essential tool for pedestrian circulation in many locations in Palo Alto. This is true of stop-controlled intersections, certain residential arterial crossings, as well as important midblock pedestrian cut-throughs and alleys in the business districts.

Upgrading un-signalized crossings with curb ramps and extensions, high visibility and/or raised crosswalks, center medians, and rapid flashing beacons (at critical school commute crossings) is an identified need to improve pedestrian circulation in most parts of the city.

5.4 Recommended Programs and Policies Summary (Five E's)

The following program and policy actions are recommended for helping establish core concepts of the BPTP 2012 within the City's decision-making framework. Similar to the existing programs review, they are organized according to the 5 "E's for both consistency and consideration by the League of American Cyclists when Palo Alto chooses to apply for Bicycle Friendly City status.

5.4.1 Engineering

- Develop a Complete Streets Checklist for all major capital and maintenance projects and a review/approval process that ensures early coordination between City departments and outside agencies.
- Establish dedicated funding for a citywide pedestrian countdown signal and crossings program and a citywide bike parking program.
- Develop and adopt an official design standard and funding policy for the use of on-street parking spaces and/or red curb zones as 'parklets' and other non-traditional uses (e.g. bike corrals, bicycle stations). Consider the California Avenue and University Avenue business districts as priority locations for initial implementation.
- Support pilot/trial projects to test design recommendations from this Plan, including bicycle chicanes, queuing streets, and back-in angled parking (see Appendix A).
- Update the School Commute Corridor Network (used to prioritize school-related transportation investments) to consider recent land use changes and network recommendations from this Plan and to include Monroe Park travel to Los Altos Schools.
- Revise the land use code to establish a six-foot minimum sidewalk width standard where the current standard is five-feet.
- Evaluate the feasibility of a future potential trail connection between El Camino Park and Caltrain/Palo Alto High School through the Transit Center.

5.4.2 Education

- Expand the Safe Routes to School Program to all schools and continue to leverage outside grant funding to implement education and encouragement programs.
- Conduct innovative bicycle facility outreach and education campaign(s) to youth and adults as part of the Safe Routes to School curriculum and to the public as these facility types are implemented.

- Improve the City of Palo Alto online bicycle page as a community resource.
- Work with other jurisdictions to update the existing user bikeway map, including Monroe Park access to Mountain View and Los Altos. The City should work with MTC to incorporate existing and new facilities into the 511.org bike mapper application and the GoogleMaps bicycle layer where feasible.

5.4.3 Encouragement

- Establish a "Friends of Palo Alto Bicycles" advocacy organization to reach out to local businesses or groups to help support and promote bicycle-related projects and to maximize public-private funding opportunities such as development of bicycle or walking maps and/or path maintenance.
- Provide support and dedicated funding for a recurring Bike Palo! / Palo Alto Sunday Streets program of events, potentially in coordination with local business groups and/or a newly established "Friends of Palo Alto Bicycles" organization. A formal policy to support regularly occurring street closure events and programming – and the potential for designating specific roadway sections for such activities – is recommended for addition to the Comprehensive Plan Transportation Element, likely under *Goal T-3: Facilities, Services, and Programs that Encourage and Promote Walking and Bicycling*
- Support and expand the existing Way 2Go program and other transportation demand management (TDM) efforts to encourage alternatives to driving for city employees and other major employers. This Plan recommends that additional funding and/or existing staff time focus on transit pass promotion, parking management, and bicycle share program expansion in addition to existing encouragement activities (such as Bike to Work Day). This recommendation is consistent with recommendations and policies from the 2007 *Climate Action Plan* and *Comprehensive Plan* that emphasize the importance of TDM initiatives for encouraging new bicycle and walking trips.

5.4.4 Enforcement

- Continue to support Operation Safe Passage and revise/expand where necessary to ensure appropriate emphasis on Safe Routes to School priority issues and campaigns.
- Consider a 20-mph zone speed limit for application in select school zones and along bicycle boulevards. Specific implementation of this recommendation will require stakeholder outreach and engineering analysis along the particular corridors.
- Conduct crosswalk violation 'stings' in areas with reported issues.
- Encourage safe and appropriate "Rules of the Road" for all roadway users through targeted enforcement and education.
- Develop a policy for establishing and expanding minimum red curb zone distances from marked and unmarked pedestrian crossings.
- Expand the existing crossing guard program and consider the potential for new protocol/locations where bicyclists may be assisted.

5.4.5 Evaluation

- Create a program to conduct regular pedestrian and bicycle data collection efforts at strategic screenlines (and locations identified for additional study) to assess activity level trends – both generally and for project before/after studies. Develop an annual report that documents and promotes findings from these data collection activities, and include a progress check on related benchmarks established in **Chapter 2** of this Plan.
- Consider building on the annual "Service Efforts and Accomplishments" survey to collect opinion data from a cross section of the public.
- Include an analysis of GHG emissions calculations for all major programs and projects (where practical) to understand the impacts of new investments on climate action goals and milestones.
- Update citywide traffic counts for all modes, including automobile counts, to assist the feasibility and design for including pedestrian and bicycle facilities in new projects as well as to analyze multi-modal level of service on Palo Alto streets.
- Consider prioritizing or requiring certification that encourages bicycle- and pedestrian-friendly developments, such as LEED-ND or STARS.

Chapter 6 Recommended Facilities and Conditions

This chapter presents an overview of recommended bicycle and pedestrian facilities and priority focus areas. The first section summarizes the recommended bikeway network and includes a review of changes from the 2003 Plan. The second section lists proposed new pedestrian and bicycle barrier crossings (called Across Barrier Connections), while the third section identifies priority pedestrian areas. The last section reviews existing and proposed conditions by sub-area and provides added context to many of the recommendations described throughout this *Bicycle + Pedestrian Transportation Plan* (BPTP 2012).

6.1 Bicycle Network Recommendations

Table 6-1 summarizes the bicycle network recommendations. The proposed network emphasizes bicycle boulevards, which accommodate all types of bicyclists. In addition, the Plan recommends improvements to several of the existing Class II bike lanes, which could include improving intersections, improving corridor visibility through use of coloration, and/or improving separation from traffic through the use of buffers and cycletracks. Additional sub-sections of this chapter provide a summary of specific recommendations by facility type, while a prioritized list of projects by category (with planning level cost estimates) is provided in Table 7-1 on page 7-3.

Table 6-1: Recommended Bikeway Network Class Mileage Totals

Facility Type	Total New or Enhanced Routes Recommended (miles)	Planning-Level Cost	Total Route Miles (Proposed Bicycle Network)
Class I Multi-Use Path*	7.06	$4,534,000	20.4
Class II Bike Lane	2.70	$140,000	44.3
Enhanced Bikeways (Class II and III)	15.34	$1,750,000	16.2
Class III Shared Lane	9.15	$75,000	17.5
Class III Bicycle Boulevard	18.20	$990,000	22.2
Across Barrier Connections	N/A	$17 - $27,000,000	N/A
Intersection Improvements	N/A	$1,250,000	N/A
Total	***52***	***$26-36,000,000***	***~120***

**Does not include barrier connections or the proposed trail project along San Francisquito Creek. Costs do not include potential future rights-of-way acquisition or easements.*

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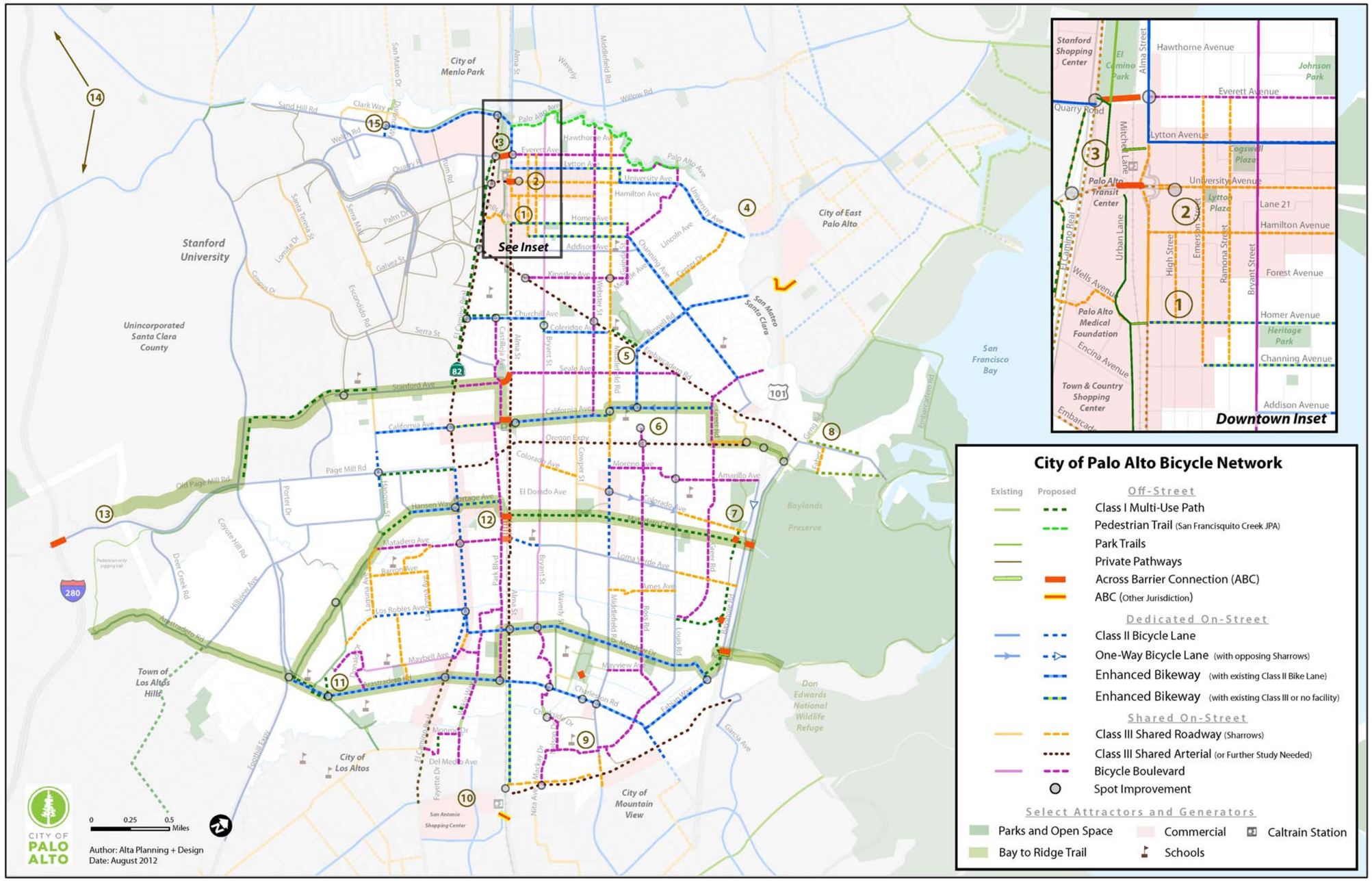


Map 6-1. Proposed Bikeway Network

Palo Alto Bikeway Network Map
Numbered Note Descriptions

1. *In order to provide sufficient access to/from Downtown from the planned contraflow bicycle lane on Homer Avenue from Alma Street to High Street, additional study is needed. Potential scenarios include converting High Street to two-way between Homer and Hamilton Avenue (preferred by PABAC) or extending the contraflow bicycle lane at least one additional block to Emerson Avenue (if potential conflicts at the existing Whole Foods parking lot driveway can be resolved). All scenarios should consider compatibility with the proposed Homer Ave/Channing Avenue Enhanced Bikeway corridor and removal of the (substandard) Addison Avenue bicycle lanes.*
2. *In coordination with future repaving, consider redesigning Emerson and/or Ramona Avenue into a high amenity shared space (e.g. with special pavers and at-grade pedestrian crossings) or "festival street" (i.e., a street that can be closed to traffic for special events) to create a bicycle and pedestrian-friendly connection between the SOFA neighborhood and Downtown.*
3. *Improve access to and through the Palo Alto Transit Center by: (a) upgrading trails within El Camino Park and improving connectivity to the existing Caltrain path; (b) providing an enhanced bikeway and new sidewalk (or Class I trail) along Alma Street from Lytton Avenue to El Camino Real; and (c) widening University Avenue sidewalks under Caltrain and improving pedestrian/ bicycle access across the El Camino Real off/on ramps.*
4. *Proposed trail concept by San Francisquito Creek Joint Powers Authority includes a new underpass at Middlefield Road, and crosses into East Palo Alto (following Woodland Avenue) at the Chaucer Street bridge. In a separate project, East Palo Alto is designing a new Highway 101 pedestrian/bicycle overcrossing at either the Newell Road/Clarke Avenue area south of University Avenue or just north of University Avenue at Manhattan Avenue/West Bayshore Road.*
5. *Connect the Churchill/Coleridge and Newell Road Enhanced Bikeways to Rinconada Park and Walter Hayes School by widening and converting the north sidewalk along Embarcadero Road into a new Class I "sidepath" trail. Further improve bicycle/pedestrian access to the Community Center area by installing a new signal or hybrid beacon crossing of Embarcadero Road to help establish Webster Avenue as a Bicycle Boulevard (and alternative school route to Middlefield Road).*
6. *Work with PAUSD and area neighbors to establish a new Class I trail through the Jordan School campus to connect the proposed Newell Road Enhanced Bikeway and Ross Road Bicycle Boulevard. Such a connection will likely require property acquisition along Garland Avenue, but would provide a continuous, high demand, and low stress bicycle route at a key location in the city.*
7. *Add southbound sharrows along West Bayshore Road between Amarillo Avenue and Matadero Creek. Longer term, work with area landowners and the Santa Clara Valley Water District to build a trail connection from Greer Park south to Adobe Creek/Meadow Drive via the Sterling Canal.*
8. *Include upgrades (widening, repaving) and new trail connections along Embarcadero and Geng Roads with plans to improve the Baylands Athletic Center and Palo Alto Public Golf Course. Improve access across Embarcadero Road and connectivity of the Bay Trail at Faber Place.*
9. *Provide a dedicated bicycle/pedestrian pathway or bicycle boulevard-type connection through the Cubberly Campus as part of future redevelopment or expansion plans. Integrate this connection into the "South Bryant Street Bicycle Boulevard" (at Nelson Drive) and Ross Road Bicycle Boulevard (via Montrose Avenue and Louis Road) via signage and wayfinding.*
10. *Coordinate with Mountain View and private developers on improving bicycle network connectivity and pedestrian access along and across San Antonio Road, particularly at Nita Drive and from Miller Avenue / Del Medio Avenue / Fayette Drive, and across the Central Expressway at the San Antonio Caltrain Station.*
11. *Further explore the feasibility of linking the Bol Park, Gunn High School, and Hetch Hetchy/Los Altos via either shared use "sidepath" connections (crossing Arastradero Road at the existing at Gunn High School entrance traffic signal) or by establishing a new trail connection along the Hetch Hetchy corridor and new signal or hybrid beacon crossing of Arastradero Road near the Alta Mesa Cemetary entrance.*
12. *Advance the conceptual design of a "South Palo Alto ABC" in the vicinity of either Matadero Creek/Park Boulevard or Margarita Avenue/ Loma Verde Avenue. Plan for a new on-street (Enhanced Bikeway) or Class I trail connection from Park Blvd to El Camino Real at Hansen Way with future potential redevelopment of the Fry's Electronics site. Consider designating the Arastradero Rd/Bol Park Path/Hansen Way/Portage Avenue/Matadero Creek Trail as a second "Bay to Ridge" trail concept, and/or clarify as the preferred urban alignment for the S-1 trail identified in the Santa Clara County Countywide Trails Master Plan.*
13. *Work with Caltrans and Santa Clara County to improve the safety and connectivity of bicycle lanes and pedestrian facilities across the Interstate 280 on/off ramps along Page Mill Road. Consider a grade-separated crossing if no on-street solution can be reasonably achieved. Along Old Page Mill Road, maintain high pavement quality and drainage functionality, and provide other enhancements (e.g. wayfinding signage, bicycle rest stops) that are consistent with its importance as a recreational and regional route.*
14. *Participate with Stanford University and San Mateo County on a revised planning effort to improve safety of the Alpine Road corridor for bicyclists and pedestrians, particularly at the I-280 interchange. Advocate for the use of any unspent Stanford University mitigation funds (formerly earmarked for Alpine Road trail improvements) on projects that improve recreational opportunities and open space access for Palo Alto residents, including enhancements to the Sand Hill Road/I-280 interchange.*
15. *The extension of Durand Way across Sand Hill Road is tentatively scheduled for construction in 2018 as part of the Stanford Medical Center expansion activities. This new connection will greatly improve the directness of bicycle facilities into Palo Alto and Stanford University from Menlo Park. In the short term, work to expand and improve bicycle parking within the Stanford Shopping Center and improve wayfinding and bicycle lane quality along Welch and Quarry Roads.*

6.1.1 Class I Trails / Shared Use Paths

The BPTP 2012 generally maintains Class I trail recommendations from the 2003 Plan and provides three additional project concepts at several locations.

First, multiple "sidepath" segments are recommended by widening existing sidewalks behind the face of the curb. These segments would extend existing trails toward El Camino Real along both Churchill Avenue and Page Mill Roads; along Stanford University property frontages at Stanford Avenue and El Camino Real; and along Embarcadero Road near the Community Center campus and out near the Palo Alto Golf Course. As sidepaths can have visibility challenges at intersections, they are identified for areas with long, unobstructed frontages and must be well-designed.

Second, the BPTP 2012 formally acknowledges and supports recent efforts by the San Francisquito Creek Joint Powers Authority to design and build a trail along the Palo Alto side of the creek from Alma Street to Chaucer Road. Lastly, the BPTP 2012 emphasizes the need to modify or replace unnecessary trailhead and barrier crossing obstacles to improve Class I path convenience for larger bicycles and families. **Table 6-2** shows the proposed Class I Multi Use Trails. **Table 7-1.** Top Recommended Projects by Category provides descriptions of the highest priority trail projects, and includes a recommendation to increase trail maintenance funding because of new and backlog facilities.

Table 6-2: Proposed Multi Use Trails

Name	Extent	Length (miles)
Adobe Reach Trail	Adobe Creek 101 crossing to Meadow Drive	0.17
Barron Creek Connector	Louis Road to Sterling Canal Trail	0.32
Baylands Preserve Path Extension	Faber Place to Embarcadero Road	0.43
Churchill Rd Sidepath	El Camino Real to Castilleja Avenue	0.16
Geng Rd Trail (Bay Trail) Widening/Repaving	Geng Road to Embarcadero Way	0.33
Greer Park Connector	John Lucas Greer Park Path to Fallen Leaf Street Path	0.19
Hansen Way Connector Path	Hansen Way to Gunn High School Path	0.23
Hetch Hetchy - Bol Park Connector path	Gunn High School Path to Terman Park Path	0.26
Jordan Trail Connector (MIddlefield Road)	California Avenue to California Avenue	0.05
Matadero Creek Trail	Alma Street to Bayshore Road	1.52
Newell Road/Ross Road Connector	California Ave to Garland Drive	0.16
Page Mill Road Sidepath	Hanover Street to El Camino Real	0.48
Palo Alto Avenue	Alma Street to Chaucer Street	1.70
Stanford Ave Trail Extension(S)	PMF Intersection to Embarcadero Road	0.40
Sterling Canal Trail	Adobe Creek crossing to Loma Verde Avenue	0.45
Walter Hays School/ Rinconada Park Sidepath	Newell Rd to Middlefield Rd	0.20
Total Multi Use Trails		***7.06***

6.1.2 Class II Bike Lanes and Enhanced Bikeways

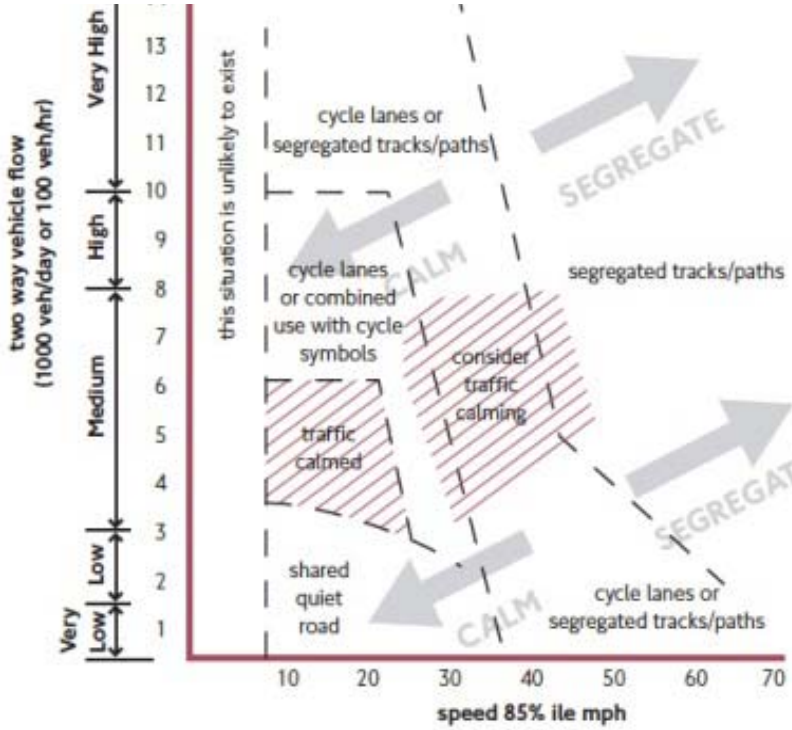
Many commuters may prefer bike lanes to bicycle boulevards and shared lanes due to their more direct routing and signalization at arterial crossings. The BPTP 2012 recommends an emphasis on removal of and enhancement to existing substandard bike lanes (particularly those that pose potential "dooring" issues adjacent to parked cars or where gutter pans affect the functionality of curbside bike lanes) and the continuation of bicycle lanes across intersections through innovative green colorization and roadway markings that improve bicyclists' visibility. Most proposed new segments of Class II bike lanes on arterials, namely along Middlefield Road and El Camino Real, will require additional analysis and public outreach to assess their feasibility.

In addition to the proposed Class II Bikeways listed in Table 6-3, the City should consider updating existing bicycle facilities that do not meet state and local standards, including locations where a five-foot bike lane is adjacent to a seven-foot parking lane.

Table 6-3: Proposed New or Enhanced Class II Bikeways

Name	Extent	Length (miles)
Standard Class II Bike Lanes		
Charleston Road	San Antonio Road to Fabian Way	0.13
Charleston Road	San Antonio Road to South of San Antonio Road	0.05
Durand Way	Sand Hill Road to Welch Road	0.07
El Camino Real	Page Mill Road to Maybell Avenue	1.20
Hanover Street	North of Page Mill Road to South of Page Mill Road	0.25
Los Robles Avenue	Laguna Avenue to La Donna Avenue	0.36
Middlefield Road	Marion Avenue to Loma Verde Avenue	0.64
Enhanced Class II (and Class III) Bikeways		
Alma Street	Charleston Road to Mountain View border	0.72
California Avenue	Hanover Street to California Turnaround	0.76
Channing Avenue	Emerson Street to Greer Road	1.77
Charleston Road/Arastradero Road	Foothill Expressway to Fabian Way	2.36
Churchill Avenue/Coleridge Avenue	El Camino Real to Middlefield Road	0.99
El Camino Way/Los Robles Avenue	La Donna Avenue to Meadow Drive	0.37
Fabian Way	Meadow Drive to Charleston Road	0.51
Hansen Way	Proposed Stanford Research Park Trail to El Camino Real	0.29
Homer Avenue	Alma Street to Guinda Street	0.74
Portage Avenue	El Camino Real to Park Boulevard	0.27

Name	Extent	Length (miles)
Lytton Avenue/Fulton Street	Alma Street to University Avenue	0.79
Meadow Drive	El Camino Way to Fabian Way	1.64
Newell Road	Woodland Avenue to Channing Avenue	0.43
Newell Road	Embarcadero Road to California Avenue	0.38
Newell Road	Channing Avenue to Embarcadero Road	0.39
North California Avenue	Alma Street to Louis Road	1.57
Palo Alto Avenue/Alma Street	El Camino Real to Lytton Avenue	0.39
Sand Hill Road Path	Durand Way to El Camino Real	0.75
University Avenue	Fulton Street to Crescent Drive	0.95
Total Class II Bikeways		**18.77**



Notes:

1. Each route will need to be judged in the light of its specific situation
2. Cycle lanes or tracks will not normally be required in traffic calmed areas
3. Congested traffic conditions may benefit from cycle lanes or tracks
4. Designs should tend to either calm traffic or segregate cyclists

Figure 6-1: Guide to Bicycle Facility Selection

(Source: Transport for London, "London Cycling Design Standards", Chapter 4)

Where conditions indicate potential suitability and demand, the Plan prioritizes additional analysis of green coloration, buffered bike lanes, or two-way cycletracks to attract "interested but concerned" riders who may otherwise avoid arterial bikeway riding of any kind. Although this latter facility type is largely dependent on public support and a detailed engineering assessment of local conditions, **Figure 6-1**: Guide to Bicycle Facility Selection offers general guidance for when (and when not to) introduce greater separation from traffic for bicyclists.

For Palo Alto, the key considerations for cycletrack safety and appropriateness will likely include:

- Feasibility of full-time parking restrictions (as opposed to 7am-7pm only) for one side of the roadway and the potential for further reduced speed limits on segments of Residential Arterials
- Proximity and connectivity to existing or proposed Class I trails and pathways
- Importance of separated facilities for attracting additional student and family bicycle trips
- Perceived and/or actual impact to design safety of limited (but regular) residential driveways
- Need for revised bicycle safety curriculum and training

6.1.3 Class III Shared Roadways

Any street that is legal for bicycles is inherently a shared roadway in which bicyclists and drivers share a lane of traffic, and a car cannot necessarily pass a bicyclist in the same lane. To improve motorists' awareness of the presence of bicyclists and to indicate good routes for bicyclists, cities often post signs indicating that the road is a "Class III Bike Route," as well as painting shared roadway markings in the travel lane.

In 2003 (at the time of the previous bicycle plan), the "shared lane marking" (sharrow) essentially did not exist as a tool for planners and engineers. As such, virtually all shared roadways in Palo Alto are indistinguishable from other roads with the exception of bicycle route confirmation signage. All existing and proposed Class III routes are candidates for sharrow striping, as are segments of other Class II and bicycle boulevard routes where intersection gaps need to be filled or lane positioning guidance is desirable. For shared roadways in busy commercial areas, the Plan suggests ways to introduce elements of enhanced visibility – such as bicycle boxes with lead-in bicycle lanes, or designating festival streets that are regularly closed to traffic for special events.

The BPTP 2012 also identifies Class III accommodations for major arterial routes such as Alma Street, El Camino Real, Embarcadero Road, and San Antonio Road. With regard to the latter, full-time Class II bike lanes were/are not feasible due to the existing right-of-way configuration and demand. Nevertheless, the City has plans to improve bicycling comfort along San Antonio Road by providing wider shoulders and parking restrictions as part of an upcoming paving and median replacement project. The feasibility of Class II facilities along Oregon Expressway is also uncertain in light of the fact that improvement plans are moving forward that do not immediately include bike lanes. On these major arterials, "Share the Road" and "Bicyclists Allowed Full Use of Lane" signage is encouraged as a complement to a high standard of pavement maintenance and shared lane markings where appropriate.

Table 6-4: Proposed Shared Roadways

Name	Extent	Length (miles)
Amaranta Way/Clemo Avenue	Los Robles Avenue to Arastradero Road	0.46
Ames Avenue	Middlefield Road to Louis Road	0.45
Barron Avenue	Los Robles Avenue to Barron Park School	0.40
Barron Avenue/Josina Avenue	Laguna Avenue to Matadero Avenue	0.51
California turnaround	California Avenue to California ABC	0.03
Center Drive	University Avenue to Channing Avenue	0.55
Colorado Avenue	Bryant Street to Cowper Street	0.25
Colorado Avenue	Louis Road to W. Bayshore Road	0.47
Emerson Street	Everett Avenue to Channing Avenue	0.52
El Camino Way	West Meadow Drive to James Road	0.12
Faber Place	Embarcadero Rd to Bay Trail	0.15
Hamilton Avenue	Alma Street to Webster Street	0.53
Laguna Avenue	Matadero Avenue to Los Robles Avenue	0.45
Loma Verde Avenue	Louis Road to W. Bayshore Road	0.40
Los Robles Avenue	Laguna Avenue to Gunn High School Path	0.24
Middlefield Road	San Antonio Way to South of San Antonio Way	0.08
Middlefield Road	Keats Circuit to San Antonio Road	0.11
Middlefield Road	Coleridge Avenue/Embarcadero Road to Marion Avenue	0.80
Middlefield Road	Palo Alto Avenue to Embarcadero Road	1.25
Oregon Avenue	Embarcadero Overpass to Greer Road	0.28
Ramona Street	Everett Avenue to Channing Avenue	0.52
University Avenue	Middlefield Road to Alma Street	0.64
Wells Avenue/Urban Lane	PMF Intersection to Caltrain Bike Path	0.19
Total Shared Roadways:		***9.15***

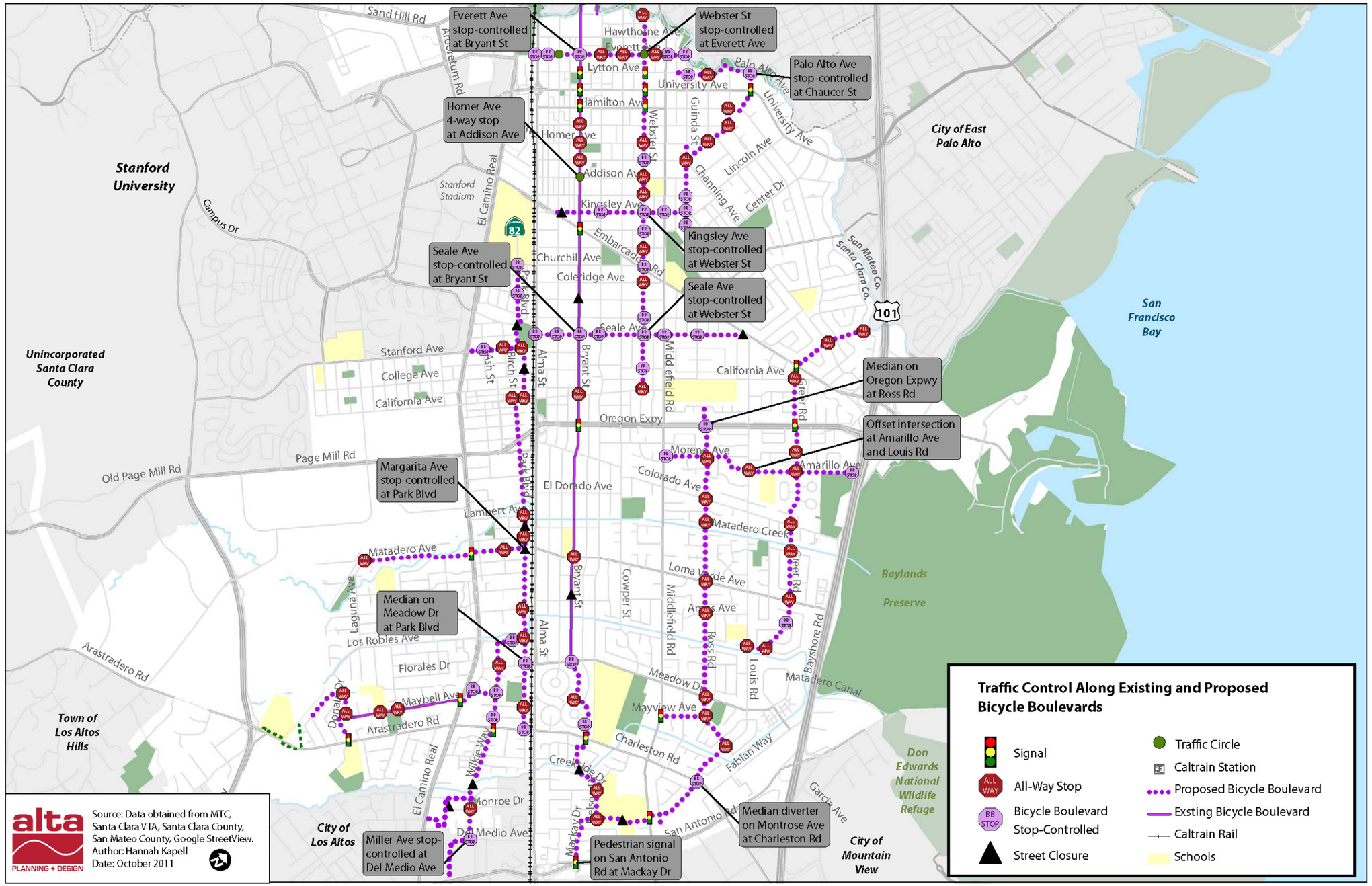
6.1.4 Bicycle Boulevards

The 2012 Bicycle + Pedestrian Transportation Plan takes advantage of analysis conducted in 2003 for identifying and prioritizing bicycle boulevard corridors – although a few changes have been made based on opportunities to improve bikeway spacing and identified priorities for new/enhanced arterial crossings. Although the main priority continues to be removing or reversing unnecessary stop signs on bicycle boulevard corridors and upgrading pavement conditions, the BPTP 2012 includes new guidance on bicycle boulevard signage, custom roadway markings, and alternative traffic calming measures. In order to promote increased ridership and

establish bicycle boulevard routes, the Plan recommends focusing implementation on specific bicycle boulevard corridors, In addition, the Plan recommends interim Bike Route signage on future bicycle boulevards citywide, which will be followed by pavement markings, traffic control revisions, and capital improvements on corridors that will then be designated as bicycle boulevards. Palo Alto staff should work closely with the Palo Alto Bicycle Advisory Committee and other stakeholders to identify the appropriate extent of treatments and to prioritize more intensive treatments as specific bicycle boulevards are considered for additional development.

Table 6-5: Proposed Bicycle Boulevards

Name	Extent	Length (miles)
Amarillo Avenue	W Bayshore Road - Louis Road	0.53
Boyce Avenue/Chaucer Street	Woodland Avenue - Guinda Street	0.65
El Camino Way/James Road	El Camino Real - Wilkie Way	0.21
Everett Avenue	Alma Street - Palo Alto Avenue	0.73
Georgia Avenue/Donald Drive	Hubbartt Drive - Arastradero Road	0.50
Greer Road	Edgewood Drive - Louis Road	1.93
Grendell School Path	Nelson Drive - Middlefield Road	0.29
Guinda Street	Homer Avenue - Melville Avenue	0.39
Kingsley Avenue	Embarcadero Road - Guinda Street	0.65
Lytton Avenue/Palo Alto Avenue	Guinda Street - Chaucer Street	0.35
Maclane Street/Wilkie Way	Park Boulevard - Wilkie-Miller Bridge	0.57
Margarita Avenue	El Camino Real - Park Boulevard	0.27
Matadero Avenue	El Camino Real - Laguna Avenue	0.54
Mayview Avenue	Middlefield Road - Ross Road	0.21
Miller Avenue/Del Medio Avenue/California Street	Wilkie-Miller Bridge - San Antonio Road	0.49
Montrose Avenue/Louis Road	Ross Road - Middlefield Road	0.54
Moreno Avenue/ Fielding Drive	Louis Road - Middlefield Road	0.47
Park Boulevard	Churchill Avenue - Maclane Street	1.93
Redwood Circle/Nelson Drive/Mackay Drive	Bryant Street - San Antonio Road	1.04
Ross Road	Garland Drive - Louis Road	1.74
Seale Avenue	Alma Street – Embarcadero Road/Louis Road	1.06
Sutherland Drive	Montrose Avenue - Greenhouse Cut-Though	0.06
Webster Street	Palo Alto Avenue – California Avenue	1.85
Wilkie Way Connector	Charleston Road - Wilkie-Miller Bridge	0.26
Proposed Bicycle Boulevards:		***18.20***



Map 6-2. Proposed Bicycle Boulevard Network with Existing Traffic Control

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6.1.5 Neighboring Community Connections

The BPTP specifically highlights bicycle connections to neighboring jurisdictions in order to provide continuous facilities for entering or leaving Palo Alto for commute, recreation, and other discretionary trip purposes. To improve access to Los Altos Hills and the Arastradero Open Space Preserve, the City is actively working with Santa Clara County and Caltrans to improve the interchange at Page Mill Road and Highway 280, as well as to identify potential enhancements along Old Page Mill Road.

Another recommended interjurisdictional connection is the extension of Durand Way across Sand Hill Road into Stanford campus from the City of Menlo Park. This project is planned for implementation in 2018 in association with the Stanford Medical Center expansion project. Important connections to East Palo Alto include a proposed enhanced bikeway on University Avenue and a barrier connection across Highway 101 south of University Avenue from Newell Road to Clark Avenue. An additional overcrossing of Highway 101 at Adobe Creek is recommended for further design development to provide a critical year-round connection to Mountain View and the Shoreline Amphitheater/Googleplex area via the Bay Trail and E. Bayshore Road.

To the south, key connections into Mountain View include access across San Antonio Road at Charleston and Middlefield Roads, on Mackay Drive connecting to Nita Avenue and California Street, and on Miller Avenue to Del Medio Avenue to California Street to San Antonio Road. Finally, this Plan proposes improved connections to Los Altos and Los Altos Hills at Monroe via a proposed path and Cesano to Los Altos Avenue, as well as Foothill Expressway and along the Bol Park/Hetch Hetchy Path.

6.1.6 Across Barrier Connections

Chapter 3 discusses barriers to bicycling and walking, including major roads, creeks, and the Caltrain/Alma Street corridor. The recommended across barrier connections enhance connectivity and facilitate pedestrian and bicycle access to key destinations. While the recommendation for a Caltrain undercrossing at Quarry Road/Everett Avenue is carried over from the 2003 *Bicycle Transportation Plan* and Stanford Medical Center Expansion EIS, serious implementation issues and potential alternative priorities are identified by this Plan.

Table 6-6: Proposed Across Barrier Connections

Name	Extent
Adobe Creek / Highway 101 Overcrossing	W. Bayshore Road to Bay Trail
California Avenue Caltrain/Alma Undercrossing	California Turnaround to Alma Avenue
Matadero Creek / Highway 101 Seasonal Undercrossing	W. Bayshore Road to the Baylands Preserve Path
Peers Park / Seal Avenue Caltrain/Alma Barrier Connection	Park Boulevard to Seale Avenue
Caltrain/Alma Barrier Connection at Matadero Creek	Park Boulevard to east of Alma Street
University Avenue Caltrain Undercrossings	Palo Alto Caltrain Station to University Avenue
Caltrain/Alma Barrier Connection at El Camino Park	Quarry Road to Everett Avenue

6.1.7 Intersection Improvements

Intersection improvements include a variety of markings, curb extensions, and signalization changes to improve bicyclist and pedestrian visibility in key locations. Intersections recommended for additional consideration include the following:

- Alma Street and Everett Avenue
- El Camino Real and Matadero Avenue
- Arastradero Road and Terman Park Path
- El Camino Real and Quarry Road
- Arastradero Road/Charleston Road and Alma Street
- Embarcadero Road and Kingsley Avenue
- Arastradero Road/Foothill Expressway/ Miranda Rd
- Fabian Way/West Bayshore Drive and Meadow Drive
- Bol Park Path at Matadero Creek
- Hanover Street and Page Mill Road
- Bryant Street and Churchill/Coleridge Avenue
- Kingsley Road and Middlefield Road
- Bryant Street and Meadow Drive
- Meadow Drive and Alma Road
- California Avenue and Middlefield Road
- Middlefield Road at Colorado Avenue
- California Avenue and Newell Road
- Moreno Avenue/Amarillo Avenue and Louis Road
- Charleston Road and Carlson Court
- Oregon Expressway and Ross Road
- Charleston Road and Mitchell Park Path
- Oregon Avenue and St. Francis Drive
- Charleston Road at Middlefield Road
- Oregon Expressway 101 Overpass and East Bayshore Road
- Churchill Avenue and Park Boulevard
- Palm Drive and El Camino Real
- Churchill Avenue at El Camino Real
- Ross Road at Jordan Middle School
- Duncan Place and Duncan-Creekside Path
- San Antonio Avenue/San Antonio Road and Mackay Drive/Nita Avenue
- El Camino Real and Arastradero Road
- Sand Hill Road and Durand Way
- El Camino Real and California Avenue
- Sand Hill/Alma/El Camino Real
- El Camino Real and Galvez Street/Embarcadero Road
- Stanford Avenue and Bowdoin Street
- El Camino Real and Hansen Way
- Webster Street at Embarcadero Road
- El Camino Real and Los Robles Avenue/El Camino Way
- Park Boulevard at Charleston Road
- I-280 and Page Mill Road (non-City facility)

6.2 Relationship of Recommended Bikeway Network to 2003 Plan

This list of key projects reflects many of the projects identified in the 2003 *Bicycle Transportation Plan*, as well as new opportunities that have arisen since 2003. Projects from the 2003 Plan that have been implemented or funded include the Homer Avenue Crossing, Charleston/Arastradero Bike Lanes, California Avenue improvements (California Avenue Streetscape Project), Hanover/Porter Bike Lanes, and the Stanford/El Camino intersection improvements. A few projects recommended in the *2003 Bicycle Transportation Plan* are no longer proposed as part of the BPTP 2012. Other routes have been added or modified based on assessment of existing conditions and opportunities.

In addition, new innovative bicycle facility types provide opportunities to enhance existing well-used or substandard facilities. These modifications from the 2003 recommendations include several new bicycle boulevard recommendations (e.g., at Webster Avenue, Amarillo and Moreno Avenues, Seale and Kingsley Avenues) and new Class III bikeways that utilize sharrows to increase visibility of the bicycle route (e.g. at Emerson Avenue, Ramona Avenue, Hamilton Avenue, Center Road and Ames Road). This list also contains some modified recommendations for Class III bikeways where alternative facilities were previously recommended (e.g., at Lytton Avenue and Middlefield Road north of the Oregon Expressway). Finally, some of the previous recommendations were removed from the network where alternative corridors provide better network spacing and connectivity (e.g., Addison Avenue, Melville Avenue, and a segment of Guinda Street).

Table 6-7: Summary of Changes to Recommended Bikeway Network – 2003 Plan and BPTP provides a summary list of the differences between the BPTP network recommendations and those from the 2003 Plan.

Table 6-7: Summary of Changes to Recommended Bikeway Network – 2003 Plan and BPTP

Corridor/ Bikeway	2003 Plan	BPTP 2012 Recommendation
Alma Street	Potential Long Range Class II between Homer Avenue and E. Meadow Drive	Enhanced Class II north of Lytton Avenue to El Camino Real Class III Shared Arterial (or Further Study Needed) – Lytton Avenue to City limits
Sand Hill Road	Existing Class II	Enhanced Bikeway
Lytton Avenue	Existing Class II Bike Lanes (identified as substandard)	Enhanced Bikeway (Enhanced Class III encouraged)
University Avenue	Existing Class II northeast of Fulton Avenue	Enhanced Bikeway
Homer Avenue	Proposed Bicycle Boulevard	Enhanced Class II couplet with Channing Avenue including a contraflow bicycle lane on Homer Avenue east of Alma Street
Emerson Avenue, Ramona Avenue	None	Class III with sharrows (or redesigned as shared/festival streets)
Hamilton Avenue, Center Drive	None	Class III with sharrows

Corridor/ Bikeway	2003 Plan	BPTP 2012 Recommendation
Middlefield Road	Proposed Class II Bike Lanes	Class II Bike Lanes from Loma Verde Avenue to Oregon Expressway approach (pending feasibility analysis); Class III with sharrows north of Oregon Expressway
Webster Avenue	None	Bicycle Boulevard from Palo Alto Avenue to California Avenue
Guinda Avenue (north of Homer Avenue)	Proposed Bicycle Boulevard	None (No longer recommended)
Addison Avenue	Existing Class II Bike Lanes (identified as substandard)	Remove from the network (pending implementation of the Kingsley Avenue Bike Boulevard and Homer/Channing Avenue Enhanced Bikeway
Melville Avenue	Proposed Bicycle Boulevard	None (No longer recommended)
Kingsley Avenue	None	Bicycle Boulevard
California Avenue	Further Study of business district segment	Enhanced Bikeway (Greer Road to Hanover Street) with future consideration of cycle tracks for segments
Churchill Road – Caltrain Path to El Camino Real	Existing Class II Bike Lanes	(Addition): Sidepath on north side of roadway (Upgrade): Enhanced Bikeway Designation
Seale Avenue	None	Bicycle Boulevard (heavily dependent on Caltrain ABC)
San Antonio Road	Propose Class II Bike Lanes	Class III Shared Arterial (or Further Study Needed)
Oregon Expressway e/o Caltrain to Greer Road	Class II Bike Lanes	Class III Shared Arterial (or Further Study Needed)
Montrose Avenue	Proposed Class III	Bicycle Boulevard (Ross/Louis Road)
Amarillo Avenue	Existing Class III	Bicycle Boulevard (Amarillo-Moreno)
Moreno Avenue	None	Bicycle Boulevard (Amarillo-Moreno)
Ames Road	None	Class III with sharrows
Urban Lane	Part of Proposed Homer Street Bicycle Boulevard	Class III with sharrows and wayfinding
Embarcadero Road	Class II Bikes Lanes	Class III Shared Arterial (or Further Study Needed); Sidepath from Newell Road to Middlefield Road
El Camino Real	Class II Bike Lanes	Class II Bike Lanes Hansen Way to Maybell Avenue; Improved Stanford Trail Serra Road to Quarry Road Class III Shared Arterial all other segments
Page Mill Road	Existing Class II Bike Lanes	(Addition): Sidepath Hanover Street to El Camino Real
Hanover Street at Page Mill Road North Approach	Proposed Class III	Class II Bike Lanes
Hansen Way	Existing Class II	Enhanced Class II Bikeway
Portage Avenue	Proposed Class III	Enhanced Bikeway
Wilkie Way/Miller Avenue	Proposed Bicycle Boulevard	Proposed Bicycle Boulevard extension to San Antonio Road via Fayette Drive (City of Mountain View)

6.3 Priority Pedestrian Areas and Treatments

This section discusses the existing pedestrian environment and proposed improvements by location. Pedestrian priority locations include Palo Alto's Downtown and California Avenue Business Districts, neighborhood commercial centers, employment and shopping centers, school zones and routes, and the Barron Park and Monroe Park neighborhoods.

6.3.1 Downtown and California Avenue Business Districts

Area Description

The Downtown and California Avenue Business Districts are distinct pedestrian activity centers, with compact blocks and numerous alleys, plazas, and ground floor commercial uses that produce a comfortable human scale and vibrant streetscapes. Sidewalks wider than in most other parts of the city allow for the designation of specific zones to maintain a clear path of travel amid a variety of street furniture, landscaping, and spill-out commercial activity. Street trees (Sycamores) planted outside of the curb along University Avenue also help alleviate sidewalk crowding and reduce the actual and visual width of roadway. Both of these districts have existing urban design and/or form-based design guidelines that help ensure a distinct pedestrian character and "sense of place" with new investments. At the time of the writing of this Plan, significant changes and enhancements to the California Avenue street cross-section are being evaluated by the City as part of the California Avenue Streetscape Improvements project.

Where feasible, the City should provide curb extensions that incorporate and expand existing tree pits to improve tree health, reduce long-term sidewalk maintenance, and increase pedestrian queuing capacity or amenities at appropriate intersections.

Treatment Priorities and Locations

- Curb Extensions
  - High collision locations: High Street/University Avenue, Waverly Street/Hamilton Avenue, California Avenue/El Camino Real (including at future BRT stop locations)
  - Midblock crossings: Emerson and Ramona Avenues immediately south of University Avenue, City Hall across Hamilton Avenue (proposed), and multiple locations along California and Cambridge Avenues
  - Transit stop or station approaches: Numerous; must not conflict with transit vehicle turns

- High Visibility Crosswalks with Advance Stop Bars
  - Establish as a standard in the Downtown BID and California Avenue PTOD zones
  - Consider integration with bicycle boxes where appropriate

- **Accessible Pedestrian Signals and Countdown Signals**
  - Establish a timeline for outfitting all signalized intersections citywide with Accessible Pedestrian Signals (where actuation is required) and countdown signals where none currently exist. Prioritize implementation within the two business districts

- **Bicycle Parking Corrals**
  - Integrate bicycle parking corrals as part of new curb extensions to free up existing sidewalks and/or limit impacts of additional bicycle parking
  - Install bicycle corrals on-street by replacing one or two parking stalls or locating within existing red curb zones (including the opposite side of "T" intersections, such as at Florence and Kipling Streets on University Avenue) to free up sidewalk space and/or limit impacts to pedestrians of additional bicycle parking

- **Raised Crosswalks**
  - Most appropriate for mid-block, uncontrolled pedestrian or trail crossings, and at select 'slip ramp' or channelized right turn locations

- **On-street Parking Flex Zones (Parklets)**
  - Offer through existing or modified sidewalk permitting process and fees
  - Enlivens streetscapes and increases room for pedestrians, cafes, and other amenities
  - Consider for similar locations as on-street bicycle corrals and potentially within select public surface parking lots adjacent to retail or food establishments

- **Festival Streets and Shared Space Streets**
  - Consider where side streets or alleys, plazas or parks, and public surface lots form contiguous public space improvement opportunities, including Ramona and/or Emerson Street between Lytton and Hamilton Avenues and in the California Ave Business District between New Mayfield Lane and Sherman Lane from El Camino Real to Park Boulevard

- **Pedestrian and/or Catenary Lighting**
  - Pedestrian-scaled lighting provides an attractive element to high-pedestrian activity areas and increases safety. Pedestrian-scaled lighting improvements are highest priority for streets bisecting and adjacent to University Avenue and California Avenue, and within public surface parking lots and connecting lanes/pathways. In addition to decorative street poles with fixtures, overhead catenary (suspended) lighting should also be considered.

Figure 6-2. Photo simulation of a potential Parklet on University Avenue in downtown Palo Alto.

Temporary, permitted use of on-street parking spaces and existing red curb (no parking) zones can help add bicycle parking and café seating while reducing sidewalk "clutter" and barriers for persons with disabilities.

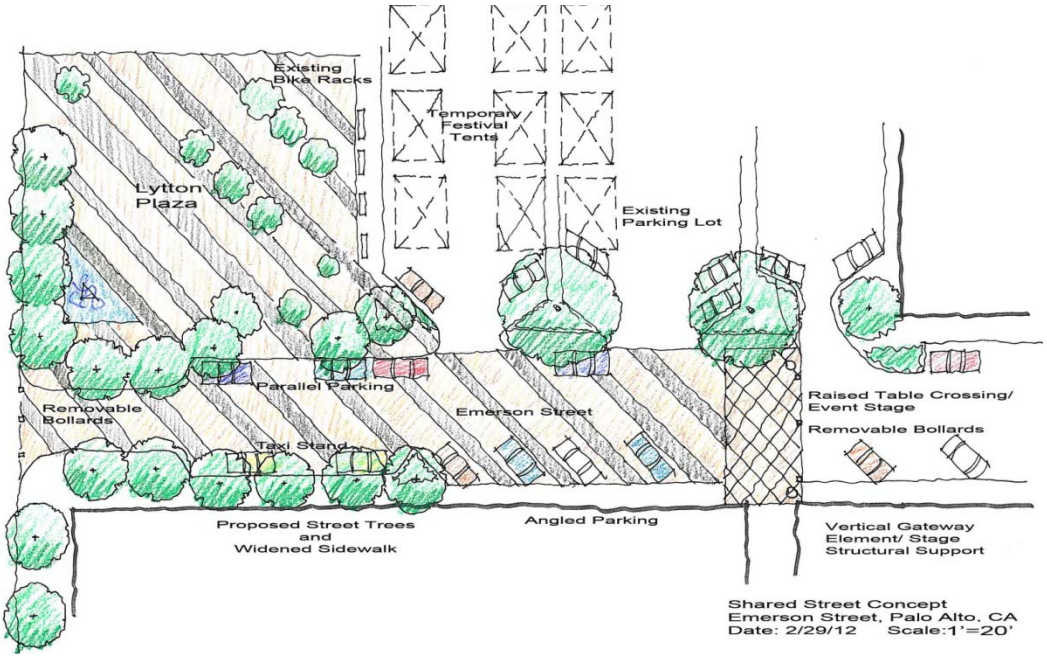

Figure 6-3. ***Photosim (above) and site plan (below) of potential festival street on Emerson Street or Ramona Street, which could be closed to automobile traffic for festivals and other events.***

6.3.2 Neighborhood Commercial Centers

Area Description

Neighborhood-serving commercial and mixed-use centers are very important for encouraging walking and biking for discretionary trips, although most are generally located off arterials and ringed with surface parking near the roadway edge. The Midtown Shopping Center, Charleston Shopping Center, and Cal-Ventura/South El Camino Real corridors are each distinct commercial districts, yet they share similar obstacles to improving sidewalk connectivity, safe pedestrian crossing opportunities, bus/shuttle access, and comfortable gathering spaces.

Treatment Priorities and Specific Locations

El Camino Real and Middlefield Road both have narrow sidewalks, often adjacent to surface parking, that reduce the attractiveness of walking and pose numerous barriers to persons with disabilities and families with strollers.

- Enhanced Pedestrian Crossings
  - El Camino Real: Improve sidewalk approaches to "stacked" crosswalks (i.e. one-sided intersection crossings) at offset intersections; remove channelized right turn lanes ('pork chop islands') and provide high visibility, decorative crosswalks similar to the recent improvements at Stanford Avenue
  - Middlefield Road: Improve Colorado Avenue (a top collision location) and provide additional pedestrian crossing opportunities, especially for the future Matadero Creek Trail
  - Unsignalized Crossing Improvements: Establish criteria for the deployment of Rapid Flashing Beacons and other enhancements to ensure motorists yield to pedestrians in unsignalized crosswalks. These treatments should exclude in-pavement pedestrian flashers, which have proven unsuccessful at various locations in Palo Alto
  - Pedestrian-only actuated signals, e.g. HAWK signals (See **Appendix A** for more details)
  - Requires good data collection efforts to establish priority locations and traffic warrants

- Road Diets
  - Potential road diet opportunities are identified on both the Middlefield Road and El Camino Real corridors, to provide bicycles lanes that help buffer pedestrians and improve crossing opportunities

- Transit Stop Improvements along City Shuttle Routes
  - Wider sidewalks, new shelters, and shelters out of the way of pedestrian through-traffic

- **High Visibility Crosswalks with Advance Stop Bars**
  - High collision locations: Colorado Avenue/Middlefield Road, Charleston Road/Middlefield Road, Los Robles Avenue/El Camino Real
  - Adjacent to community centers, churches, and daycare centers/schools
- **"Green" Connections (e.g., Safe Routes to Parks)**
  - Hoover, Mitchell, and Boulware Park access routes
  - Matadero Creek Trail
  - Los Robles Avenue/El Camino Way Enhanced Bikeway (or Cycletrack)
  - Wilkie Bicycle Boulevard will provide access to Summerhill Park
- **South Palo Alto Caltrain/Alma Undercrossing at Matadero Creek**
  - Knits together two major commercial areas
- **Sunday Streets/Bike Palo Alto! Event Programming**
  - Include routes that connect to or through neighborhood commercial districts, not just the two main business districts

6.3.3 Employment and Shopping Centers

Area Description

Major employment (i.e. office, industrial, medical) districts in Palo Alto include the Stanford Research Park, E. Meadow Drive/Fabian Way sub-area, the greater Stanford Medical Center campus area along Sand Hill Road, and at Embarcadero Road east of Highway 101. These locations generate significant travel demand for weekday commute trips and happen to provide critical connections for recreational trail and open space destinations. The Stanford Research Park is the largest of these areas and poses significant challenges to pedestrians due to its large and un-engaging parcels, narrow and disconnected network of sidewalks, and the overwhelming presence of paved surface parking lots.

Town and Country Shopping Center, as with other "lifestyle malls," may not fall directly under the purview of City transportation planning but are nonetheless important destinations and occasionally, great examples of best practice pedestrian treatments and programming

Treatment Priorities and Locations

- **Shared Use Paths**
  - Research Park: Extending Bol Park Path to El Camino Real via Research Park/Hansen Way or a Hanover Street/Page Mill Road sidepath
  - Fabian Way/Meadow Drive: Adobe Creek Reach Trail and Highway 101 overcrossing
  - Medical Center: El Camino Park Trail improvements, San Francisquito Creek Trail development

- **Completing Sidewalk Gaps**
    - Research Park sidewalk completion for transit access: Hillview Street, Hanover Street, Porter Drive (in coordination with Stanford University)
    - West Bayshore: Complete sidewalk or provide Class I trail between East Palo Alto and Channing Avenue to provide access to Edgewood Plaza
- **Transportation Demand Management (TDM)**
    - Promote education and encouragement programs and transit service travel planning to increase the appeal of transportation alternatives. Coordinate with the Stanford TDM staff.
    - Develop a policy that requires private development adjacent to the Caltrain corridor to participate in the Caltrain GO Pass program as a standard TDM element

6.3.4 School Zones/School Commute Corridor Network

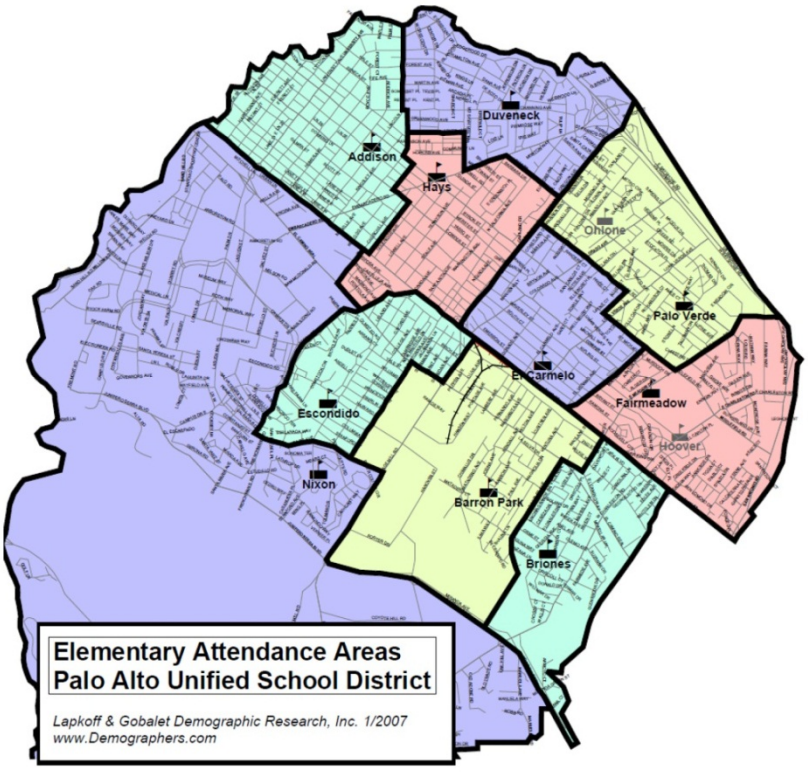

Figure 6-4: Elementary Attendance Areas - PAUSD

Area Description

The Palo Alto Safe Routes to School Program is one of the more successful programs in the nation at encouraging youth and young families to walk, bike, and take transit to school. With well-established national and state Safe Routes to School capital improvement programs, locations in and around schools are great opportunities for leveraging outside investment. With recent funding to conduct school site assessments

and develop recommended walking route maps, the Safe Routes to School program is well-positioned to identify and prioritize improvements using consultant assistance, general recommendations from this Plan, and previous planning that defines the official School Commute Corridors Network.

The adopted School Commute Corridors Network depicts key corridors and intersections that are distinct from school zones, identified by a coalition of school and city officials and concerned parents. Map 6-3 depicts the adopted network that has been modified to include the revised bicycle boulevard network proposed by this Plan.

Treatment Priorities and Locations

- **High Visibility Yellow Crosswalks with Advance Stop Bars**
  - School Commute Corridor Network Critical Intersections
  - On suggested routes to school identified by school task forces
  - Crosswalk coloring must be yellow directly adjacent to schools and may include crosswalks within 600 feet of any school

- **All-Pedestrian Signal Interval (potentially restricted to morning commutes)**
  - Existing at Arastradero Road and Donald Drive-Terman Road, Embarcadero Road and Middlefield Road; future potential locations to be determined

- **Pedestrian Actuated Rapid Flashing Beacons**
  - Important school routes across un-signalized arterial intersections

- **'No Right Turn On Red When School Children Are Present' Signs**

- **Crossing Guards**
  - School Commute Corridor Network Critical Intersections
  - On suggested routes to school identified by school task forces

- **Shared Use Pathway Improvements and Extensions**

6.3.5 Barron Park and Monroe Park Neighborhoods

While in a sense all neighborhoods in Palo Alto are priority areas for safe and pedestrian-friendly travel, the lack of dedicated pedestrian facilities in the Barron and Monroe Park neighborhoods requires significantly more attention and creative solutions than elsewhere in the city. Several integrated design strategies to improve bicycle and pedestrian travel are identified in the proposed design guidelines. City staff would work closely with the neighborhood to develop any proposed changes.

A key connectivity issue in the Monroe Park neighborhood is the lack of access to the San Antonio Shopping Center just across San Antonio Road in Mountain View.

Treatment Priorities and Locations

- Pedestrian and Bicycle-Friendly Chicanes and Other Traffic Calming Devices
- Shared Use Trail Access and Lighting Improvements
- Walking Path and Access Improvements to El Camino Real

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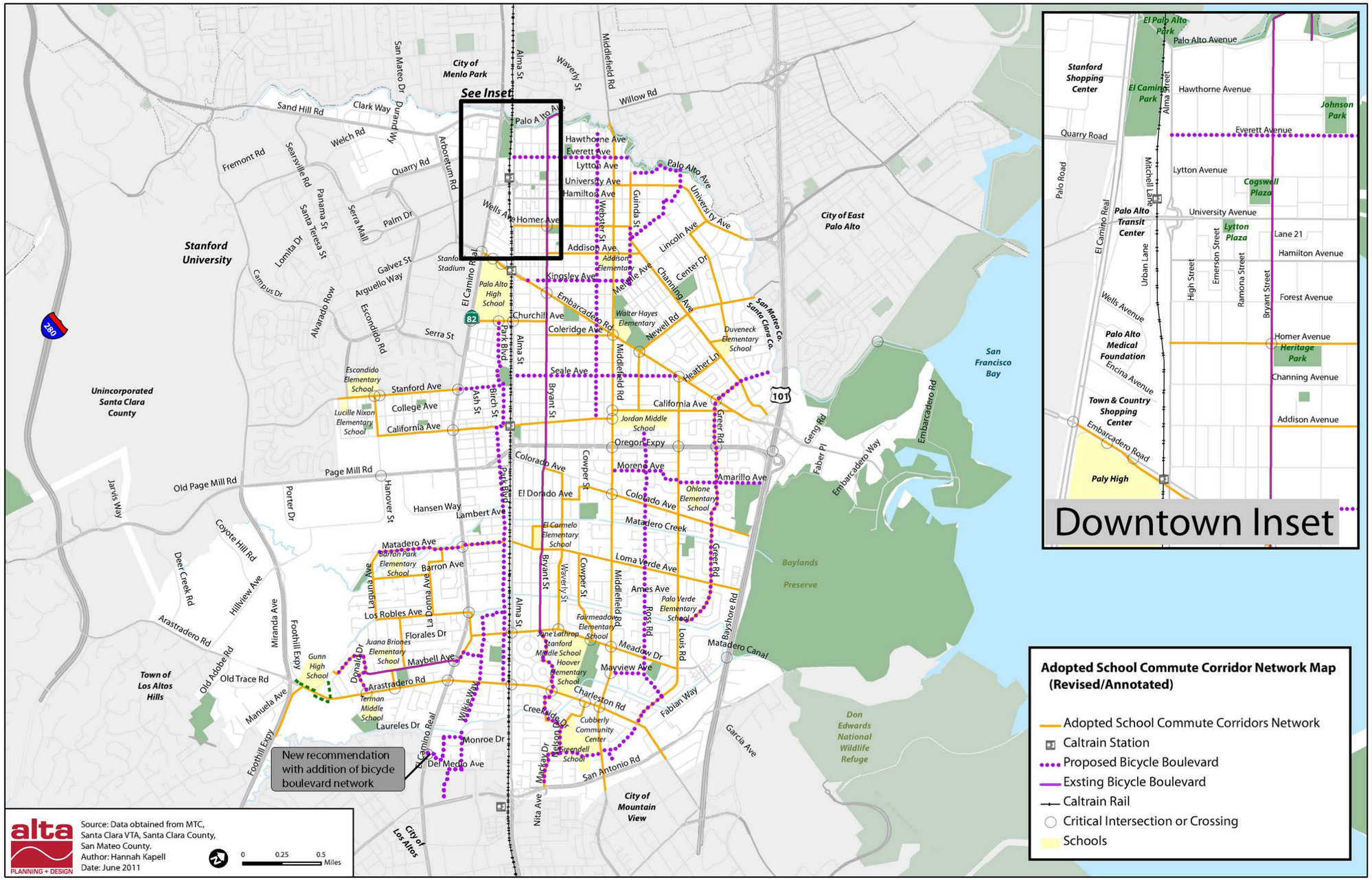

Map 6-3: Adopted School Commute Corridor Network Map (With Revised Proposed Bicycle Boulevards)

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6.4 Recommendations by Sub-Area

This section presents existing and proposed conditions for bicycling and walking by quadrant of the city, starting in the "northeast" and working clockwise to "northwest" Palo Alto. Since several of the bicycling and walking improvements would occur in conjunction and/or benefit both modes, this section is intended to highlight place-based circulation issues shared between modes. **Figure 6-5** shows the quadrants discussed in the following sections.

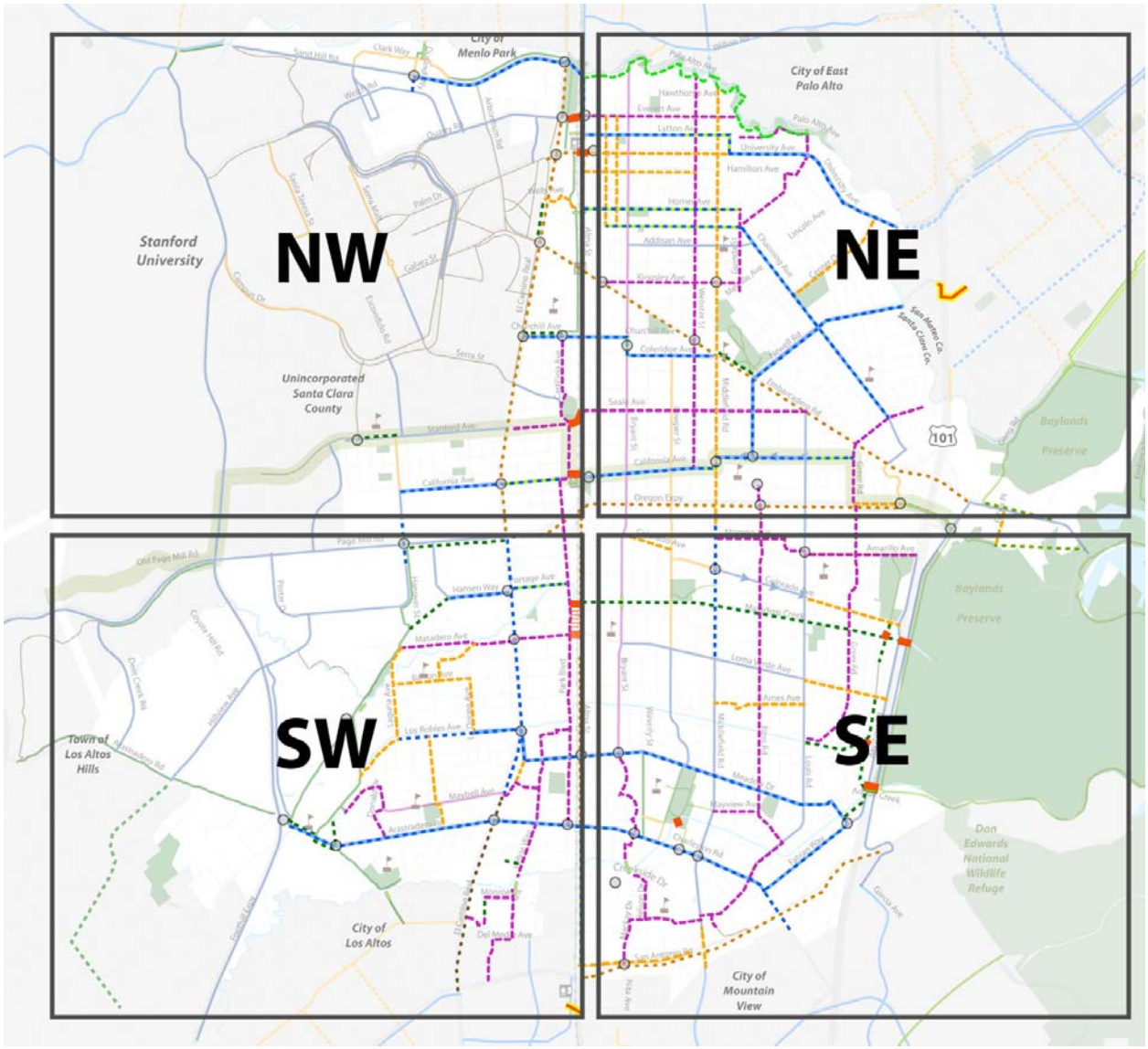
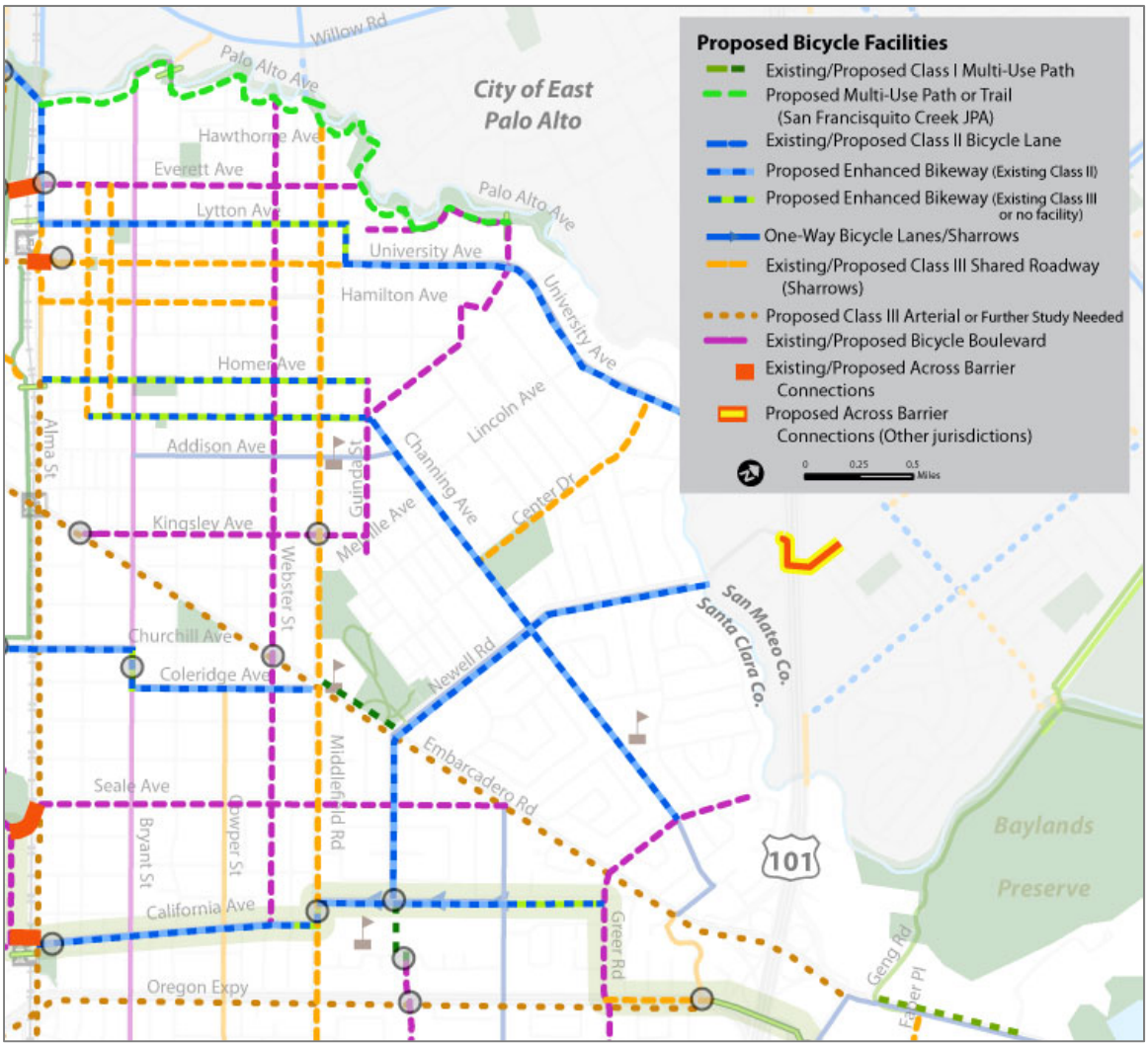


Figure 6-5: City Quadrants for Sub-Area Analysis

6.4.1 Northeast Palo Alto

Proposed Bikeway Map



Area Description

The San Francisquito Creek corridor and primarily residential neighborhood north of University Avenue provides several low-volume, bicycle-friendly connections to downtown Palo Alto. Existing Class II bike lanes on Alma Street connect the Palo Alto Transit Center with Menlo Park via a separated bridge crossing and trail through El Palo Alto Park. A second pedestrian/bicycle bridge connects Willow Road to Palo Alto Avenue and the beginning of the Bryant Street Bicycle Boulevard, providing a comfortable alternative to Middlefield Road for trips extending southward through downtown. However, connections into East Palo Alto are challenging, as the bike lanes on University Avenue in both Palo Alto and East Palo Alto drop on the overcrossing at Highway 101. East Palo Alto has identified this is as a primary transportation priority and is initiating a feasibility study to consider a crossing at Newell Road or elsewhere. The Friendship Bridge on the Bay Trail

across the San Francisquito Creek does provide a good access, although it is less convenient for commuting bicyclists. In addition, a sidewalk or Class I path should be provided along West Bayshore between East Palo Alto and Channing Avenue to provide access in the area around Edgewood Plaza.

As would be expected, greater downtown is the area of highest concentrated travel demand for all modes. University Avenue has consistent pedestrian activity and engaging storefronts. Several plazas and well-designed private patios/sidewalk cafes enhance the pedestrian environment, and a handful of pedestrian-friendly lanes maintain a human scale while providing mid-block cut-throughs. Despite high bicycle demand, downtown has few high-quality dedicated bicycle facilities; a single block of bike lanes striped along Bryant Street and sub-standard width bike lanes along Lytton Avenue are the only dedicated bike facilities between Alma Street and Middlefield Road.

South of downtown, the Homer Avenue underpass provides a convenient pedestrian and bicycle connection across Caltrain and Alma Street. Despite good design and proximity to transit, employment, housing and a popular grocery store, the underpass is considered underutilized and lacks good connections from both the western approach from El Camino Real and from the one-way streets to the east.[6] The Bryant Street Bicycle Boulevard has a bicycle-only signalized crossing of Embarcadero Road and is the best connection from downtown to Old Palo Alto and southern neighborhoods. The Coleridge/Churchill Class II bikeway is an important east-west connection, and other bikeway connections are at Palo Alto High School to the Caltrain Bike Path and the Castilleja-Park-Wilkie Bicycle Boulevard. A new trail connects the Caltrain bicycle path to the Town and Country Shopping Center, although access under Embarcadero Road and across El Camino Real to Stanford University is problematic for pedestrians and bicyclists.

Existing Class II bike lanes and the Caltrain undercrossing at N California Avenue provide a second vital east-west connection within and through the Old Palo Alto neighborhood. One of only three bikeways considered by VTA to be of "countywide significance," this corridor directly links the neighborhood to the California Avenue business district and Jordan Middle School. N California Avenue is also part of the larger Bay to Ridge Trail concept linking the Baylands and Foothills Open Space Preserves. The Embarcadero Road overcrossing further east, via St. Francis Drive (or Oregon Avenue), is the only existing year-round pedestrian/bicycle crossing of Highway 101 to the Baylands, although its approaches are obscure and in need of upgrades. Heading south, existing Class II bike lanes on Louis Road extend for several miles toward San Antonio Road.

East of the confluence of Embarcadero and Middlefield Roads, and generally south of Channing Avenue, the Lucie Stern Community Center cluster includes two large parks/public gardens, several schools and churches, and the city's main library, art center, and children's activity center. Land use in this area is primarily single-family residential land, with the exceptions of Jordan Middle School and the small Edgewood Shopping Center near Highway 101. Existing Class II bike lanes on Channing and Newell Roads provide good access to and through the Community Center. Newell Road continues over San Francisquito Creek via the Newell Road Bridge (planned for replacement) and into East Palo Alto's Woodland Avenue.

The VTA and Caltrans are planning a project on the Oregon Expressway, which would make operational, pedestrian and bicycle safety improvements at intersections between West Bayshore and Bryant Street.

[6] Recent data collection shows that, while use of the Homer underpass is substantial, it is lower than counts at the California Avenue Tunnel.

Improvements will include signal timing modification, construction of pedestrian curb ramps and sidewalk gaps, and studies of operational changes at the unsignalized intersections of Waverly, Ross, and Indian. The project will also include a feasibility study of adding a turn lane at Middlefield Road and improving efficiency and safety.

Recommended Treatments and Locations

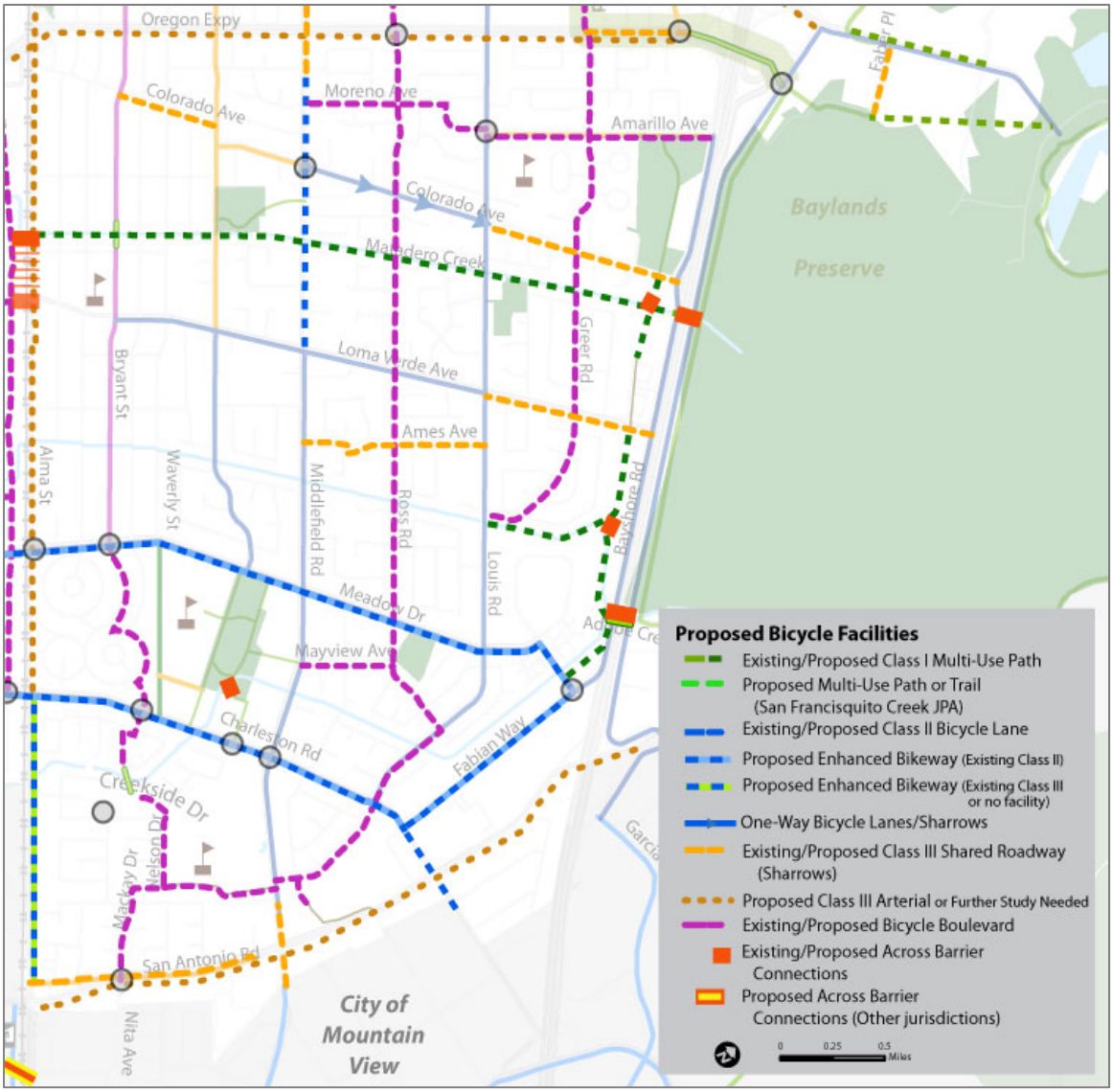
- **Intersection Spot Improvements**
  - Oregon Expressway: Signalize bicycle- and pedestrian-only crossing at Ross Road; improve bicycle and pedestrian crossings at most of the signalized intersections (project in planning).
  - Lytton Avenue/Alma Street Intersection: Install bike box or two-step turn for the southbound approach to facilitate left-turns.
  - Embarcadero Road: Study the feasibility of a signal with forced vehicle right-turns or an actuated bicycle and pedestrian beacon crossing at Webster Street to facilitate school commute access and the proposed bicycle boulevard; reconfigure the design of the Emerson/Kingsley Avenue intersection as part of the larger *Embarcadero Plan Line Study*.
  - N California Avenue at Middlefield Road: Provide a more intuitive, protected crossing of Middlefield Road to establish further the Bay to Ridge Trail and school commute route.
- **Across Barrier Connections**
  - New undercrossing of Caltrain at Peers Park/Park Boulevard: Connects to Serra Road and Stanford University from Seale Avenue, which has the potential to be a future bicycle boulevard once and if the connection is established.
  - Caltrain Stations: Upgrade the existing University Avenue and California Avenue undercrossings of Caltrain for improved access and accessibility. Consider an additional barrier connection across Caltrain between the Palo Alto Transit Center and El Camino Park as a long term option if utility conflict issues can be resolved and other barrier connections prove infeasible.
- **Trails**
  - San Francisquito Creek: Formally support the San Francisquito Creek Joint Powers Authority (JPA)'s efforts to develop a multi-purpose creek trail along the northern City border.
  - Bay to Ridge Trail: Upgrade the California Avenue and Embarcadero Road overcrossing approaches; extend the trail network to Byxbee Park; repave the Bay Trail at Geng Road; and consider paving the spur trail from the Geng Road Sports Center to the International School and Main Post Office.
  - **Embarcadero Road/Rinconada Park** Sidepath: Widen sidewalk to provide a physically separated connection between Newell Road/Coleridge Avenue bikeways and to/from Rinconada Park trails.

- **Bike Lane/Sharrow Roadway Striping**
  - Alma Street: Add Class III signage and markings south of Lytton Avenue, provide enhanced bicycle lanes and/or a Class I trail adjacent to Caltrain north to El Camino Real, and extend sharrows from Homer to Lytton Avenue over the University Avenue overpass.
  - Homer/Channing couplet: Prioritize this corridor with the goal of implementing enhanced bikeway facilities; at minimum, implement two-way bicycle travel on Homer Avenue from Alma Street to High Street, conversion of High Street to two-way north into downtown, and shared lane markings on the couplet with a connection via High Street and Emerson Street.
  - Lytton Avenue: When the street is resurfaced in 2012, replace with enhanced sharrows to position bicyclists away from the "door zone" and facilitate passing of stopped transit vehicles, provide wayfinding signage, curb extensions, and potentially green colorization, bike boxes, and markings through intersections.
  - Addison Avenue: Currently has sub-standard bike lanes. If a dedicated facility is developed on the Homer/Channing couplet, remove from the bikeway network along with the proposed Melville Avenue Bicycle Boulevard further south (providing better network spacing and connectivity to both the Homer Avenue and Embarcadero Road undercrossings). If continuous, dedicated facilities are not possible or are a longer-term solution on Homer/Channing, extend to Emerson Avenue (for two-way access to the Homer Tunnel) and restripe with 9.5-foot travel lanes, a 12-foot shared bicycle/parking lane, and a five-foot time-restricted bike lane; or convert to sharrows.
  - Middlefield Road: Add shared lane markings for wayfinding and visibility; repave deteriorated sections just north of Embarcadero Road.
- **Bicycle Boulevards**
  - Everett Avenue: Repave and install additional traffic circles and signage/wayfinding improvements to "complete" the Everett Avenue Bicycle Boulevard.
  - Kingsley Avenue: Designate as bicycle boulevard and prioritize improvements with future repaving, including an improved connection to the Embarcadero Road Caltrain underpass.
  - Webster Street: Provide an alternative to Middlefield Road for commutes to the Addison and Walter Hayes Elementary Schools; provide an enhanced or signalized crossing of Embarcadero Road, repave numerous deteriorated segments, and remove or replace unwarranted stop signals with traffic circles. Consider additional traffic calming measures near downtown.
  - Guinda/Everett Avenue, Greer Road, Seale Avenue: Convert to bicycle boulevards pending input from the Palo Alto Bicycle Advisory Committee.
  - Ross/Louis Road: Pursue traffic signal installation improvements at Oregon Expressway in partnership with County of Santa Clara and pursue traffic calming projects within residential neighborhoods to allow for phased deployment of bicycle boulevard.
- **Pedestrian Improvements**
  - Lytton Avenue: Provide high visibility crosswalks, advanced stop bars, countdown pedestrian signals, and transit stop upgrades.

- West side of Alma Street: provide sidewalks or a multi-use pathway, depending on the plans for the Alma Street/El Camino Real area as part of the El Camino Park improvements.
- Emerson/Ramona Avenues: Explore the design of these streets as shared spaces or festival streets in conjunction with a roadway maintenance project; improve or provide new midblock pedestrian crossings where feasible.
- Midtown Shopping Center Enhanced Crosswalks: Provide high visibility crosswalks at existing Midtown traffic signals to highlight and provide awareness of pedestrian activity.
- Citywide Traffic Signal Countdown Signals: Complete current countdown signal deployment.

6.4.2 Southeast Palo Alto

Proposed Bikeway Map



Area Description

East of Caltrain between Oregon Expressway and the City of Mountain View lies "southeast" Palo Alto, where a highly modified grid network and variety of bicycle and pedestrian facilities pose numerous challenges and opportunities.

South of Midtown, two at-grade Caltrain crossings at Charleston Road and Meadow Drive provide critical east-west bike lanes across the Mitchell Park and the Greendell/Cubberly community campuses. Meadow Drive is especially popular with school commute bicyclists due to its wide bicycle lanes, numerous bikeway linkages, and lower traffic volumes and speeds as compared to Charleston Road.

Recent upgrades to the Charleston/Arastradero corridor have improved pedestrian crossing opportunities and bicycle connectivity. As this roadway bends south toward San Antonio Road, the bicycle lanes drop amidst higher traffic volumes just shy of the Mountain View border (and major commercial/employment destinations beyond). Pending capital projects on San Antonio Road will enhance the pedestrian comfort and overall character of this corridor while accommodating bicycle detection and connectivity at several locations. An enhanced bikeway on Alma Street from Charleston Road to the Mountain View border will assist bicycle access between jurisdictions.

Existing Class II bike lanes on E Bayshore Road, Louis Road, Middlefield Road, and Cowper Street provide north-south dedicated bikeways, while Bryant Street, Ross Road, Montrose Avenue, Greer Road, Moreno Avenue, and Amarillo Avenue are opportunities for slower-speed bicycle boulevard connections. These routes provide an attractive connection between Midtown retail and Mitchell Park Library, as well as direct access to Ramos Park and recreational opportunities north of Oregon Expressway. Midtown has east-west bike lanes on portions of Loma Verde and Colorado Avenues, both collector arterials important for neighborhood circulation.

Middlefield Road's current four-lane cross-section (including a fifth turn lane at signalized intersections) discourages pedestrian crossing activity and may be a contributing factor to the pedestrian collision hot spot at Colorado Avenue. Between Moreno and Colorado Avenues, Middlefield Court and the adjacent surface parking lot east of Middlefield Road are opportunities for additional bicycle, pedestrian, and "placemaking" improvements as redevelopment and maintenance schedules allow. The City has prioritized a Plan Line Study for Middlefield Road through Midtown as part of the VTA VTP2035 update process.

Recommended Treatments and Locations

Due to the presence of rolled curbs, the BPTP recommends that future bicycle boulevard projects include some level of physical modification to reduce sidewalk encroachment by vehicles, reduce or maintain low traffic volumes and speeds, and encourage additional landscaping/tree canopy (see **Appendix A** discussion of queuing streets for additional guidance on retrofitting rolled curbed streets).

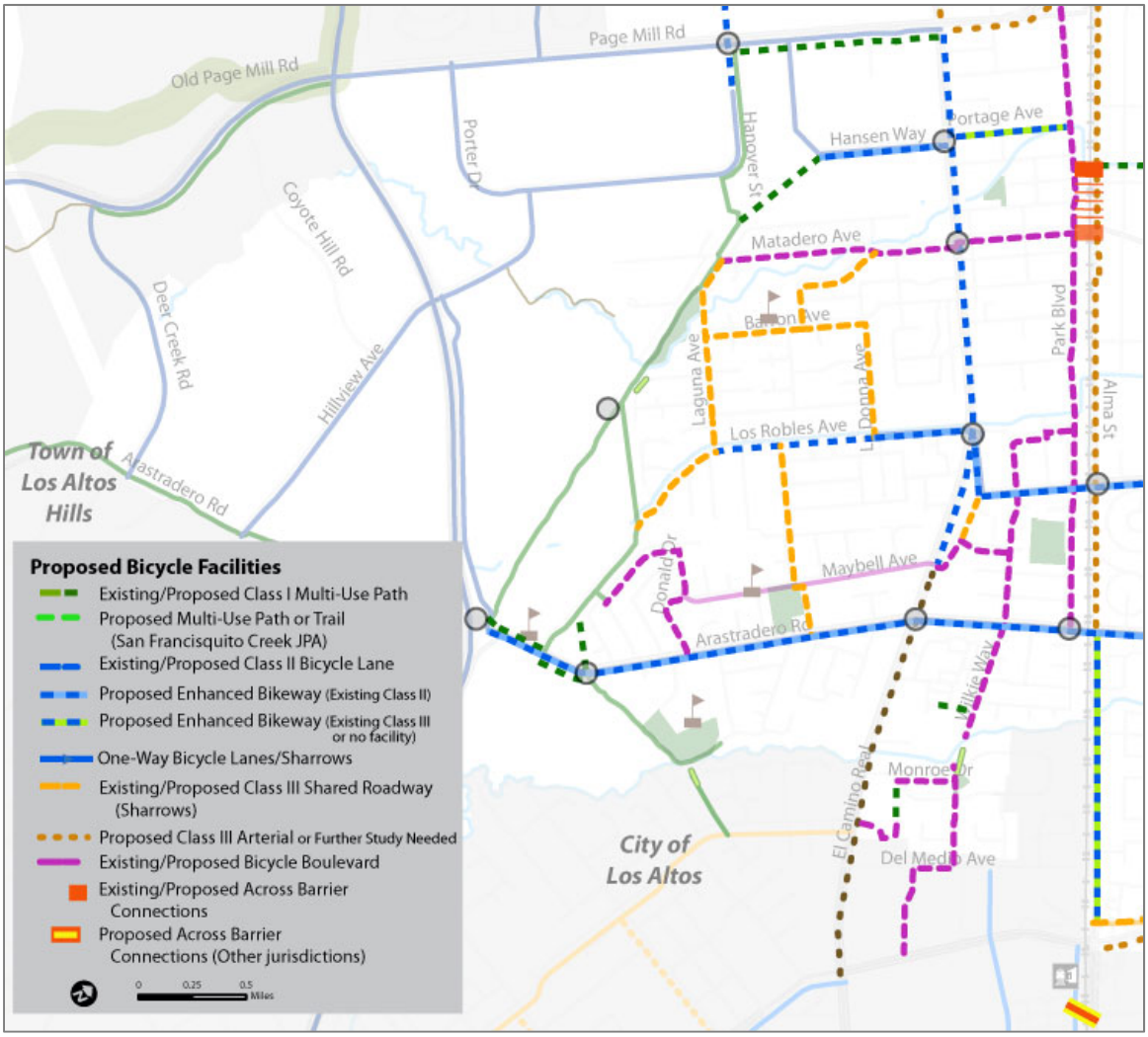
- **Intersection Spot Improvements**
    - Charleston at Nelson Drive, and Carlson Court: Enhance crossings (e.g. bicycle-friendly medians, curb bulbs, improved signal detection, high visibility crosswalks).
    - Charleston Road at Middlefield Road: Consider redesigning with interior through bike lanes and dedicated right-turn only lanes (except transit) to reduce potential conflicts.

- San Antonion Road/Avenue at Mackay Drive: Improve bicycle access across San Antonio Road into Mountain View via the Nita Avenue intersection.

- **Trails**
  - Adobe Creek: Connect E Meadow Drive to the existing undercrossing (and potential future overcrossing) of Highway 101 via a spur or "reach" trail with comprehensive wayfinding to guide and link users to/from the various connecting bikeways.
  - Matadero Creek: Study a Class I path with separated crossings of Caltrain/Alma and Highway 101 along the existing maintenance road; consider a phased implementation approach in combination with more aggressive strategies to secure funds for the entire corridor.
  - Benjamin Lefkowitz Undercrossing: Light as short-term improvement for park connectivity due to Highway 101 skylight displacement.
- **Bike Lane/Sharrow Roadway Striping**
  - Charleston/Arastradero Roads: Extend the bike lanes into Mountain View (or via Leghorn Avenue), enhanced wayfinding, and improve Fabian Way as a connection to Adobe Creek and W. Bayshore Road.
  - San Antonio Avenue and San Antonio Road: Stripe sharrow markings along San Antonio Avenue as an alternative to the busy arterial and improve north/south connections across San Antonio Road into Mountain View at Middlefield Road and Charleston Road.
  - Alma Street north of Charleston Road: Study the feasibility of Class II bicycle lanes with future roadway maintenance activities (including potential bridge modifications across Oregon Expressway).
  - Alma Street south of Charleston Road: Construct enhanced bikeway to the Mountain View border.
  - Middlefield Road: Loma Verde to Moreno Avenue, continue existing Class II bike lanes; pursue the Plan Line Study to continue bicycle lanes along Middlefield Road through Midtown and to promote better pedestrian facilities through this high-pedestrian activity area.
  - Ames Avenue: Stripe sharrow markings to provide bicycle access to the back entrance of Palo Verde School.
- **Bicycle Boulevards**
  - Amarillo/Moreno Avenues: Provide a safe, attractive bicycle connection between Midtown and Greer Park (with direct access to Ohlone Elementary School) via Moreno and Amarillo Avenues.
  - Ross/Louis Road: Pursue traffic calming projects within residential neighborhoods to allow for phased deployment of bicycle boulevard.

6.4.3 Southwest Palo Alto

Proposed Bikeway Map



Area Description

From a non-motorized perspective, Southwest Palo Alto is composed of three distinct sections – the greater Barron Park neighborhood(s), the Stanford Research Park, and the neighborhoods between El Camino and Caltrain (including Ventura and Monroe).

The presence of four schools in Palo Alto (two elementary, one middle, and one high school) and two schools in Los Altos dominates travel demand amid the residential Barron Park, Palo Alto Orchard, Green Acres, and Esther Clark Park (i.e. Greater Barron Park) neighborhoods. Lacking a well-connected grid of streets and sidewalk facilities throughout much of the area, many walkers and bicyclists rely on Class I paths that link the schools, parks, and destinations west and south into Los Altos and Los Altos Hills.

From the east, Charleston Road has bike lanes that jump El Camino Real and pick back up along Arastradero Road, extending to Terman Middle School, Gunn High School, and recreational destinations beyond Foothill

Expressway. At the time of this Plan, the recent re-striping of Arastradero Road to include bike lanes and center left-turn lanes/pedestrian median opportunities remains in a trial phase.

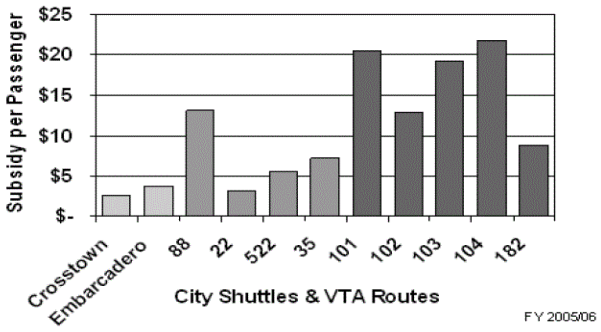
At El Camino Real and Charleston/Arastradero Roads, high traffic volumes, channelized right turns (i.e., "pork chop" islands), and lack of bicycle facilities up to and across the slightly skewed intersection create a major neighborhood and school commute barrier. The presence of channelized right turn lanes also inhibits proper placement of and access to the existing bus stop pair, one of only three locations in Palo Alto planned to serve future El Camino Bus Rapid Transit (BRT) service.

Improving upon and/or mitigating the lack of dedicated on-street facilities for pedestrians and bicycles is also needed for other east-west connections along the School Commute Corridor Network and for access to commercial services along El Camino Real. This need is most acute along Matadero Avenue, a narrow collector arterial and proposed bicycle boulevard that experiences the most neighborhood traffic and has a poor connection across El Camino Real.

Matadero/Margarita Avenue at El Camino Real. *The slightly off-set nature of this intersection creates excessively long and/or out-of-direction crossings. Creative measures to improve the geometry and visibility of this crossing (potential example above right) are needed in order to develop the high priority Matadero-Margarita Bicycle Boulevard.*

Further south, the Meadow Drive Class II bike lanes continue west to El Camino Way, a short frontage-type road that distributes traffic to El Camino Real at Los Robles and Maybell Avenues. Although Class II bike lanes officially connect Meadow Drive to Los Robles, the awkward intersection approach and exposure to turning vehicles may be contributing to the (relatively) high number of pedestrian and bicycle collisions at this location.

The large parcels and auto-orientation of the Stanford Research Park (and VA Medical Center) pose major physical and psychological barriers to increased walking and bicycling. According to Palo Alto's 2008 Transit Study, the area also does not generate much demand for transit despite being served by multiple free shuttles and VTA commuter



The 2008 Palo Alto Transit Study identifies the spread out nature of the Research Park and its highly selective demand market (i.e. a potential customer base that prizes convenience and comfort) as major contributors to its poor transit performance, which is observed in the above graphic that shows a high per-passenger subsidy for routes primarily serving the Research Park. A different strategy, one that re-brands the Research Park by expanding the off-street trail network and promoting bicycle access (and bicycle sharing) from the California Avenue Business District, could be a more effective medium-term solution to encouraging shifts away from vehicular commuting. Such a strategy would also improve connectivity between the Barron Park, Cal-Ventura, and College Terrace neighborhoods.

routes and home to numerous major employers with Transportation Demand Management (TDM) programs. Stanford is currently funding a half-time TDM position focused solely on the Research Park.

For pedestrians, numerous sidewalk gaps, narrow sidewalks, and the absence of destinations within easy walking distance all contribute to an underwhelming experience (and demand), although access to shuttle/transit stops remains essential for those with limited mobility or without access to a vehicle. For bicyclists, several miles of recently installed Class II bike lanes have helped create an extensive on-street network, although this network is attractive generally only to experienced commuter and recreational bicyclists (in part due to traffic, in part due to one of the city's rare hills along Hanover Street near the Hewlett Packard campus).

The Ventura and Charleston Meadows neighborhoods lie east of El Camino Real and south of California Avenue. This area is well-served by the Castelleja-Park-Wilkie corridor, which is slated for bicycle boulevard upgrades in 2012/2013, as well as the proposed Miller/Del Medio extension. The corridor connects the California Avenue business district, Stanford University, and numerous other destinations (including the Town and Country Shopping Center) to the southern city border and San Antonio Shopping Center. While the Ventura neighborhood is mostly residential except for those properties fronting El Camino, the northern section includes several interior commercial parcels (dominated by the large AOL/Fry's Electronics sites) that are included in the greater California Avenue Pedestrian & Transit Oriented Development Combined (PTOD) Overlay District. This zone is designated to absorb additional housing and commercial growth as Palo Alto's only "Priority Development Area" identified in the current draft of MTC's 2040 regional plan. How and when this area is redeveloped will be a major contributing factor to non-motorized demand and accessibility for this area, in particular for the connection between the Hansen Way/El Camino intersection and Park Boulevard.

Without a crossing of Caltrain between California Avenue and Meadow Street, and with a number of streets forming "T" intersections at El Camino Real, the top priority for the Ventura neighborhood is improving east-west connections. This is especially true for school-related trips that require crossing El Camino Real to access the Barron Park neighborhood.

Along El Camino Real between Hansen Way and the southern city limit is a unique commercial strip that, while auto-oriented, provides numerous lunchtime and other community serving destinations that generate substantial pedestrian demand (along with a cluster of pedestrian and bicycle collisions). According to the City's *Comprehensive Plan* Policy L-35, this South El Camino Real area should be established "as a well-designed, compact, vital, Multi-neighborhood Center with diverse uses, a mix of one-, two-, and three-story buildings, and a network of pedestrian-oriented streets and ways." The 2003 *El Camino Real Master Planning Study* established a vision, which, along with the recent design resolution of El Camino BRT, provides opportunities for bicycle and pedestrian enhancements.

Recommended Treatments and Locations

An effective strategy is needed to encourage additional commute mode shift and improved access to El Camino Real and California Avenue for discretionary and commuter trips. To that end, this Plan proposes expanding off-street trail facilities in tandem with a public/private partnership campaign to focus and improve TDM efforts of major employers around the forthcoming Caltrain corridor bicycle share program.

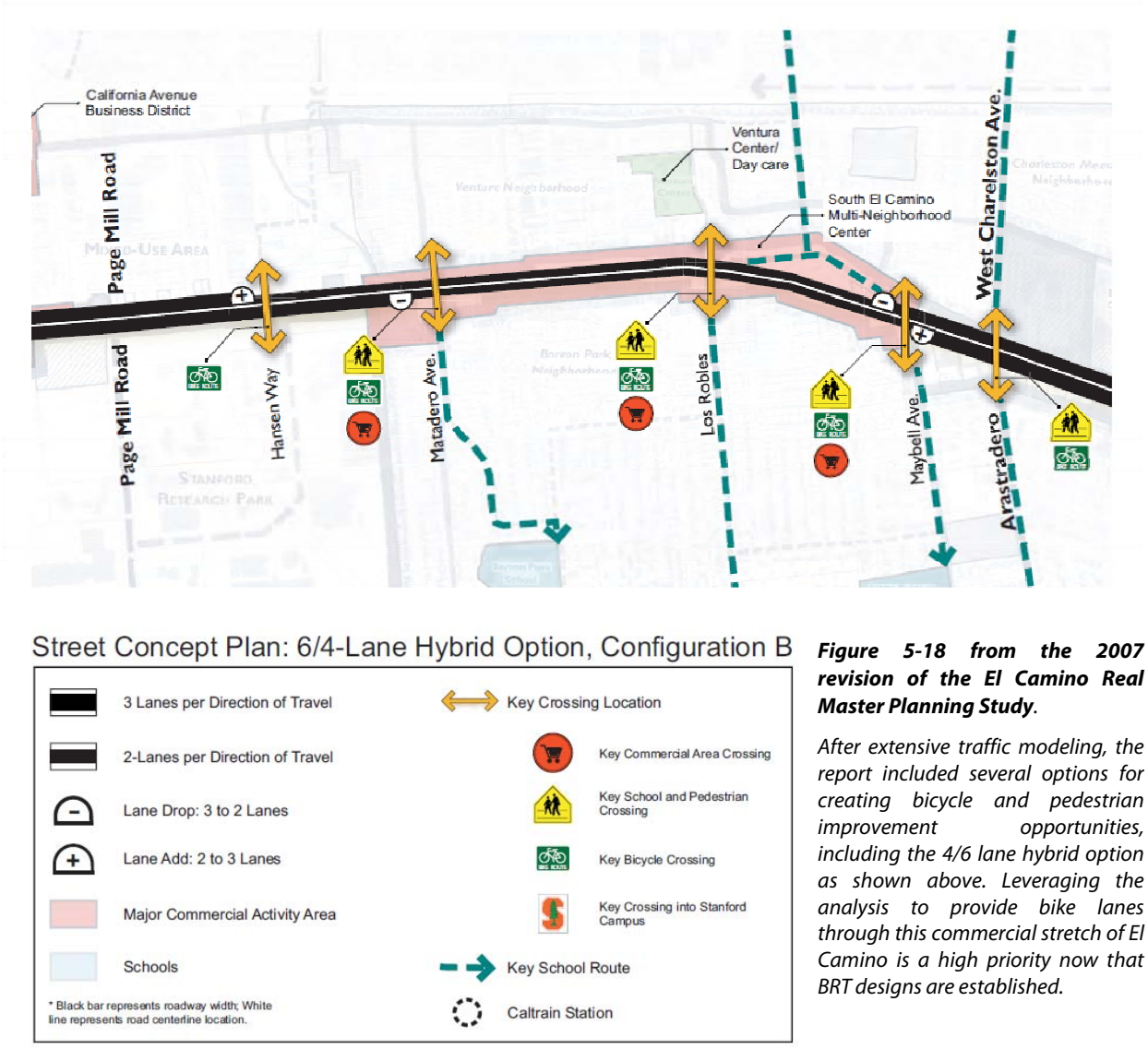


Figure 5-18 from the 2007 revision of the El Camino Real Master Planning Study.

After extensive traffic modeling, the report included several options for creating bicycle and pedestrian improvement opportunities, including the 4/6 lane hybrid option as shown above. Leveraging the analysis to provide bike lanes through this commercial stretch of El Camino is a high priority now that BRT designs are established.

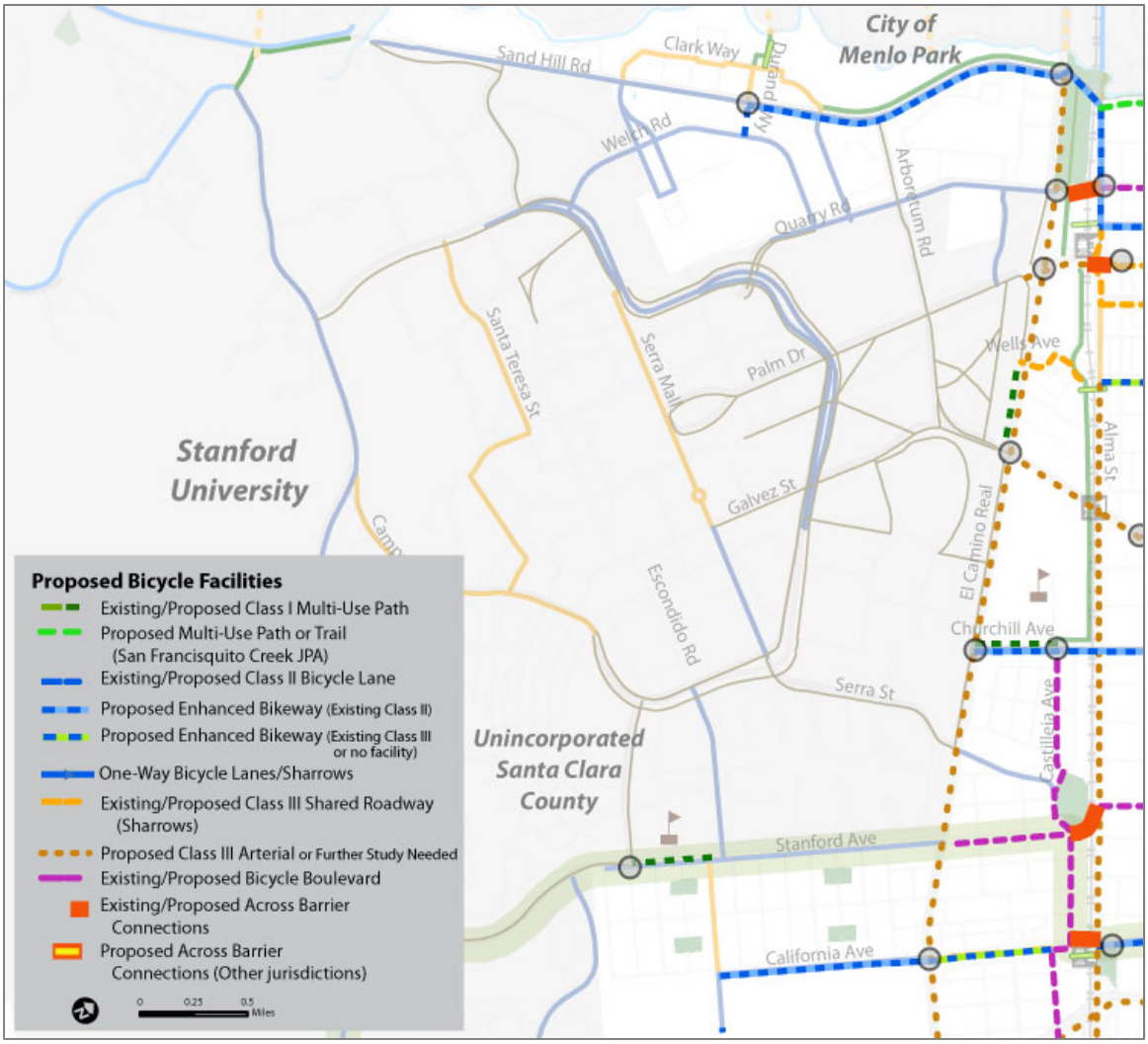
- **Intersection Spot Improvements**
  - Arastradero Road at Foothill Expressway: Stripe and enhance signage as part of an upcoming resurfacing project.
  - Matadero Avenue: Provide enhancements within 200-feet of the El Camino Real approach to separate pedestrians from vehicles; remove the southbound left-turn lane from El Camino Real to Margarita Avenue (at Matadero Avenue) in favor of a median refuge island and realigned (shorter) crosswalk; consider a partial closure of Margarita Avenue (appears viable due to the ability of the Ventura neighborhood street grid to offer alternative access routes for the small number of vehicles that would be displaced).

- **Across Barrier Connections**
  - Matadero Creek Caltrain undercrossing: Connect with Midtown and the proposed Matadero Creek Trail; conduct a feasibility/conceptual design study along with (or soon after) identifying plans for High Speed Rail.
  - In the long-term, consider better trail connections to the VA hospital and across Matadero Creek to an existing private path system.
- **Trails**
  - Greater Barron Park trail network: Extend north into the Stanford Research Park toward the California Avenue Business District; install pedestrian-scaled lighting along existing trails.
  - Bol Park Path: Improve accessibility at Miranda Road and Laguna Avenue (removal of existing trail barriers and curb ramp upgrades). The City should work with Stanford University to reach agreement on extending the current month-to-month lease and developing a connection to the VA hospital.
  - Bol Park/Hanover Street path: Consider extending along Page Mill Road and/or directly through the Research Park campus to Hansen Way along an historic railroad corridor easement. If successful, the latter trail connection would further increase the priority of improving the Hanover/El Camino Real intersection for non-motorized users. Communicate and coordinate with Stanford University and affected Research Park tenants due to the need for improvements on private property.
- **Bike Lane/Sharrow Roadway Striping**
  - Charleston/Arastradero Road corridor: Confirm and enhance the existing bike lanes and traffic calm adjacent corridors as needed to balance safety and access concerns.
  - El Camino Way: Consider sharrows from Meadow to Maybell to enhance this safe routes to school connection.
  - El Camino Way and Los Robles: Enhance bike lanes (potentially consolidate with sidewalks into a shared use path) approaching and across El Camino Real to La Donna Avenue.
  - Hanover Street: Complete and enhance bike lanes at the approaches to Page Mill Road (history of bicycle collisions and connections to the Nixon to Gunn school commute route).
  - El Camino Real: Further evaluate Class II bike lanes from Hanover Street to Maybell Avenue; consider a strategic combination of lane reductions, limited expansion of existing parking restrictions, and striping; coordinate with VTA's El Camino BRT project to assess the potential impact on future bus service.
- **Bicycle Boulevards**
  - Matadero/Margarita Bicycle Boulevard: Improve connection across El Camino Real, traffic calm Matadero Avenue, and provide wayfinding striping and signage.

- Maybell Bicycle Boulevard: Enhance striping and signage; extend via Donald Drive and Georgia Avenues to Terman Middle School and Gunn High School; spot improvements at Donald Drive and at the spur trail from Georgia Avenue to the Gunn High School shared path.

6.4.4 Northwest Palo Alto

Proposed Bikeway Map



Area Description

Northwest Palo Alto is a backwards "C"-shaped sliver of land between Caltrain, Stanford University properties, and the border with Menlo Park along San Francisquito Creek. Containing the city's other major business district (California Avenue) and its biggest shopping mall (Stanford Shopping Center), travel demand is also driven by numerous medical facilities and three public schools in addition to the University campus. Despite seven crossing opportunities, the Caltrain corridor still represents a physical and psychological barrier to non-motorized connectivity, which is reinforced by its proximity to El Camino Real.

With a grid network of traffic-calmed residential streets and a pedestrian-scaled commercial district, the College Terrace and Evergreen Park neighborhoods provide a dramatic change from the sprawling campuses that lie adjacent. Pedestrian activity centers on and around the California Avenue business district and Caltrain station, and major bicycle connections include the north-south Embarcadero Path/Castilleja/Park Boulevard and Hanover Street/Escondido Road corridors, as well as the east-west Stanford Avenue/California Avenue corridor. The latter is part of the designated Bay to Ridge Trail, including Class II bike lanes west of El Camino (and an almost complete jogging path network past the elementary schools toward the Stanford "Dish"), as well as Class III shared streets to the east of El Camino that terminate at Park Boulevard.

The redesign of the Stanford/El Camino Real intersection (completed 2011) and the streetscape overhaul of California Avenue (in design) are two highly anticipated improvements that will further bolster efforts to encourage compact growth as part of the Pedestrian and Transit Oriented Development (PTOD) zoning overlay district.

On Sundays during much of the year, several blocks of California Avenue are closed to traffic to host a weekly farmer's market. Such events should be expanded and made more regular, where feasible, to encourage and promote active and healthy transportation options for residents and shoppers. The provision of temporary pedestrian and bicycle facilities (and detour routes) will also be important with several large public projects in the works and increased private construction anticipated in the future.

The narrow strip of west Palo Alto north of Park Boulevard includes the Southgate neighborhood, Palo Alto High School campus, the Town and Country Shopping Center, and the Palo Alto Medical Foundation complex. Important bicycle routes to/from Stanford University include the following:

- Park Boulevard spur (Class II bike lanes from the Castilleja-Park Bicycle Boulevard across El Camino Real to Serra Street)
- Homer Avenue underpass and connection through the PAMF campus across El Camino to the Stanford trail network and Lasuen Road
- Churchill/Alma crossing that links into the city's bicycle network east of Caltrain and helps mitigate the long distance between the next available crossing of El Camino over 2,000 feet to the north (at Embarcadero Road)
- Galvez/Embarcadero Road connector at El Camino Real, which is not a bicycle-friendly intersection but offers great access to Stanford Stadium and the Town and Country Shopping Center (recent improvements to which include a connector trail to the Embarcadero/Caltrain path)

The recently completed Medical Center expansion EIS and approved public benefits package provide a rigorously studied, prioritized project list for the majority of Palo Alto that lies west of El Camino and north of University Avenue. These improvements include non-motorized and transit wayfinding improvements along Quarry Road, a dramatically enhanced El Camino Park and Palo Alto Transit Center connection, and Stanford-led pedestrian improvements to connect Welch Road with Vineyard Lane. A future trail connection should be considered to improve connectivity between El Camino Park and Caltrain/Palo Alto High School through the Transit Center.

In addition to (or as part of) the approved Medical Center traffic mitigation and public benefits package, there are several other bicycle and pedestrian improvement opportunities identified by the EIR. Where Durand

Way (a Class III bikeway) intersects with Sand Hill Road, Stanford is planning to construct a direct extension to Welch Road (with bicycle lanes), providing an important connection from Menlo Park over San Francisquito Creek into campus. This connection will greatly reduce travel times and increase legibility for pedestrians and bicyclists who are currently forced out of direction toward Pasteur Drive and/or Vineyard Lane. Community feedback and field inspection also indicate the need for better bike lane and shared use pathway connections where the Sand Hill Road trail intersects with El Camino Real, the Caltrain tracks, and Alma Street toward Palo Alto Avenue and downtown.

Future Durand Way road and bicycle lane connector at Sand Hill Road. *Pedestrians and bicyclists crossing over San Francisquito Creek into Palo Alto will have a much more direct and legible connection into campus when Durand Way and Welch Road are connected at Sand Hill Road as part of the improvement plans for the Stanford Medical Center expansion.*

Recommended Treatments and Locations

- Across Barrier Connections
    - California Avenue Caltrain undercrossing: Redesign to provide ADA access and a separated bicycle connection.
- Trails
    - Jogging path along Stanford Avenue: Connect and complete the path in front of Escondido School to enhance the Bay to Ridge Trail.

- **Churchill Road Sidepath/Embarcadero Trail Extension**: Link the Embarcadero Path and Churchill Mall Path in the Stanford athletic fields via a widened sidewalk and reconfigured El Camino Real intersection.

- **Bike Lane/Sharrow Roadway Striping**
  - El Camino Real: Provide intersection through-markings (sharrows) across all bikeway connections.
  - Palo Alto Medical Foundation campus: Provide wayfinding and sharrow markings from the Homer Avenue undercrossing, with potential Stanford University connections along El Camino Real to Galvez Road and along the existing low-volume Lasuen Street into the heart of campus.
  - Sand Hill Road: Replace deteriorated bike lane markings with enhanced bikeway treatments, including signal actuation.

- **Bicycle Boulevards**
  - Park Boulevard: Sign and mark bicycle boulevard from Churchill Street to Lambert Avenue because major traffic calming treatments are already in place and pursue additional improvements south as future phase projects.
  - Matadero Avenue: Pursue focused traffic calming treatments at Josina Avenue and Laguna Avenue and sign/mark bicycle boulevard.

- **Intersection Spot Improvements**
  - Palo Alto High to the Castilleja-Park Bicycle Boulevard: Improve the unsignalized crossing at Churchill and connection to the Caltrain bike path along Embarcadero Road.

- **Pedestrian Improvements**
  - El Camino Real: Improve and widen sidewalks along El Camino Real in conjunction with ongoing construction and maintenance activities. Provide pedestrian crossing improvements as the area densifies over time, including bus stop and sidewalk upgrades by California Avenue (a top pedestrian collision location) as part of the El Camino BRT project.

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Chapter 7 Implementation and Funding

This Plan outlines a set of programmatic and infrastructure improvements that will encourage walking and bicycling for everyday trips in Palo Alto. This chapter addresses how the City can implement the proposed projects, from guidelines for designing high-quality pedestrian and bicycle infrastructure, to prioritizing projects to identify the order in which the City should pursue implementation. This chapter also identifies hoe Palo Alto has traditionally funded pedestrian and bicycle improvements and proposes a strategy for identifying money for future implementation.

7.1 Design Guidelines

Appendix A: Design Guidelines presents innovative bicycle and pedestrian facilities that can complement existing standards and guidelines. Despite the experimental nature of some of the recommended treatments, all include U.S. examples and many have been adopted by the National Association of City Transportation Officials (NACTO). The design guidelines are intended to be a toolkit that allows the City flexibility for implementing all future projects. It incorporates the latest thinking from NACTO (which has been endorsed by the FHWA) and reflects recent State policies such as Complete Streets.

7.2 Project Prioritization

This section summarizes the process and criteria used to prioritize and strategically rank bicycle and pedestrian recommendations in the *Bicycle and Pedestrian Transportation Plan* (BPTP).

7.2.1 2003 Bicycle Transportation Plan Criteria and Rankings

Three criteria used to prioritize projects are essentially carried over from the 2003 Bicycle Transportation Plan, which helps promote continuity between planning processes and highlight many of the previously identified priority projects not yet implemented. These criteria are safety, connectivity, and a "special" category that denotes previous commitments and/or public support. While similar, each has been updated and/or simplified from the 2003 Plan to reflect new conditions, available data, and revised public input from the project planning process.

Safety

High: Project location has a significant crash history AND is located on the identified School Commute Corridors Network

Medium: Project has a significant crash history, OR is located on the identified School Commute Corridors Network, OR addresses common safety concerns identified through the Plan development process

Low: Project addresses a perceived or low risk safety concern identified by the community

Connectivity

High: Project closes a gap between two Class I trail segments OR creates a new significant new connection to an activity center or across a major circulation barrier such as a freeway, creek, or arterial intersection

Medium: Project closes a gap between two on-street bikeways OR extends a Class I trail segment OR enhances an existing arterial crossing or access to an activity center

Low: Project improves circulation within the existing bikeway network or extends an on-street bikeway without addressing barriers or providing new activity center connections

Special

This criterion refers to special circumstances – such as current/past planning and funding commitments and/or public support identified through the plan outreach process – that contribute to the project's status as a high priority. Scoring range is based on a qualitative assessment of these factors.

7.2.2 Five I's Evaluation Framework

In addition to the three criteria above, the priority project list was developed and further refined according to the 'Five I's' strategic evaluation framework established in **Chapter 2** of this Plan and promoted throughout the planning process. Unless otherwise noted, each project has been given a High, Medium or Low 'score', and its rank has been adjusted based on a qualitative assessment of the following criteria. It should be noted that not all 'I's are given equal weight in developing and ranking projects, and that in some cases (particularly with Innovation) the criteria are most valuable as guiding principles during design and implementation, not to select projects.

Integration

This criterion rates the potential to integrate the project with another identified city priority or project, and/or incorporate integrated design features to achieve multiple benefits and reduced waste/public impacts.

Inclusion

This criterion asks, "How important is the project for attracting "interested but concerned" bicycle riders and/or improving universal accessibility for vulnerable users and people with disabilities?"

Innovation

This criterion notes the project's dependence on, and/or potential incorporation of, innovative design features to overcome barriers to implementation. This criterion generally does not influence the project ranking, but is included to help identify where innovative projects may require additional education and outreach to build public support or ensure proper usage of the facility. *Note: Due to the impracticality of determining levels of innovation for each project at this stage, this category simply denotes the potential absence or presence of innovative features and is given a "Yes or "No" score.*

Investment

This criterion reflects the expected benefit-to-cost ratio in general terms, including the project's potential competitiveness for outside grant funding.

Institutional Partnerships

This criterion identifies the project's potential and/or need for mutual coordination and cost sharing between various agencies, jurisdictions, and private/public partnerships. *Note: A "high" score in this category denotes the potential for improved feasibility (due to cost sharing), but it also indicates an increased project risk associated with garnering widespread support or approvals.*

7.2.3 Project Categories

To identify priorities among similar projects, project recommendations for the BPTP are organized into nine distinct categories:

- Across Barrier Connections
- Trails
- Bike Lane/Sharrow Roadway Striping
- Bicycle Boulevards
- Intersection Spot Improvements
- Programmatic (Infrastructure)
- System Rehabilitation/ Maintenance
- Design, Feasibility, and Planning
- Non-Infrastructure (Education, Encouragement)

The high priority projects, and perhaps the overall system and segments themselves, may change over time because of changing bicycling and walking patterns, land use patterns, implementation constraints and opportunities, and the development of other transportation system facilities. The City of Palo Alto should review the project list and project ranking at regular intervals to ensure it reflects the most current priorities, needs, and opportunities for implementing the bicycle network in a logical and efficient manner.

Table 7-1 shows the results of this prioritization and includes a project description and list of related projects. Planning level cost estimates are also provided, which include previous cost estimates (where available), new estimates based on high-level cost assumptions (excludes right-of-way, design and staff time), and programmatic funding recommendations for annual and one-time expenditures.

Table 7-1. Top Recommended Projects by Category

ID	PROJECT NAME	PLANNING LEVEL COST ESTIMATE
Across Barrier Connections		
ABC-1	**Adobe Creek Highway 101 Overcrossing**	**$5-9 million**
Project Description:	Construct year-round pedestrian and bicycle overpass of Highway 101 between Adobe Creek/Bay Trail/Baylands Nature Preserve and W. Bayshore Rd near the existing Benjamin Lefkowitz seasonal undercrossing.	
Related Projects/Plans:	Adobe Creek Reach Trail; Fabian Way Enhanced Bikeway; Embarcadero Rd Highway 101 Overpass Access Improvements; Sterling Canal Trail; Barron Creek connector; *Comprehensive Plan Transportation Element* Goals T-1 and T-3, Land Use & Design Element Policy L-42, and Community Services Element Goal C-5	
Rankings:	Safety: *Medium* / Connectivity: *High* / Special: *High* Integration: *High* / Inclusion: *High* / Innovation: *Yes* Investment: *Medium* / Institutional Partnerships: *Medium*	

ID	PROJECT NAME	PLANNING LEVEL COST ESTIMATE
ABC-2	Caltrain/Alma Barrier Crossing at Matadero Creek	$5 million

Project Description: Construct a grade-separated pedestrian and bicycle crossing of Caltrain/Alma Street in the vicinity of Matadero Creek/Park Boulevard or between Margarita and Loma Verde Avenues. This project closes a 1.3 mile gap between existing crossings at California Avenue and Meadow Street, greatly improving east-west connectivity in conjunction with other improvements.

Related Projects/Plans: Matadero Creek Trail Feasibility Study; Matadero/Margarita Bicycle Boulevard; Bol Park Pathway Improvements, El Camino Real spot improvements

Rankings:

Safety: *Medium*	Connectivity: *High*	Special: *High*
Integration: *High*	Inclusion: *High*	Innovation: *No*
Investment: *Medium/Low*	Institutional Partnerships: *Medium*	

ID	PROJECT NAME	PLANNING LEVEL COST ESTIMATE
ABC-3	Palo Alto Transit Center/University Avenue Undercrossings	$2-5 million

Project Description: Widen and improve the existing sidewalk undercrossings along University Avenue at the Palo Alto Transit Center. This project will improve bicycle and pedestrian access to transit and between downtown Palo Alto and Stanford University's main entrance, and should include lighting, wayfinding and public art enhancements.

Related Projects/Plans: Alma Street Enhanced Bikeway; University Avenue and High Street spot improvement; downtown shared bikeways; proposed Safe Routes to Transit and VTA/Caltrain Public Bicycle Share programs

Rankings:

Safety: *Medium*	Connectivity: *High*	Special: *High*
Integration: *Medium*	Inclusion: *Medium*	Innovation: *No*
Investment: *Medium/High*	Institutional Partnerships: *High*	

ID	PROJECT NAME	PLANNING LEVEL COST ESTIMATE
ABC-4	California Avenue Caltrain/Alma Undercrossing	$2-5 million

Project Description: Modify or reconstruct the California Avenue Caltrain/Alma Street undercrossing to improve access and reduce user conflicts. At minimum this project should provide rampways that meet pedestrian accessibility best practices. Pending additional feasibility analysis and budget, other project goals include a widened tunnel with separate pathways for pedestrians and bicyclists and better integration with improved on-street bikeways.

Related Projects/Plans: California Avenue Enhanced Bikeway, Castilleja-Park-Wilkie Bicycle Boulevard; California Avenue Streetscape Improvements; VTA/Caltrain Public Bicycle Share program; Alma St/Oregon Expressway bridge replacement (future County project)

Rankings:

Safety: *Medium*	Connectivity: *Medium*	Special: *Medium*
Integration: *High*	Inclusion: *High*	Innovation: *No*
Investment: *Medium*	Institutional Partnerships: *Medium*	

ID	PROJECT NAME	PLANNING LEVEL COST ESTIMATE
ABC-5	Matadero Creek / Highway 101 Seasonal Undercrossing	$1.1 million

Project Description: Upgrade the existing Santa Clara Valley Water District (SCVWD) maintenance road underneath Highway 101 to a Class I trail facility. This project would improve east-west mobility across a major barrier (Highway 101) and connect to an existing trail/fire road within the Baylands Nature Preserve, although it may require development of additional Class I trail segments to the west along Matadero Creek before it is warranted. Similar to the existing Benjamin Lefkowitz undercrossing at Adobe Creek, this crossing would be subject to seasonal flooding and closed approximately six months of the year in the winter season.

Related Projects/Plans: Matadero Creek Trail & Feasibility Study; Amarillo-Moreno Bicycle Boulevard; Sterling Canal Trail

Rankings:

Safety: *Medium/Low*	Connectivity: *High*	Special: *Medium*
Integration: *High*	Inclusion: *High*	Innovation: *No*
Investment: *Medium*	Institutional Partnerships: *Medium/High*	

ID	PROJECT NAME	PLANNING LEVEL COST ESTIMATE
ABC-6	Newell Road Bridge Crossing at San Francisquito Creek	$500,000

Project Description: Provide enhanced (dedicated) bicycle and pedestrian facilities and planning as part of the Newell Road Bridge replacement project, an identified high priority for the City due to the bridge's "obsolete" classification by Caltrans. Funding represents a planning-level estimate of non-motorized enhancements over-and-above what would be minimally required.

Related Projects/Plans: Newell Road Bridge Replacement Project (Public Works); Newell Road Enhanced Bikeway; East Palo Alto Highway 101 Barrier Crossing

Rankings:

Safety: *Low*	Connectivity: *High*	Special: *High*
Integration: *High*	Inclusion: *Medium*	Innovation: *No*
Investment: *High/Medium*	Institutional Partnerships: Medium	

ID	PROJECT NAME	PLANNING LEVEL COST ESTIMATE
ABC-7	Middlefield Road Undercrossing at San Francisquito Creek	$1 million

Project Description: Construct year-round pedestrian or share-use pathway under Middlefield Road along San Francisquito Creek as part of a multi-jurisdictional creek trail development effort.

Related Projects/Plans: San Franciquito Creek Joint Powers Authority Creek Trail Project; future replacement of the Middlefield Road/San Francisquito bridge crossing

Rankings:

Safety: *Low*	Connectivity: *High*	Special: *Medium*
Integration: *High*	Inclusion: *High*	Innovation: *Varies*
Investment: *Medium/Low*	Institutional Partnerships: *High*	

ID	PROJECT NAME	PLANNING LEVEL COST ESTIMATE

Trails and Shared Use Pathways

TR-1 Embarcadero Road / Rinconada Park Sidepath — $200,000

Project Description: Widen existing sidewalk between Middlefield Road and Newell Road along the north side of Embarcadero Road to provide a Class I path to/from Rinconada Park and Walter Hays Elementary School. This off-street "sidepath" would close an important gap between the Churchill/Coleridge Avenue, Rinconada Park, and Newell Road bikeways and improve the School Commute Corridor Network without significant impact to traffic operations along Embarcadero Road.

Related Projects/Plans: Newell Road Enhanced Bikeway; Coleridge/Churchill Avenue Enhanced Bikeway; Safe Routes to School; Rinconada Park Improvements

Rankings:

Safety: *High/Medium*	Connectivity: *High*	Special: *High*
Integration: *High*	Inclusion: *High*	Innovation: *Yes*
Investment: *High*	Institutional Partnerships: *High*	

TR-2 Adobe Creek Reach Trail — $100,000

Project Description: Upgrade the existing Santa Clara Valley Water District (SCVWD) maintenance road to a Class I trail facility from W. Bayshore Road at Adobe Creek to E. Meadow Drive. This trail would help connect the existing Benjamin Lefkowitz underpass and future potential overcrossing.

Related Projects/Plans: **Adobe Creek/Highway 101 Overcrossing; Meadow Drive Enhanced Bikeway; ; Sterling Canal Trail; Fabian Way Enhanced Bikeway**

Rankings:

Safety: *Medium/Low*	Connectivity: *High*	Special: *High*
Integration: *High*	Inclusion: *High*	Innovation: *No*
Investment: *High/Medium*	Institutional Partnerships: *High*	

ID	PROJECT NAME	PLANNING LEVEL COST ESTIMATE
TR-3	Existing Trail Access Improvements	$500,000

Project Description: Enhance on-street intersections along the existing trail network and key existing bridge/overpass approaches to improve ADA access, bikeway connectivity, and convenience for all users.

Priority upgrades include: modifying or replacing substandard safety corrals with bollards and associated striping/signage; installing accessible curb ramps and re-grading poor transitions; pedestrian-scaled lighting; installing high visibility crosswalks at key locations; and landscaping maintenance/removal. Priority locations include, but are not limited to, the following:

- Bol Park Path at Matadero Avenue
- Highway 101/Embarcadero Road overcross approaches
- Gunn HS path at Georgia Avenue, Miranda Avenue/Arastradero Road
- Adobe Creek Highway101 underpass approaches at W. Bayshore Road
- Matadero Creek ped/bike bridge along the Bryant Street Bike Boulevard
- Adobe Creek ped/bike bridge approaches at Duncan Place and Creekside Drive
-Benjamin Lefkowitz underpass lighting improvements

Related Projects/Plans: Adobe Creek/Highway 101 Overcrossing; Meadow Drive Enhanced Bikeway; Fabian Way Enhanced Bikeway

Rankings:

Safety: *Varies*	Connectivity: High	Special: *High*
Integration: *Medium*	Inclusion: *High*	Innovation: *No*
Investment: *High/Medium*	Institutional Partnerships: *Low*	

ID	PROJECT NAME	PLANNING LEVEL COST ESTIMATE
TR-4	Bol Park / Gunn HS / Los Altos Path Lighting & Upgrades	$550,000

Project Description: Install pathway or pedestrian-scaled lighting in conjunction with trail maintenance and access upgrades along this popular school commute trail to improve early morning and evening visibility and safety. As part of this project, explore ADA access improvements to the existing VA Medical Center "back connection" to provide an attractive bypass of the steep bicycle lanes on Hillview Street for the outer Stanford Research Park area, and a sidepath along Arastradero Road between Foothill Expressway and the existing pedestrian crossing at the Gunn High School entrance.

Related Projects/Plans: Existing Trail Access Improvements; Safe Routes to School; Bol Park Path Research Park extension; Hetch Hetchy/Los Altos Path extension or Arastradero Road Sidepath; Arastradero Road Enhanced Bikeway

Rankings:

Safety: *Medium/High*	Connectivity: *Medium/High*	Special: *High*
Integration: *Medium*	Inclusion: *High*	Innovation: *No*
Investment: *Medium*	Institutional Partnerships: *High*	

ID	PROJECT NAME	PLANNING LEVEL COST ESTIMATE
TR-5	Churchill Road Sidepath/Embarcadero Trail Extension	$150,000

Project Description: Extend existing Class I trail (Caltrain path) along north side of Churchill Road to Stanford University trailhead at El Camino Real by widening existing sidewalk adjacent to Palo Alto High School and PAUSD office.

Related Projects/Plans: Castilleja-Park-Wilkie Bike Boulevard and intersection crossing improvement at Churchill Avenue; Southgate neighborhood priority paving (Public Works)

Rankings:

Safety: *High/Medium*	Connectivity: *High*	Special: *Medium*
Integration: *Medium*	Inclusion: *High*	Innovation: *Yes*
Investment: *High/Medium*	Institutional Partnerships: *High*	

ID	PROJECT NAME	PLANNING LEVEL COST ESTIMATE
TR-6	Geng Road and Embarcadero Road (Bay Trail) Maintenance	$100,000

Project Description: Repaving and upgrades to the Bay Trail segment along Geng Road, and potential upgrade/extension of existing pathway along Embarcadero Road adjacent to the Palo Alto Municipal Golf Course and Santa Clara County Airport.

Related Projects/Plans: Baylands Trail extension from E. Bayshore Road; Existing Trail Acccess Improvements; Baylands Athletic Center Improvements Project (Parks & Recreation)

Rankings:

Safety: *Low*	Connectivity: *Medium*	Special: *Medium/High*
Integration: *Medium/High*	Inclusion: *High*	Innovation: *No*
Investment: *High/Medium*	Institutional Partnerships: *Medium*	

ID	PROJECT NAME	PLANNING LEVEL COST ESTIMATE

Bicycle Boulevards

BB-1 Castilleja-Park-Wilkie Bicycle Boulevard — $210,000

Project Description: Comprehensive improvements, including signage, striping, and capital spot improvements from Churchill Road past Charleston Road to the southern city limits at Del Medio Avenue. Provide wayfinding at jog along California Avenues. Cost estimate does not include repaving.

Related Projects/Plans: Churchill Road Sidepath and Enhanced Bikeway; Southgate Stormwater Improvements and Green Street (Public Works); Southgate Neighborhood Priority Paving (Public Works); California Avenue Streetscape Improvements; Safe Routes to School

Rankings:

Safety: *Medium/High*	Connectivity: *High*	Special: *High*
Integration: *High*	Inclusion: *High*	Innovation: *Yes*
Investment: *High*	Institutional Partnerships: *Medium*	

BB-2 Matadero - Margarita Bicycle Boulevard — $290,000

Project Description: Corridor enhancements to consider include:
- Wayfinding signs and pavement markings
- Matadero Avenue chicanes with pass-through,
- ADA/safety upgrades at El Camino Real approach
- El Camino Real: crosswalk realignment, signal detection upgrades, potential center median refuge and partial traffic diversion at Margarita Avenue
- Consider traffic diversion at Margarita Avenue

Related Projects/Plans: Matadero Creek Caltrain/Alma Barrier Crossing; Matadero Creek Trail Feasibility Study; Castilleja-Park-Wilkie Bicycle Boulevard; Bol Park Path Lighting and Upgrades; Portage Avenue/Hansen Way Enhanced Bikeways; El Camino Real Bicycle Lanes Study and Intersection Through-Markings; Safe Routes to School

Rankings:

Safety: *Medium*	Connectivity: *High*	Special: *High*
Integration: *High/Medium*	Inclusion: *High*	Innovation: *Yes*
Investment: *High*	Institutional Partnerships: *Medium/High*	

BB-3 Bryant Street Bicycle Boulevard — $80,000

Project Description: Wayfinding signs and pavement markings south of Bryant Street. Spot improvements for additional safety and comfort, including Churchill/Coleridge Avenue spot improvement and arterial crossing enhancements at University Avenue, Meadow Drive (consider beacon or signal), Charleston Road, and San Antonio Road at Nita Drive into Mountain View.

Related Projects/Plans: Everett Avenue Bicycle Boulevard; Churchill/Coleridge Enhanced Bikeway, Charleston Road and Meadow Drive Enhanced Bikeways; Existing Trail Access Spot Improvements (Adobe Creek bridge); Safe Routes to School

Rankings:

Safety: *Medium/High*	Connectivity: *Medium*	Special: *High*
Integration: *High*	Inclusion: *High*	Innovation: *Yes*
Investment: *High/Medium*	Institutional Partnerships: *Low*	

ID	PROJECT NAME	PLANNING LEVEL COST ESTIMATE
BB-4	Ross/Louis Road Bicycle Boulevard	$150,000

Project Description: Spot improvements throughout corridor, including wayfinding signs and pavement markings. Priority locations and treatments to consider include:
- Traffic circles at Moreno Avenue, Ames Road, and Mayview Avenue
- Chicanes with bicycle pass-through at Louis Road
- Revised center median at Charleston Road, Montrose Avenue/Middlefield Avenue at Cubberly Community Center entrance.

Cost estimate excludes committed funds for Oregon Expressway bicycle signal. Longer-term opportunities to explore with PAUSD include trail connections through the Cubberly campus to Nelson Drive and through the Jordan Middle School campus to Newell Road, although the latter connection presents significant barriers to implementation.

Related Projects/Plans: Newell Road Enhanced Bikeway; Amarillo/Moreno Bicycle Boulevard

Rankings:

Safety: *Medium*	Connectivity: *High*	Special: *High*
Integration: *High*	Inclusion: *High*	Innovation: *Yes*
Investment: *Medium/Low*	Institutional Partnerships: *High*	

BB-5	Webster Street Bicycle Boulevard	$190,000

Project Description: This project will further develop Webster Street into an attractive bike route (and alternative to Middlefield Road) for school-related travel and trips between north and south Palo Alto. Wayfinding signs and pavement markings should be placed along the corridor. Pending the results of a traffic warrant study and/or an Embarcadero Road corridor analysis, this project should include implementation of an actuated beacon crossing or bicycle priority signal at Embarcadero Road, which is currently unsignalized. Additional improvements may include stop sign reversals, traffic circles, and pavement resurfacing from Everett Avenue to N California Avenue (pavement improvements not included in cost estimate).

Related Projects/Plans: Embarcadero Road Class III Shared Arterial/Corridor Study; Safe Routes to School; Street Maintenance program (Public Works); Kingsley Avenue and Guinda-Chaucer Bicycle Boulevards

Rankings:

Safety: *High/Medium*	Connectivity: *High*	Special: *Medium*
Integration: *Medium*	Inclusion: *High*	Innovation: *Yes*
Investment: *High*	Institutional Partnerships: *Low*	

BB-6	Amarillo- Moreno Bicycle Boulevard	$70,000

Project Description: Wayfinding signs and pavement markings from Middlefield Road to West Bayshore Road. Consider offset intersection treatments such as signs and pavement markings to assist with wayfinding at Louis Road where the route jogs. Consider traffic circle at Ross Road (included in Ross cost estimate) and/or Greer Road.

Related Projects/Plans: Middlefield Road Bicycle Lanes (study); Ross Road and Greer Road Bicycle Boulevards; Safe Routes to School; Matadero Creek /101 Seasonal Undercrossing

Rankings:

Safety: *Medium*	Connectivity: *Medium/High*	Special: *Medium*
Integration: *Medium*	Inclusion: *High*	Innovation: *Yes*
Investment: *Medium/High*	Institutional Partnerships: *Medium*	

ID	PROJECT NAME	PLANNING LEVEL COST ESTIMATE

Bike Lanes/Sharrows/Enhanced Bikeways

BK-1 Charleston/Arastradero Road Enhanced Bikeway — $1.5 million

Project Description: Phase 2 follow-up to the approved Charleston Road re-striping and pending trial study of Arastradero Road re-striping. Project to include: enhanced bike lane striping (green lanes, intersection through-markings, and bike boxes as appropriate); installation of permanent median islands; improved ped/bike crossings at key north-south bikeway connections; and select spot improvements (e.g., at El Camino Real and Middlefield Road).

Related Projects/Plans: Arastradero Road Trial Striping; Middlefield Road/Charleston Road Spot Improvement; Bol Park/Hetch Hetchy/Terman Park Path; numerous bicycle boulevards; Safe Routes to School; Fabian Way Enhanced Bikeway; City of Palo Alto 2012-2016 CIP

Rankings:

Safety: *High*	Connectivity: *High*	Special: *High*
Integration: *High*	Inclusion: *High*	Innovation: *Yes*
Investment: *Medium/High*	Institutional Partnerships: *Medium*	

BK-2 California Avenue Enhanced Bikeway — $200,000

Project Description: Potential cycletrack or enhanced striping and signage of existing substandard (time restricted) bike lanes, and enhanced signage and markings coordinated with the California Avenue streetscape improvements project, to improve safety and access to the business district, Caltrain, Jordan Middle School and Escondido/Nixon Elementary Schools; and to improve mobility and attractiveness along the Bay to Ridge Trail. Part of the "Civic Loop" urban trail concept.

Related Projects/Plans: California Avenue Streetscape Project; California Avenue Caltrain/Alma Barrier Connection Improvements; Castilleja-Park-Wilkie, Greer Road and Webster Street Bicycle Boulevards; Safe Routes to School; El Camino Real BRT and Intersection Through-Markings

Rankings:

Safety: *High*	Connectivity: *High*	Special: *High*
Integration: *High*	Inclusion: *High*	Innovation: *Yes*
Investment: *High*	Institutional Partnerships: *High*	

BK-3 Channing Avenue Enhanced Bikeway — $25,000

Project Description: Provide enhanced bicycle markings in the short term between Homer Avenue and Greer Road in conjunction with roadway resurfacing. Longer term, consider potential for separation of bicycles and automobile traffic through design of a two-way cycletrack facility that connects to the Newell Road and Channing/Homer Enhanced Bikeways as part of the "Civic Loop" concept that includes the existing Embarcadero/Caltrain trail, the Castilleja- Park-Wilkie Bicycle Boulevard, and the California Avenue Enhanced Bikeway.

Related Projects/Plans: Street Maintenance Program (Public Works); Enhanced Bikeway/Cycletrack Study; California Avenue, Channing/Homer Avenue, and Newell Road Enhanced Bikeways

Rankings:

Safety: *Medium*	Connectivity: *Medium/Low*	Special: *High*
Integration: *High*	Inclusion: *Medium*	Innovation: *Yes*
Investment: *High*	Institutional Partnerships: *Medium*	

ID	PROJECT NAME	PLANNING LEVEL COST ESTIMATE
BK-4	Lytton Avenue / Alma Street / Sand Hill Road Enhanced Bikeway	$400,000

Project Description: Replacement of substandard bicycle lanes and incorporation of enhanced bicycle markings (super sharrows and lead-in bike lanes/boxes), pedestrian countdown displays, ADA curb ramps, and select curb extensions on Lytton Avenue as part of the upcoming repaving project. Enhance existing Class II bike lanes on Alma Street and Sand Hill Road; consider cycletrack or new Class I trail along the Caltrain/El Camino Park frontage as part of the park improvement project and Stanford Medical Center Expansion mitigation. This enhanced bikeway may be considered as an alternative to the Everett Avenue Across Barrier Connection concept identified in the 2003 *Bicycle Transportation Plan* and Stanford Medical Center Expansion EIS.

Related Projects/Plans: Street Maintenance Program (Public Works); Pedestrian Countdown Signals & Crossings Program; University Avenue Enhanced Bikeway; Everett Avenue Bicycle Boulevard; El Camino Park improvement project; Safe Routes to Transit Program

Rankings:

Safety: *Medium*	Connectivity: *High*	Special: *High*
Integration: *High*	Inclusion: *Medium/High*	Innovation: *Yes*
Investment: *High*	Institutional Partnerships: *High*	

ID	PROJECT NAME	PLANNING LEVEL COST ESTIMATE
BK-5	Homer/Channing Avenue Enhanced Bikeway	$85,000

Project Description: Provide dedicated or enhanced shared bike facility(ies) from the Homer Avenue Underpass to Guinda Street in order to improve connections to the Homer Street underpass and develop the "Civic Loop" bikeways concept. At minimum, provide contra-flow bike lane on Homer Avenue from Alma to High Street, and convert High Street to two-way flow to Forest or Hamilton Avenue (for downtown access). East of Emerson Street this enhanced bikeway corridor can be established through shared lane markings and signage, conversion of a vehicle traffic lane into a Class II bicycle lane, or conversion of either Homer or Channing Avenue into a two-way cycletrack.

Related Projects/Plans: Channing/Newell Road Enhanced Bikeway; Emerson and Ramona Street Class III shared lane markings; Downtown and Professorville Parking Upgrades; private development at Alma Street/Homer Avenue; Enhanced Bikeway/Cycletrack Study

Rankings:

Safety: *Medium*	Connectivity: *High*	Special: *High*
Integration: *Low*	Inclusion: *High*	Innovation: *Yes*
Investment: *High*	Institutional Partnerships: *Medium/High*	

ID	PROJECT NAME	PLANNING LEVEL COST ESTIMATE
BK-6	Citywide Sharrow Markings & Wayfinding Signage	$140,000

Project Description: Mark all existing and proposed Class III facilities that meet minimum pavement condition and placement standards with sharrows. Wayfinding signage improvements at strategic locations within the bikeway network, with emphasis on improving navigability of community centers, parks and school grounds and coordinated signage with adjacent jurisdictions.
As an interim measure, sign and mark appropriate segments of the future bicycle boulevard network streets (Map 6-2 on page 6-11) as Class III Bike Routes. Use California standard Bike Route signs (CAMUTCD Sign D11-1).

Related Projects/Plans: Citywide projects

Rankings:

Safety: *Varies*	Connectivity: *High*	Special: *High*
Integration: *High*	Inclusion: *Medium*	Innovation: *Yes*
Investment: *High*	Institutional Partnerships: *Medium*	

ID	PROJECT NAME	PLANNING LEVEL COST ESTIMATE
BK-7	Meadow St / El Camino Way / Los Robles Enhanced Bikeway	$300,000

Project Description: Potential cycletrack redesign or enhanced striping and signage of existing bike lanes between La Donna and Meadow Street along Los Robles/El Camino Way; Enhanced striping and signage, including intersection through-markings, for existing Meadow Street bike lanes from El Camino Way to Fabian Way.

Related Projects/Plans: Bay to Ridge Trail (revised additional alignment); Shared Lane Marking projects in the Barron Park neighborhood; Park -Wilkie, Maybell, and Ross/Louis Road Bicycle Boulevards; intersection improvements at Hansen Way/El Camino Real, Los Robles Ave/El Camino Real, Alma St/Meadow Drive

Rankings:

Safety: *High/Medium*	Connectivity: *Medium*	Special: *High/Medium*
Integration: *Medium/Low*	Inclusion: *High*	Innovation: *Yes*
Investment: *High/Medium*	Institutional Partnerships: *Medium*	

ID	PROJECT NAME	PLANNING LEVEL COST ESTIMATE
BK-8	Newell Road Enhanced Bikeway	$80,000

Project Description: Provide enhanced bicycle markings in the short term between Homer/Channing Avenues and Jordan Middle School/ California Avenue. Longer-term, or as part of the Newell Road Bridge Crossing Replacement Project or Cycletrack Study, consider further separation and permanent parking prohibitions on one side of the street.

Related Projects/Plans: Channing and California Avenue Enhanced Bikeway; Ross/Louis Road Bicycle Boulevard; Newell Road Bridge Replacement (Public Works); East Palo Alto Highway 101 Barrier Connection

Rankings:

Safety: *Medium*	Connectivity: *Medium/Low*	Special: *Low*
Integration: *High*	Inclusion: *High*	Innovation: *Yes*
Investment: *High*	Institutional Partnerships: *Medium*	

ID	PROJECT NAME	PLANNING LEVEL COST ESTIMATE
BK-9	Fabian Way Enhanced Bikeway	$65,000

Project Description: Potential cycletrack or enhanced striping and signage of existing substandard (time restricted) bike lanes to improve safety and access to Adobe Creek Highway 101 crossing, Charleston bike lanes to San Antonio Road.

Related Projects/Plans: Charleston and Meadow Enhanced Bikeways; Adobe Creek Reach Trail; Adobe Creek Highway 101 Overcrossing

Rankings:

Safety: *Medium*	Connectivity: *Medium*	Special: *Low*
Integration: *Medium/Low*	Inclusion: *High*	Innovation: *Yes*
Investment: *Medium*	Institutional Partnerships: *Medium*	

Intersection Spot Improvements

ID	PROJECT NAME	PLANNING LEVEL COST ESTIMATE
INT-1	El Camino Real Intersection Through-Markings	$125,000

Project Description: Consistent intersection through-markings at major existing east-west crossings of El Camino Real to improve visual connectivity and demarcate the bicycle path of travel across this major arterial barrier. This project, which must be explored with Caltrans, should be coordinated as a single project (if proven feasible) to maximize implementation opportunities. Priority locations include:

- Sand Hill Way Trail/Alma Street Bike Lanes
- Quarry Road to El Camino Park / Palo Alto Transit Center
- PAMF crossing to Stanford U.
- Churchill Road to Stanford trail
- Park Boulevard/Serra Street
- Stanford Avenue - California Avenue
- Los Robles Avenue/El Camino Way
- Maybell Avenue/El Camino Way
- Charleston/Arastradero Road

Related Projects/Plans: Numerous enhanced bikeways; El Camino Real Bus Rapid Transit; El Camino Real Bicycle Lanes Study

Rankings:

Safety: *High*	Connectivity: *High*	Special: *High*
Integration: *High*	Inclusion: *Medium*	Innovation: *Yes*
Investment: *High*	Institutional Partnerships: *High*	

ID	PROJECT NAME	PLANNING LEVEL COST ESTIMATE
INT-2	Charleston Road at Middlefield Road Bicycle Through-Lanes	$25,000

Project Description: (Top Collision Location): Re-channelize Charleston Rd approaches to Middlefield Rd to improve bike lane positioning and reduce right-turn conflicts with vehicles. Consider a right-turn only lane for vehicles with a dedicated through-bike lane, intersection through-markings, and related signal enhancements as needed. May be studied as part of the *Middlefield Road Plan Line Study*.

Related Projects/Plans: Charleston/Arastradero Enhanced Bikeway; *Middlfield Road Plan Line Study*; Safe Routes to School

Rankings:

Safety: *High*	Connectivity: *Medium*	Special: *High*
Integration: *High*	Inclusion: *Medium/High*	Innovation: *Yes*
Investment: *High*	Institutional Partnerships: *Low*	

ID	PROJECT NAME	PLANNING LEVEL COST ESTIMATE
INT-3	High Street at University Avenue	$50,000

Project Description: (Top Collision location); New curb extension(s) and ramps on the west side of High Street; enhanced crosswalk striping and signage.

Related Projects/Plans: University Avenue/Palo Alto Transit Center Undercrossings; Homer Avenue Enhanced Bikeway

Rankings:

Safety: *High*	Connectivity: *Medium/Low*	Special: *High*
Integration: *Low/Medium*	Inclusion: *High*	Innovation: *No*
Investment: *High*	Institutional Partnerships: *Medium*	

ID	PROJECT NAME	PLANNING LEVEL COST ESTIMATE
INT-4	Hanover Street at Page Mill Road	$50,000

Project Description: (Top Collision Location): Reconfigure number and width of vehicular travel lanes to connect existing bike lanes. Include intersection through-markings and striping of two-step turn for access to Hanover Street sidepath.

Related Projects/Plans: Hanover Street Sidepath Upgrades; Safe Routes to School; Page Mill Road Sidepath; Bol Park Path Lighting and Upgrades

Rankings:

Safety: *High*	Connectivity: *High/Medium*	Special: *High*
Integration: *Low*	Inclusion: *High*	Innovation: *Yes*
Investment: *High*	Institutional Partnerships: *Medium*	

ID	PROJECT NAME	PLANNING LEVEL COST ESTIMATE
INT-5	El Camino Real at Embarcadero Road	$900,000

Project Description: (Top Collision Location): Removal of "pork chop" islands and relocation/replacement of signals (as necessary); installation of new curb ramps, enhanced crosswalks, and sidewalk improvements similar to those constructed at Stanford Avenue and El Camino Real. Additional attention should be paid to improving the bicycle connection from the Town & Country Shopping Center to/from the existing Caltrain Class I pathway.

Related Projects/Plans: Stanford University El Camino Real Class I Frontage Trail; Kinglsey Bicycle Boulevard and Spot Improvement at Embarcadero Road/Emerson Street; Churchill Road Enhanced Bikeway and Sidepath

Rankings:

Safety: *High*	Connectivity: *High*	Special: *High*
Integration: *Medium/High*	Inclusion: *Medium*	Innovation: *No*
Investment: *Medium*	Institutional Partnerships: *High*	

ID	PROJECT NAME	PLANNING LEVEL COST ESTIMATE
INT-6	Churchill Avenue at El Camino Real	$100,000

Project Description: Removal of "pork chop" island and relocation of existing signal; new curb ramp, sidewalk improvements, and bicycle signage and striping (bike box, intersection-through markings) to facilitate access to/from Churchill Road and Stanford University path across El Camino Real. Suggested implementation with Project TR-5, although may be a stand-alone project if planned in phases.

Related Projects/Plans: Churchill Road Sidepath (TR-5), El Camino Real Shared Lane Markings; Castilleja-Park-Wilkie Bicycle Boulevard; Southgate Stormwater Improvements and Green Street Project (Public Works); Churchill/Coleridge Enhanced Bikeway

Rankings:

Safety: *High*	Connectivity: *High*	Special: *Medium*
Integration: *Medium/High*	Inclusion: *High*	Innovation: *Yes*
Investment: *High/Medium*	Institutional Partnerships: *High*	

Programs (Infrastructure)

PR-1	Safe Routes to School	$500,000

Project Description: Comprehensive access and safety improvements along the School Commute Corridor Network to be determined through detailed school site assessments and outreach as part of the VTA VERBS grant-funded project. Common elements likely to include: crosswalk striping and signage; flashing beacons and/or hybrid pedestrian signals; trail and bicycle boulevard spot improvements; targeted striping and signage for enhanced bikeway development. Funding targeted from outside grants (SRTS/SR2S), existing CIP Program, and other sources.

Related Projects/Plans: Complements the bicycle boulevard, enhanced bikeway, and trail spot improvement projects; Street Maintenance Program (Public Works)

Rankings:

Safety: *High*	Connectivity: *Varies*	Special: *High*
Integration: *High*	Inclusion: *High*	Innovation: *Varies*
Investment: *High*	Institutional Partnerships: *High*	

PR-2	Bicycle Parking Corral / Rack Installation Program	$75,000

Project Description: Dedicated funding to implement on-street bike corrals, "mini-corrals" along sidewalks, and both standard and custom public art racks at strategic locations and on a request basis. Note: This budget includes up to ten bicycle corral installations and several public art racks that are planned for installation in Downtown for 2011/2012.

Related Projects/Plans: *Comprehensive Plan Transportation Element* Policy T-19; VTA Public Bicycle Share Program

Rankings:

Safety: *N/A*	Connectivity: *N/A*	Special: *High*
Integration: *High*	Inclusion: *N/A*	Innovation: *Yes*
Investment: *High*	Institutional Partnerships: *Medium/High*	

ID	PROJECT NAME	PLANNING LEVEL COST ESTIMATE
PR-3	Pedestrian Countdown Signals & Crossings Program	$50,000 annual

Project Description: Develop a new program for high visibility and/or raised crosswalks, curb bulbs, and pedestrian signals (countdown signals, HAWK, Rapid Flashing Beacons) for non-school areas throughout the City.

Related Projects/Plans: Safe Routes to School; Street Maintenance Program (Public Works); Thermoplastic Striping and Markings Program (Public Works)

Rankings:

Safety: *Varies*	Connectivity: *N/A*	Special: *High*
Integration: *High*	Inclusion: *High*	Innovation: *Yes*
Investment: *High*	Institutional Partnerships: *Medium/Low*	

PR-4	Trail Spot Repair and Maintenance Program	$125,000 annual

Project Description: Increased dedicated funding for spot repairs and striping and markings for existing Class I trails.

Related Projects/Plans: Numerous sidepath and trail extension projects; Geng Road Trail Repaving; Existing Trail Access Improvements; Bol Park Path Lighting & Upgrades

Rankings:

Safety: *Varies*	Connectivity: *Varies*	Special: *High*
Integration: *Medium*	Inclusion: *High*	Innovation: *Varies*
Investment: *Medium/High*	Institutional Partnerships: *Medium/High*	

PR-5	Bicycle Share Program	Initial outlay funded; future expansions TBD

Project Description: VTA-led, multi-city program to include initial outlay of 100 bicycles at 7-12 locations in Palo Alto, focused around the Caltrain stations. This program, which may be folded into existing Transportation Demand Management efforts and staffing, should monitor, promote, and expand the public bike share system assuming initial success.

Related Projects/Plans: Bicycle Parking Program, existing Transportation Demand Management efforts

Rankings:

Safety: *N/A*	Connectivity: *N/A*	Special: *High*
Integration: *High/Medium*	Inclusion: *High*	Innovation: *Yes*
Investment: *High*	Institutional Partnerships: *High*	

PR-6	Safe Routes to Transit Program	$500,000

Project Description: ADA pedestrian access and stop enhancements for Palo Alto shuttle, local VTA (including Route 35), and El Camino Bus Rapid Transit (BRT) services. Funding anticipated to come from outside grant sources.

Related Projects/Plans: Palo Alto Transit Center/University Avenue Undercrossings; Lytton/Alma/Sand Hill Road Enhanced Bikeway; Safe Routes to School; El Camino Bus Rapid Transit; Palo Alto Free Shuttle; *Middlefield Road* and *Embarcadero Road Plan Line Studies*

Rankings:

Safety: *Medium/High*	Connectivity: *Varies*	Special: *Medium*
Integration: *High*	Inclusion: *High*	Innovation: *No*
Investment: *Varies*	Institutional Partnerships: *High*	

ID	PROJECT NAME	PLANNING LEVEL COST ESTIMATE
PR-7	Safe Routes to Parks / Palo Alto Greenways Program	TBD

Project Description: Park access and greenway network development improvements, to be determined through future study and/or coordination with Palo Alto Parks & Recreation.

Related Projects/Plans: *Comprehensive Plan Transportation Element* Policy T-22; Land Use & Design Element Policies L-15 and L-17; Bay Trail and Bay to Ridge Trail; Safe Routes to School; Bicycle Boulevard network; Creek Trail projects

Rankings:

Safety: *N/A*	Connectivity: *Medium/High*	Special: *Medium*
Integration: *High*	Inclusion: *High*	Innovation: *Varies*
Investment: *High/Medium*	Institutional Partnerships: *High*	

PR-7	Trail Barrier Removal Program	TBD

Project Description: Remove rigid bollards and inappropriate fences from entrances to bicycle paths and bridges. If blocking access to vehicles is a priority at a particular location, a mechanism that is not hazardous to bicyclists should be used. The Draft Highway Design Manual, Chapter 1000, Index 1003.1(16) provides guidance and alternatives.

Related Projects/Plans: Trail Spot Repair and Maintenance Program

Rankings:

Safety: *High*	Connectivity: *Low*	Special: *Low*
Integration: *Medium*	Inclusion: *High*	Innovation: *Low*
Investment: *High*	Institutional Partnerships: *Low*	

System Rehabilitation/Maintenance

The following projects are identified as priority bikeway maintenance projects based on the most recent available Pavement Maintenance Management System (PMMS) roadway scores from Public Works. This list does not include existing scheduled paving projects (such as for Alma Street and Oregon Expressway/Oregon Avenue) except where to highlight the need for potential scope enhancements.

R-1	Castilleja Street - Park Boulevard	$100,000

Project Description: Paving repair as part of the development of the Castilleja-Park-Wilkie Bicycle Boulevard. Include signage and wayfinding upgrades in coordination with Project BB-1.

Related Projects/Plans: Street Maintenance Program (Public Works); Southgate Stormwater Improvements and Green Street Project (Public Works); California Avenue Streetscape Project; Charleston/Arastradero Enhanced Bikeway

R-2	Lytton Avenue	$200,000

Project Description: Mill and overlay of Lytton Ave from Alma Street to Florence Avenue. Scheduled for 2012. Project should consider enhancements to existing bikeway and crosswalk striping, additional pedestrian countdown signals where none currently exist; and pedestrian curb extensions where feasible as part of required curb ramp installation. (See BK-4 for more details.)

Related Projects/Plans: Street Maintenance Program (Public Works); Lytton / Alma / Sand Hill Enhanced Bikeway; Pedestrian Countdown Signals & Crossings Program; Safe Routes to Transit

ID	PROJECT NAME	PLANNING LEVEL COST ESTIMATE
R-3	Emerson and Ramona Streets	$200,000 - $1 million

Project Description: At minimum, pavement and signage/marking upgrades along proposed Class III bikeways through downtown between Palo Alto Avenue and the proposed Homer/Channing Enhanced Bikeway with prioritization of mid-block and plaza/park pedestrian connections. With Project F-5, explore signature downtown or "festival street" design that integrates roadway resurfacing activities with parking lot and/or alley upgrades.

Related Projects/Plans: Street Maintenance Program (Public Works); Bike Palo Alto!/Sunday Streets Program (proposed); Homer/Channing and Lytton/Alma/Sand Hill Enhanced Bikeways; California Avenue Streetscape Improvements; *Comprehensive Plan Transportation Element* Policies T-20 through T-23

R-4	Middlefield Road	TBD

Project Description: Enhanced striping/markings, and other pedestrian- and bicycle-oriented improvements, as part of repaving needs near Walter Hayes and Addison Elementary Shools and at the approaches to Oregon Expressway from Midtown and Jordan Middle School.

Related Projects/Plans: Webster Street Bicycle Boulevard; Middlefield Road Shared Lane Markings; *Middlefield Road "Complete Street" Plan Line Study*; Safe Routes to Transit; Safe Routes to School

R-5	Everett, Webster, Kingsley Avenue Bicycle Boulevards	$150,000

Project Description: Significant pavement repair along key stretches of the Everett Bicycle Boulevard, Webster Street Bicycle Boulevard, and Kingsley Bicycle Boulevard.

Related Projects/Plans: Intersection Spot Improvements at Embarcadero Road and Kingsley Avenue, and at Embarcadero Road and Webster Street; Safe Routes to School

Design, Feasibility, and Planning

F-1	Middlefield Road "Complete Street" Plan Line Study	$60,000

Project Description: Develop design alternatives for, and study the feasibility of, a potential lane reduction to provide Class II bike lanes and improve the Middlefield Road/Colorado Avenue area (a top collision location) for improved access to the Midtown Shopping Center district.

Related Projects/Plans: *Comprehensive Plan Transportation Element* Policy T-31 and Land Use & Design Element Program L-40; Proposed Class II Bike Lanes on Middlefield Road; Safe Routes to Transit Program; Amarillo-Moreno Bicycle Boulevard; Charleston Road Enhanced Bikeway

Rankings:

Safety: *High*	Connectivity: *High*	Special: *Medium*
Integration: *High*	Inclusion: *High*	Innovation: *No*
Investment: *High*	Institutional Partnerships: *Medium/Low*	

ID	PROJECT NAME	PLANNING LEVEL COST ESTIMATE
F-2	El Camino Real Bicycle Lanes	$100,000

Project Description: Feasibility and design study of Class II bike lanes from Page Mill Rd to Maybell Ave/Charleston Ave, which is the segment identified for further study/implementation as part of the 2003 El Camino Real Master Schematic Design Study. Analysis would ideally occur under/be coordinated with the upcoming environmental impact assessment for the El Camino Real Bus Rapid Transit (BRT) project.

Related Projects/Plans: VTA El Camino Real Bus Rapid Transit; *Comprehensive Plan Land Use & Design Element* policy L-35 and Program L-33

Rankings:

Safety: *High*	Connectivity: *High*	Special: *High*
Integration: *Medium*	Inclusion: *Medium/Low*	Innovation: *No*
Investment: *Medium/High*	Institutional Partnerships: Medium/*High*	

F-3	Matadero Creek Trail & Crossings Feasibility Study	$150,000

Project Description: Feasibility/design study to determine the preferred alignment, design elements, and potential phasing approach for the development of a Class I trail along the existing Matadero Creek maintenance road (or parallel street segments) from Park Boulevard to E. Bayshore Road.

Related Projects/Plans: Bay to Ridge Trail (additional revised alignment); Matadero Creek Class I Trail; Matadero Creek / Highway 101 Seasonal Undercrossing; Caltrain/Alma Barrier Crossing at Matadero Creek; Safe Routes to Parks/Palo Alto Greenways Program (proposed); Safe Routes to School; *Comprehensive Plan Land Use & Design Element* Program L-41.

Rankings:

Safety: *Medium*	Connectivity: *High*	Special: *High*
Integration: *Medium*	Inclusion: *High*	Innovation: *No*
Investment: *Medium*	Institutional Partnerships: *High*	

F-4	Embarcadero Road Plan Line Study	$60,000

Project Description: Feasibility and design study to identify appropriate bicycle and pedestrian treatments along and across this important residential arterial. Analysis should include the feasibility/warrant establishment of a marked crossing at Webster Street for the Webster Street Bicycle Boulevard, reconfiguration of the Emerson Street/Kingsley Avenue and Coleridge Avenue intersections, and improved connections under Caltrain/Alma Street.

Related Projects/Plans: Embarcadero Road / Walter Hays Sidepath; Coleridge/Churchill Enhanced Bikeways; Webster Street and Kingsley Avenue Bicycle Boulevards; Embarcadero Road Class III Arterial (or Future Study Needed); Safe Routes to School

Rankings:

Safety: *Medium*	Connectivity: *High*	Special: *High*
Integration: *Medium/High*	Inclusion: *Medium/High*	Innovation: *Varies*
Investment: *Medium/High*	Institutional Partnerships: *Medium*	

ID	PROJECT NAME	PLANNING LEVEL COST ESTIMATE
F-5	Emerson/ Ramona Street Festival or Shared Street(s)	$50,000

Project Description: Feasibility/design study of potential shared space and/or festival street along Emerson Street and/or Ramona Street between Lytton Avenue and Hamilton Avenue. Includes assessment of connections and design opportunities of adjacent existing public parking lots, alleyways, and plazas. See Project R-3 for more details.

Related Projects/Plans: Street Maintenance Program (Public Works); Homer Avenue contra-flow bike lane; Homer/Channing Avenue Enhanced Bikeways

Rankings:

Safety: *Medium/Low*	Connectivity: *Medium/High*	Special: *Medium*
Integration: *High*	Inclusion: *High/Medium*	Innovation: *Yes*
Investment: *High*	Institutional Partnerships: *Medium*	

F-6	Bol Park Path / Stanford Research Park Extension	$30,000

Project Description: Feasibility and design analysis of future potential trail connection through the Stanford Research Park between Hansen Way and the existing Bol Park Path near Matadero Avenue.

Related Projects/Plans: Existing Trail Access Improvements; Hansen Way/Portage Avenue Enhanced Bikeway; Bol Park Path Lighting and Upgrades; Matadero-Margarita Bicycle Boulevard

Rankings:

Safety: *Medium/Low*	Connectivity: *High*	Special: *Medium/High*
Integration: *Medium*	Inclusion: *High/Medium*	Innovation: *No*
Investment: *Medium*	Institutional Partnerships: *High*	

F-7	Enhanced Bikeway / Cycletrack Study	$30,000

Project Description: Feasibility/design study to assess potential for cycletrack design in Palo Alto.

Related Projects/Plans: Enhanced Bikeways, including the Homer Avenue contra-flow bike lane; Innovative Bicycle Facility Education and Outreach; numerous sidepath recommendations

Rankings:

Safety: *TBD*	Connectivity: *High*	Special: *Low*
Integration: *Medium*	Inclusion: *High*	Innovation: *Yes*
Investment: *TBD*	Institutional Partnerships: *Low*	

Non-Infrastructure (Education, Encouragement)

E-1	Safe Routes to School	$500,000

Project Description: See VERBS grant program RFP/work plan for more details. Includes comprehensive education, encouragement, and enforcement activities at all PAUSD schools.

Related Projects/Plans: Safe Routes to School (Infrastructure); *Palo Alto Bicycle and Pedestrian Transportation Plan*

Rankings:

Safety: *High*	Connectivity: *N/A*	Special: *High*
Integration: *High*	Inclusion: *High*	Innovation: *Yes*
Investment: *High*	Institutional Partnerships: *High*	

ID	PROJECT NAME	PLANNING LEVEL COST ESTIMATE
E-2	Citywide Traffic Counts and Data Collection	.10 FTE or equivalent

Project Description: Conduct regular pedestrian and bicycle counts at high-use locations and locations identified for additional study. Provide an annual report outlining trends analysis and progress toward *Bicycle and Pedestrian Transportation Plan* benchmarks, where applicable. Citywide counts should be consistent with National Pedestrian and Bicycle Documentation Project guidelines.

Related Projects/Plans: This program is related to all projects and recommendations within this plan and is highly consistent with/critical to policies and programs under *Comprehensive Plan Transportation Element* Goal T-4: An Efficient Roadway Network for All Users

Rankings:

Safety: *N/A*	Connectivity: *N/A*	Special: *High*
Integration: *High*	Inclusion: *N/A*	Innovation: *Varies*
Investment: *High*	Institutional Partnerships: *High/Medium*	

ID	PROJECT NAME	PLANNING LEVEL COST ESTIMATE
E-3	Bike Palo Alto! / Palo Alto Sunday Streets	$50,000 (proposed)

Project Description: "Cyclovia" style program that encourages walking and biking through recurring street closure events and programming during the late spring/summer/early fall.

Related Projects/Plans: Existing Downtown events programming; Safe Routes to School; proposed bicycle boulevards; Stanford University Wellness program (potential)

Rankings:

Safety: *N/A*	Connectivity: *N/A*	Special: *Medium*
Integration: *Medium/High*	Inclusion: *High*	Innovation: *Yes*
Investment: *High*	Institutional Partnerships:: *High*	

ID	PROJECT NAME	PLANNING LEVEL COST ESTIMATE
E-4	City Employee TDM Program	TBD

Project Description: Increase walking/biking (and transit) incentives for City employees and continued support for the annual Bike to Work Day.

Related Projects/Plans: VTA Public Bicycle Share Program; 2007 *Palo Alto Climate Action Plan*; *Comprehensive Plan Transportation Element* Programs T-5 and T-8

Rankings:

Safety: *NA*	Connectivity: *Low*	Special: *High*
Integration: *High*	Inclusion: *High/Medium*	Innovation: *Yes*
Investment: *High*	Institutional Partnerships: *High*	

ID	PROJECT NAME	PLANNING LEVEL COST ESTIMATE
E-5	Adult Bicycle Safety Education and On-Street Skills Training	$30,000

Project Description: Continue and expand opportunities to educate and encourage youth and adults to walk and bicycle safely. Funds to be identified through the Safe Routes to School VERBS grant, existing CIP programs, and on a per project basis. Additional emphasis within this program could be to encourage and promote knowledge of and training for new innovative bicycle facilities and the forthcoming public bicycle share program.

Related Projects/Plans: Safe Routes to School; VTA Public Bicycle Share Program

Rankings:

Safety: *High*	Connectivity: *Low*	Special: *High*
Integration: *Medium*	Inclusion: *High*	Innovation: *No*
Investment: *Medium*	Institutional Partnerships: *Medium*	

7.2.4 Cost Estimate Assumptions

Cost estimates for bikeway facilities are based on cost opinions provided by the City of Palo Alto and experience with neighboring cities. **Table 7-2** provides a detailed summary of the planning-level estimate costs of different bikeway facility types. **Table 7-3** lists typical costs of additional bicycle and pedestrian facilities and amenities.

Table 7-2. Cost Estimate Assumptions for Bikeway Facilities

Item	Quantity	Units	Unit Cost	Total
Class I Shared Use Path - 10' paved, 2' shoulders				
Wayfinding	4	EA	$300	$1,200
Clear and Grub	73,920	SF	$1.00	$73,920
Asphalt Concrete Pavement	52,800	SF	$8.00	$422,400
Decomposed Granite Shoulders	21,120	SF	$5.00	$105,600
Striping*	15,840	LF	$2.50	$39,600
Total Cost Per Typical Mile	$642,720			
Class 2 Bike Lanes				
Bike Lane Sign/Wayfinding	10	EA	$300	$3,000
Striping Removal	10,560	LF	$1.25	$13,200
Striping and Stenciling	10,560	LF	$2.50	$26,400
Total Cost Per Typical Mile	$42,600			
Enhanced Bike Lanes				
Bike Lane Sign/Wayfinding	10	EA	$300	$3,000
Striping Removal	10,560	LF	$1.25	$13,200
Striping and Stenciling	10,560	LF	$2.50	$26,400
Green bike lane (thermoplastic)	5,000	SF	$7.00	$35,000
Intersection markings	150	EA	$250.00	$37,500
Total Cost Per Typical Mile	$115,100			
Class 3 Bike Route - Urban - Per Mile				
Bike Route Sign/Wayfinding†	10	EA	$300	$3,000
Shared Lane Marking‡	20	EA	$250	$5,000
Total Cost Per Typical Mile	$8,000			
Bicycle Boulevard§				
Pavement Markings	20	EA	$100.00	$2,000
Signing**	10	EA	$300.00	$3,000
Total Cost Per Typical Mile	$5,000 + costs for traffic calming, crossing treatments, and other improvements			

* Includes center stripe and striping along path edges.
† Assumes five signs per mile in each direction.
‡ Assumes shared lane marking are placed every 265 feet.
§ Treatments will vary based on operational characteristics along the route; cost for planning purposes only.
** Assumes ten signs per mile in each direction.

Table 7-3. Typical Cost Estimates for Bicycle and Pedestrian Facilities and Amenities

Item	Unit	Planning-Level Cost Estimate
Intersections		
Pedestrian Scramble Signal	EA	$50,000.00
Hybrid Pedestrian Signal Crossing (HAWK)	EA	$50.000
Pedestrian Countdown Signal Heads	EA	$800.00
High Visibility Crosswalk	WA	$1,200.00
Pedestrian Refuge Island	EA	$25,000.00
Rectangular rapid flashing beacons	EA	$12,500.00
Sidewalks		
Sidewalk, Widening (includes curb and gutter)	SF	$25.00
Curb Ramps (perpendicular)	EA, per corner	$5,000.00
Traffic Calming		
Bulb Out	EA	$15,000 - $25,000
Chicane	EA	$15,000 - $35,000
Speed Bump	EA	$3,000 - $4,500
Traffic Calming Circle	EA	$8,000 - $12,000
Bicycle Paths and Lanes		
Bicycle Loop Detector	EA	$1,000.00
Colored bike lane, paint	SF	$2.00
Colored bike lane, thermoplastic	SF	$5.00 to $7.00
Bike Box, no coloration	EA	$1,900.00
Bike Box, thermoplastic (10' by 12')	EA	$2,300.00
Bike Box, thermoplastic (16' by 14' with lead-in and egress)	EA	$5,600.00

7.3 Key Potential Funding Sources

The long list of improvement concepts in **Chapter 6** and priority projects described in this chapter will require substantial funding to complete, and represents a commitment of $7.5 - $10 million in local funding over the next five to ten years (or more). However, the prioritization outlined in the previous section provides a strategy for Palo Alto to begin implementing projects in the Plan that will provide the most benefit to the community. In addition, a variety of funding sources can be leveraged with existing funding in order to reduce the City's burden. Key sources are addressed below, with a complete list provided in **Appendix F**.

7.3.1 Private Development Impact Fees and Mitigation

The **Palo Alto Municipal Code** regulates the standard of developments and use of city streets and supports non-motorized travel and improvements. Recent best practice revisions to the code include Transportation Impact Fees for mitigating congestion in certain areas, strong requirements for bicycle parking with new projects, and urban design guidelines that foster pedestrian-friendly streetscapes.

The largest and most obvious source related to private development is the recently approved **Stanford Medical Center expansion**, which includes a mitigation and public benefit package that will provide valuable funding for many new projects. The traffic mitigation and public benefits approved in May 2011 identifies $5.5 million in direct pedestrian and bicycle-related improvements, and additional funding for non-motorized transportation may be available through a separate Sustainability Fund created as part of this package.

7.3.2 Palo Alto CIP and Regional Funding

Table 7-4 summarizes the analysis and approach for the three principal funding sources for pedestrian, bicycle, and other related transportation improvements. It shows that direct, identified funding and need for bicycle and pedestrian projects is nearly $65 million under current planning (2011-2035), which could increase by approximately 40% if "routine accommodation" and coordination opportunities are successfully leveraged. City staff will continue to refine and confirm these funding sources to help constrain and focus project development priorities.

Table 7-4: Palo Alto Bicycle and Pedestrian Summary of Potential Funding

	CIP 2011-2015	Stanford Hospital Expansion 2011-2020	Regional Projects and Grants (VTP 2035)	Total
Direct Funding (assumes 100%)	$13,450,000	$5,550,000	$45,700,000	$64,700,000
Partial and Accommodation (assumes 10% share of related projects and programs)	$2,237,300	$1,613,000	$1,960,000.0	$5,810,300
Potential Coordination	$1,192,480 (assumes 1% value share of utility and other non-direct capital investment within City right-of-way)		$14,600,000.00 (5% leverage assumed from El Camino Real BRT and Palo Alto Transit Center programmed funds)	$15,792,480
Total	$16,879,780	$7,163,000	$47,660,000	$86,302,780

7.3.3 State, Federal, and Regional Grants and Partnerships

Federal FHWA/HUD Partnership

Founded in 2009, the Partnership for Sustainable Communities is a joint project of the Environmental Protection Agency (EPA), the U.S. Department of Housing and Urban Development (HUD), and the U.S. Department of Transportation (USDOT). The partnership aims to "improve access to affordable housing, more transportation options, and lower transportation costs while protecting the environment in communities nationwide." The Partnership is based on five Livability Principles, one of which explicitly addresses the need for bicycle and pedestrian infrastructure ("Provide more transportation choices: Develop safe, reliable, and economical transportation choices to decrease household transportation costs, reduce our nation's dependence on foreign oil, improve air quality, reduce greenhouse gas emissions, and promote public health").

The Partnership is not a formal agency with a regular annual grant program. Nevertheless, it is an important effort that has already led to some new grant opportunities (including both TIGER I and TIGER II grants). The City of Palo Alto should track Partnership communications and be prepared to respond proactively to announcements of new grant programs. Initiatives that speak to multiple livability goals (such as partnerships with Caltrain or with affordable housing groups) are more likely to score well than initiatives that are narrowly limited in scope to bicycle and pedestrian efforts.

More information: http://www.epa.gov/smartgrowth/partnership/

Safe Routes to School

Caltrans administers funding for Safe Routes to School projects through two separate and distinct programs: the state-legislated Program (SR2S) and the federally-legislated Program (SRTS). Both programs competitively award reimbursement grants with the goal of increasing the number of children who walk or bicycle to school.

California Safe Routes to School Program expires December 21, 2012, requires a 10 percent local match, is eligible to cities and counties, and targets children in grades K-12. The fund is primarily for construction, but applicants may use up to 10 percent of the program funds for education, encouragement, enforcement, and evaluation activities. Cycle 9 provided $24.25 million for FY 10/11.

The Federal Safe Routes to School Program was extended through December 2010, and may be included in the future federal transportation bill. Cities, counties, school districts, non-profits, and tribal organizations are eligible for the 100 percent reimbursable funds that target children in grades K-8. Applicants may use funds for construction or for education, encouragement, enforcement, and evaluation activities. Construction must be within two miles of a grade school or middle school. Cycle 2 provided $46 million for FY 08/09 and 09/10.

Online resource: http://www.dot.ca.gov/hq/LocalPrograms/saferoutes/saferoutes.htm

Safe Routes to Transit

Approved in March 2004, Regional Measure 2 (RM2) raised the toll on seven state-owned Bay Area bridges by one dollar for 20 years. This fee increase funds various operational improvements and capital projects that reduce congestion or improve travel in the toll bridge corridors.

MTC allocates the $20 million of RM2 funding to the Safe Routes to Transit Program, which provides competitive grant funding for capital and planning projects that improve bicycle access to transit facilities. Eligible projects must reduce congestion on one or more of the Bay Area's toll bridges. Transform and the East Bay Bicycle Coalition administer SR2T funding. Awarded in five $4 million grant cycles, funding has been awarded in 2005 and 2011. Future funding cycles will be in 2013.

Online resource: http://www.transcoalition.org/c/bikeped/bikeped_saferoutes.html

Bicycle Transportation Account

The Bicycle Transportation Account (BTA) provides state funding for local projects that improve the safety and convenience of bicycling for transportation. Because of its focus on transportation, BTA projects must serve a transportation purpose. Funds are available for both planning and construction. Caltrans administers BTA funds and requires eligible cities and counties to have adopted a bicycle transportation plan. This BPTP meets BTA requirements for state funding. City bicycle transportation plans must be approved by the local Metropolitan Transportation Commission (MTC) prior to Caltrans approval. Out of $7.2 million available statewide, the maximum amount available for individual projects is $1.2 million.

Online resource: www.dot.ca.gov/hq/LocalPrograms/bta/btawebPage.htm

7.3.4 Bicycle Facilities Program

The Bay Area Air Quality Management District (BAAQMD) Bicycle Facility Program (BFP) provides grant funding to reduce motor vehicle emissions through the implementation of new bikeways and bicycle parking facilities in the Bay Area. The TFCA program funds the BFP. Projects must cost between $10,000 and $120,000 and the applicant must have secured 50 percent in matching funds. The BAAQMD typically releases a call for projects in June or July, requiring an application submittal in September and announcing project awards in November.

Online resource: http://www.baaqmd.gov/Divisions/Strategic-Incentives/Bicycle-Facility-Program.aspx

7.4 CEQA Environmental Analysis

This BPTP has completed an Initial Study/Negative Declaration (IS/ND) environmental assessment. All projects requiring lane reductions and off-street facilities within this Plan will require a separate review under Section 15152 of the California Environmental Quality Act (CEQA) Guidelines. Parking removal does not trigger CEQA review. Future projects or activities in Palo Alto will be evaluated for consistency with the IS/ND to determine if they would have effects not examined in this document. If individual projects or activities in Palo Alto would have no effects beyond those examined in this IS/ND, no further CEQA compliance would be required. The final plan report will include the IS/ND as an appendix, which will likely determine that a Mitigated Negative Declaration is appropriate for the proposed BPTP.

Appendix A. Design Guidelines and Standards

This section presents innovative bicycle and pedestrian facilities that build upon and improve Palo Alto's existing non-motorized network. All of the facilities presented have been implemented in the United States. However, not all are approved for use by Caltrans or the Association of American State Highway Transportation Officials (AASHTO).

Many of the bicycle facilities are from the National Association of City Transportation Officials (NACTO) Urban Bikeways Design Guide, which has developed design guidelines for innovative bicycle facilities and is the most up-to-date source for information and guidance for on-street bicycle facilities. The Design Guide is meant to complement, not supersede, guidance from AASHTO and MUTCD, and was recently endorsed by the U.S. Secretary of Transportation. NACTO is an association of major urban cities, who among other initiatives, have banded together to form Cities for Cycling. Local guidelines for bicycle and pedestrian facilities include the Valley Transportation Authority (VTA) bicycle and pedestrian guidelines.

It should be noted that some treatments may be unsuitable for locations in Palo Alto, particularly treatments that were designed for large urban environments with few driveways or unsignalized intersections. Established facility types are recommended where feasible and appropriate to the roadway conditions, while innovation may be considered when such treatments may be safer and more effective than standard solutions. Palo Alto should collect data to identify whether innovative facilities are appropriate in the suburban setting. Before and after data about motor vehicle and bicyclist volume and roadway position, crashes, compliance, conflicts, delay, or other variables should be collected as appropriate on experimental treatments.

The design guidelines are a toolbox for implementing key plan recommendations and for providing innovative, attractive, economical, and high-quality bicycle and pedestrian facilities. Each design sheet discusses an innovative facility, presenting the most currently available design standards, recommended facility applications, and examples of implementation. Where possible, these descriptions include a discussion of issues and dimensions specific to Palo Alto conditions, as well as references to the VTA *Pedestrian Technical Guidelines* (2003) and the *County Expressway Bicycle Design Guidelines* (2003). When implementing new facility designs, the City should work with engineers, the Palo Alto Bicycle Advisory Committee (PABAC), and other stakeholders, consider trial and pilot projects, and provide information to the public about expected use of and behavior around new facilities.

Bikeway Facility Classifications

Description

Bikeways provide access for bicyclists. Travel area widths for bicycles are measured exclusive of gutters, because the longitudinal joint may not always be smooth, and may be difficult to ride along, and the gutter is not a suitable surface for bicycle travel.

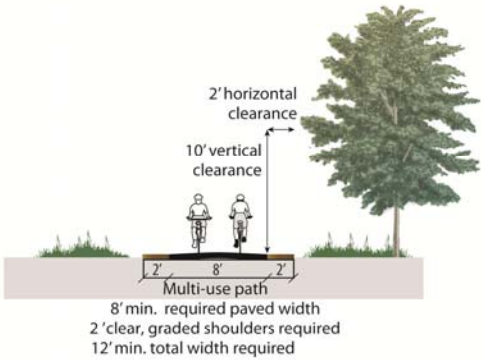
Application

- 6' bike lanes preferred (Santa Clara County guidelines)

Design

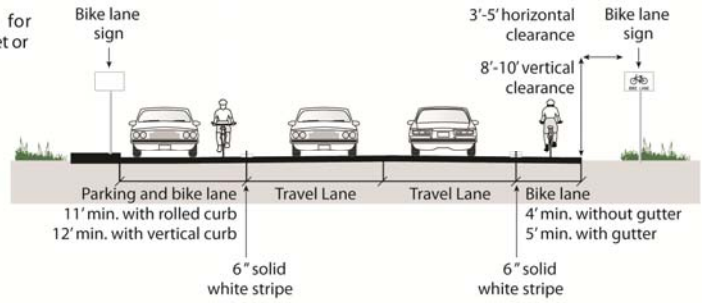
CLASS I
Multi-Use Path

Provides a completely separated right of way for the exclusive use of bicycles and pedestrians with crossflow minimized.



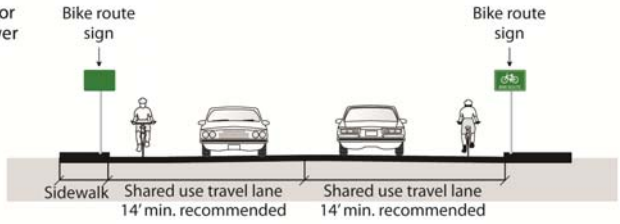
CLASS II
Bike Lane

Provides a striped lane for one-way bike travel on a street or highway.



CLASS III
Bike Route
Signed Shared Roadway

Provides for shared use with pedestrian or motor vehicle traffic, typically on lower volume roadways.



Design References

Santa Clara County, *County Expressway Bicycle Accommodation Guidelines* (2003)
Caltrans Highway Design Manual, Chapter 1000
CA-MUTCD

Sharrows

Description

Shared lane markings, or "sharrows," help position and guide bicyclists on shared roadways, and remind/alert motorists to the presence of bicyclists and their right of travel. Sharrows are commonly used to delineate bikeways where Class II bike lanes are not feasible and/or along lower volume roadways where extensive striping and signage are inappropriate. Innovative use of sharrows include angled chevrons for wayfinding at decision-points, a combined uphill bike lane/downhill sharrow for steep inclines, and "super sharrows" that include an underlying green paint or slurry treatment to emphasize the bicyclist right-of-way on busy commercial streets. Super sharrows can be considered an enhanced bikeway option in some circumstances.

Application

- Sharrows should not be placed on roadways with a speed limit at or above 40 mph.
- Sharrows should be placed 13 feet from the curb where parallel parking exists (12 feet minimum can be acceptable pending detailed consideration by the City and PABAC).
- Sharrows may be placed in the middle of the outside travel lane if there are two or more travel lanes per direction, or if the outside lane is less than 14 feet, where parking turnover is high or where bicyclists may need positioning guidance.
- Sharrows should be installed before and after intersections, with additional markings spaced every 150 to 500 ft along school commute routes or for more complex or longer stretches (as determined by city traffic engineer).
- Sharrows may also be installed through key intersections to delineate the path of travel and increase the visual continuity and conspicuity of the bicycle facility
- Sharrows may be combined with other treatments such as green paint or slurry treatments (also known as "super sharrows").

Design References

California MUTCD, Section 9C.103 (2010) specifies that sharrows only be used on roadways with parallel parking, but the forthcoming 2011 edition will give local engineers greater discretion with sharrow placement on roadways with or without parking.

FHWA Publication No.: FHWA-HRT-10-044: Evaluation of Shared Lane Markings.

VTA Bicycle Technical Guidelines

Materials Cost Estimate

$275 per stencil

Design

Sharrows delineate bicyclists' path of travel away from potential open car doors and improve wayfinding.

This sharrow in Long Beach, CA uses an underlying green color treatment to help improve visibility and alert motorists

Enhanced Bikeway Option - Buffered Bike Lanes

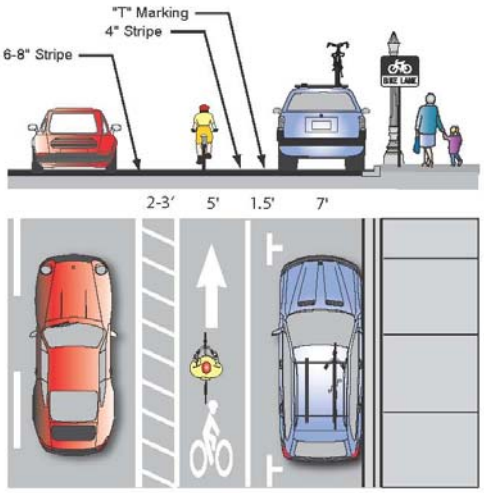
Description

A buffered bike lane is further separated from a travel or parking lane by a striped "shy zone." The buffered zone can be demarcated with hatched striping and/or soft hit posts.

Application

- Buffers may be installed between bike lanes and travel lanes or adjacent to parking lanes to provide additional shy distance from vehicles.
- Where extra buffer room is available and it is necessary to keep motor vehicles out of the bikeway, soft hit posts may be used to create additional separation, provided design minimizes potential hazard to bicyclists and drivers. The Palo Alto Bicycle Advisory Committee (PABAC) should review potential installation locations.
- The buffer shall be marked with two solid white lines with diagonal hatching. Double white lines indicate lanes where crossing is discouraged, though not prohibited. For clarity, consider dashing the inside buffer boundary where cars are expected to cross.
- Not appropriate for roadways with a high density of vehicle curb cuts/driveways.
- May be combined with time-restricted bike lanes and colored bikeway treatments.

Design



Design References

VTA Bicycle Technical Guidelines recommend eight-foot wide bike lanes on roadways with posted speeds of 45 mph or more (buffered bike lanes are not referenced).

National Association of City Transportation Officials (NACTO) Urban Bikeway Design Guide: http://nacto.org/cities-for-cycling/design-guide/

Photo

Fairfax, CA: Buffered bike lanes installed as part of a Safe Routes to School project on Sir Francis Drake Blvd (arterial).

Materials Cost Estimate

Varies depending on existing roadway cross section; comparable to bicycle lane costs where existing lanes can be narrowed

Enhanced Bikeway Option - Cycletracks

Description

Cycletracks combine the user experience of a separated path with the on-street infrastructure of a conventional bike lane. They are separated from vehicle traffic lanes, parking lanes, and sidewalks to provide space exclusively for bicyclists. When on-street parking is provided, cycletracks are located on the outside of the parking lane and should include three feet of separation. Cycletracks can be either one-way or two-way, on one or both sides of a street, and are separated from vehicles and pedestrians by pavement markings or coloring, bollards, curbs/medians, or a combination of these elements.

Intersection conflicts should be addressed by providing adequate signage, pavement markings, and visibility of bicyclists in the facility.

Application

- Most appropriate on roadways with high bicycle demand, infrequent cross streets, and infrequent/low volume curb cuts.
- On streets where conflicts at intersections can be effectively mitigated using parking lane setbacks, bicycle markings through the intersection, and other signalized intersection treatments.
- Reduces risk of 'dooring' compared to a bike lane, and is attractive to a wider variety of bicyclists of all ages and abilities.
- Low implementation cost when making use of existing pavement and drainage and using parking lane or other barrier for protection from traffic.
- Ten-foot minimum for two-way facility, with 12 feet desired.
- On one-way streets, reduces out-of-direction travel by providing contra-flow movement.

Design

A "DO NOT ENTER" sign (MUTCD R5-1) with "EXCEPT BIKES" plaque shall be posted along the facility to only permit use by bicycles.

If configured on a one-way street, a "ONE WAY" sign (MUTCD R6-1, R6-2) with "EXCEPT BIKES" plaque shall be posted along the facility and at intersecting streets, alleys, and driveways informing motorists to expect two-way traffic.

Design References

National Association of City Transportation Officials (NACTO) Bikeway Design Guide

League of American Bicyclists (LAB) Sidepath Suitability Index: www.bikelib.org/roads/blos/sidepathform.htm

Materials Cost

Varies dramatically by available right of way width and design used. Can be comparable to buffered bike lane costs per mile when existing signals and pavement are utilized.

Cycle Tracks at Driveways and Minor Street Crossings

Description

At driveways and crossings of minor streets, the majority of traffic will continue through intersections, while a small number of automobiles will cross the cycletrack. At these locations, bicyclist visibility is important, as a buffer of parked cars or vegetation can reduce the visibility of a bicyclist traveling in the cycletrack. Biyclists should not be expected to stop at these minor intersections if the major street does not stop, and markings and signage should be used to indicate that drivers should watch for bicyclists.

Access management should be used to reduce the number of crossings of driveways on a cycle track.

Application

- If raised, maintain the height of the cycletrack, requiring automobiles to cross over.
- Remove parking 16 feet prior to the intersection.
- Use colored pavement markings and/or shared lane markings through the conflict area.
- Place warning signage to identify the crossing.

Design References

National Association of City Transportation Officials (NACTO) Bikeway Design Guide

CROW Design Manual for Bicycle Traffic.

Alta Planning + Design. (2009). Cycle Tracks: Lessons Learned.

Design

Colored pavement informs bicyclists and drivers of a potential conflict area.

Bicycle markings at a driveway crossing

Materials Cost

Varies dramatically by available right of way width and design used. Can be comparable to buffered bike lane costs per mile when existing signals and pavement are utilized.

Cycle Tracks at Driveways and Minor Street Crossings

Description

- Stripe stop line, remove parking, and consider dropping cycle track to a bike lane 16 feet back from the intersection for visibility.
- Use bike box treatments to move bicyclists in front of traffic and to facilitate right turns.
- Use colored pavement markings and/or shared lane markings through the conflict area.
- Provide left-turning movements with 'Copenhagen lefts' (a two-stage crossing, described below).

Application

The "Copenhagen Left" facilitates safe left-turn movements from cycletracks. Bicyclists approaching an intersection can make a right into the intersecting street from the cycle track, to position themselves in front of cars. Bicyclists can go straight across the road they were on during next signal phase. All movements in this process are guided by separate traffic signals – motorists are not allowed to make right turns on red signals. In addition, motorists have an exclusive left-turn phase, in order to make their movements distinct from the bicyclists'.

To increase visibility of bicyclists, several treatments can be applied at intersections:

- **Protected Phases at Signals**. With this treatment, left and right turning movements are separated from conflicting through movements. The use of a bicycle signal head is required in this treatment to ensure all users know which signals to follow. Demand-only bicycle signals can be implemented to reduce vehicle delay to prevent an empty signal phase from regularly occurring. If heavy bicyclist left turns are expected, these movements should be given its own signal phase and push button.

Design

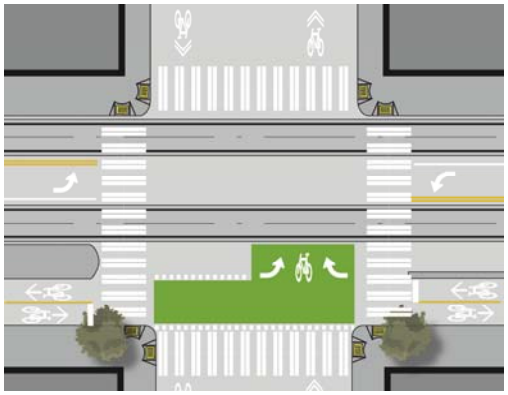


Diagram of a 'Copenhagen Left' at an intersection of a two-way cycle track and street with shared lane markings.

Bike box positions bicyclists to make a left turn from a cycle track in Portland, OR.

- **Advanced Signal Phases**. Signalization utilizing a bicycle signal head can also be set to provide cycletrack users a green phase in advance of vehicle phases. The amount of time will depend on the width of the intersection.
- **Unsignalized Treatments** . At non-signalized intersections the same conflicts exist. Warning signs, special markings and the removal of on-street parking (if present) in advance of the intersection can all raise visibility and awareness for bicyclists.

Design References

National Association of City Transportation Officials (NACTO) Bikeway Design Guide

Materials Cost

Varies dramatically by available right of way width and design used. Can be comparable to buffered bike lane costs per mile when existing signals and pavement are utilized.

Cycletracks Continued

Additional Disscussion

Separation

Cycletracks can be separated by a barrier or by on-street parking. Cycletracks using barrier separation are typically at-grade. Openings in the barrier or curb are needed at driveways or other access points. The barrier should be dropped at intersections to allow vehicle crossing.

When on-street parking is present, it should separate the cycletrack from the roadway, the cycletrack should be placed with a two-foot buffer between parking and the cycletrack to minimize the hazard of opening car doors to passing bicyclists.

Placement

Cycletracks should be placed along slower speed urban/suburban streets with long blocks and few driveway or midblock access points for vehicles. Cycletracks located on one-way streets will have fewer potential conflicts than those on two-way streets. A two-way cycletrack is desirable when there are more destinations on one side of a street or if the cycletrack will be connecting to a shared use path or other bicycle facility on one side of the street.

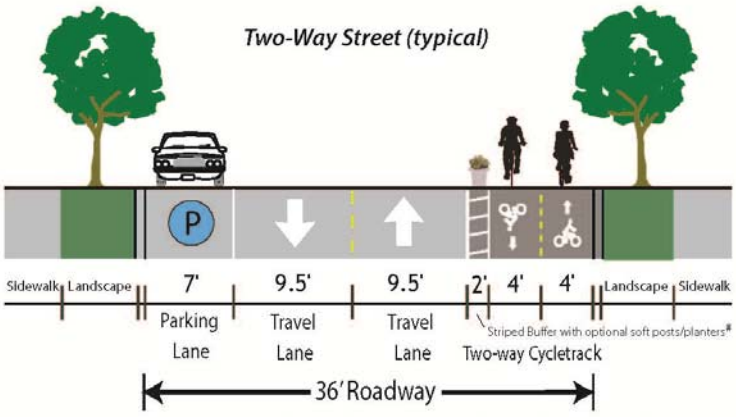
Cycletracks should only be constructed along corridors with adequate right-of-way. Sidewalks or other pedestrian facilities should not be narrowed to accommodate the cycletrack as pedestrians will likely walk on the cycletrack if sidewalk capacity is reduced. Visual and physical cues should be present that make it easy to understand where bicyclists and pedestrians should be moving.

Access Management.

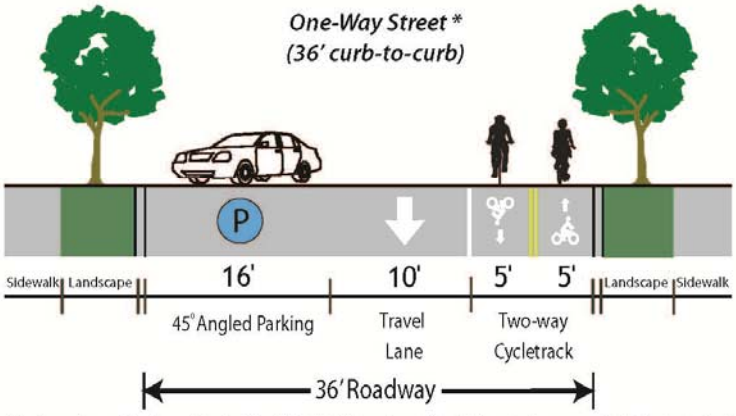
The reduction in the number of potential conflict points can also benefit a cycletrack corridor. Medians, driveway consolidations, or restricted movements reduce the potential for conflict.

Retrofitting Streets for Two-Way Cycletracks

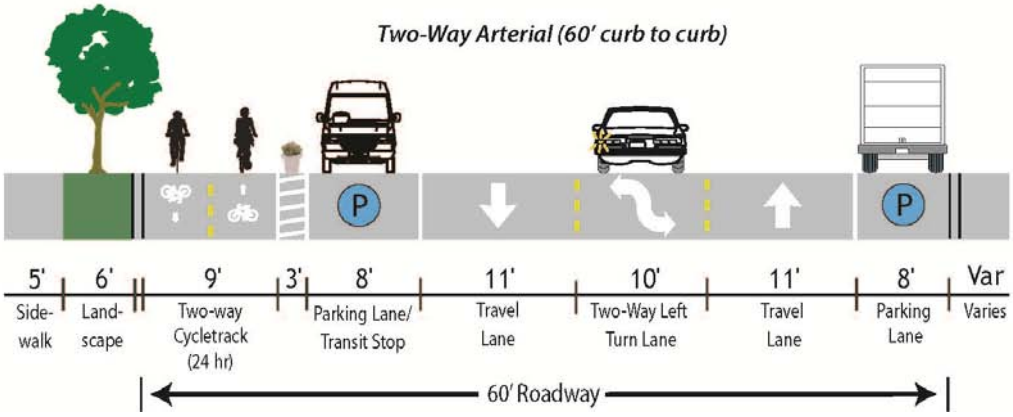
Sample Cross-Sections (Proposed)



If implemented as part of a repaving project, consider a 2" rolled curb/raised cycletrack or different surface treatment/color for added separation



* Proposed design can be considered a combination Class II left-side bike lane/ contraflow bike lane for the purpose of sufficient angled parking stall width



Enhanced Bikeway Option - Floating Bicycle Lanes

Description

Floating bicycle lanes are an on-street bicycle facility that accommodates peak hour traffic with an additional traffic lane by restricting parking and permitting bicyclists to use the parking lane. Floating bike lanes require an additional stripe within the parking lane to delineate the peak hour bike lane. Signage is needed to display restricted parking times and when bicyclists may use the peak hour lane delineation.

Application

Off-peak traffic does not warrant outside travel lane.

Peak hour parking demand does not warrant parking lane.

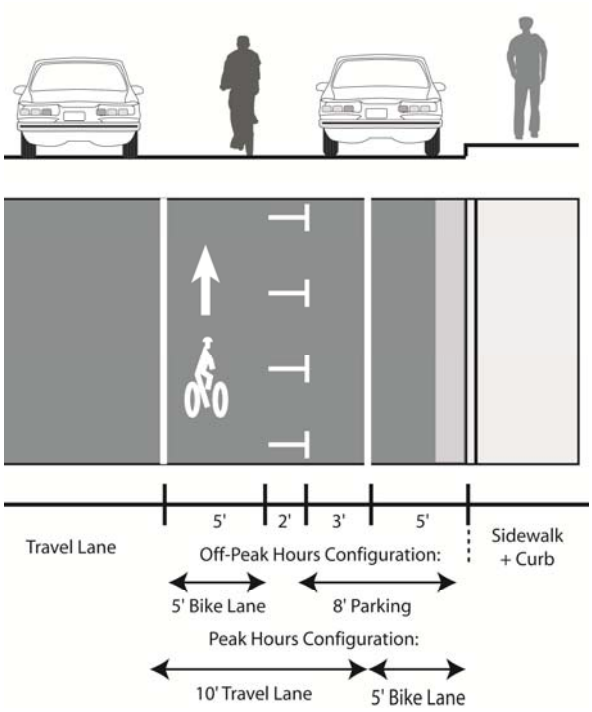
Design Reference

City of San Francisco, CA

Materials Cost Estimate

$25,000-$35,000 per mile (if retrofitting street as separate project)

Design



Example

San Francisco has installed floating bike lanes on The Embarcadero.

Enhanced Bikeway Option - Restricted Hours Bicycle Lanes

Description

California Vehicle Code permits automobile parking within a Class II bicycle lane unless otherwise signed. CAMUTD defines a Class II bicycle lane as permitting automobile parking. Restricted hours bike lanes restrict parking within bike lanes at designated hours. This design is different from floating bike lanes in that bicyclists lose the bike lane to parking during designated hours and must share the travel lane with motorists. Palo Alto has installed restricted hours bike lanes on several streets, including Channing Ave, Newell Rd, N California Ave, Loma Verde Ave, and Fabian Way.

Application

Existing streets with time-restricted bike lanes on (primarily) residential streets.

For 36-foot curb-to-curb roadways conditions, time-restricted lane should be five feet wide to allow for a 12-foot shared parking/bike lane on the opposite side and two 9.5-foot travel lanes.

Can be upgraded to full-time bike lanes where weekend bicycle connections are a high priority and/or where evening/weekend parking utilization rates are low.

Signage

Design References

CAMUTD Section 9C.04

City of Palo Alto 2003 Bicycle Transportation Plan

Photo

Palo Alto prohibits parking within the Loma Verde bike lane from 7 am to 7 pm on weekdays.

Materials Cost Estimate

Varies depending on existing conditions.

Enhanced Bikeway Option -Contaflow Bike Lanes

Description

A contraflow bike lane provides a dedicated bicycle lane against one-way traffic flow.

Application

One-way roadways where bicycle traffic is prioritized over on-street parking and automobile traffic.

Bicycle demand warrants increased bicyclist accessibility and connectivity.

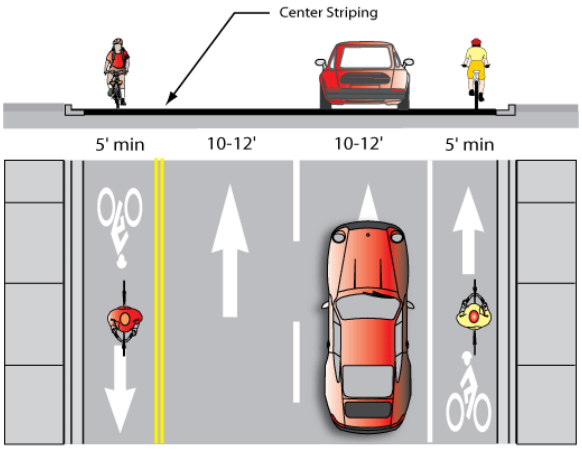
Contraflow bike lanes should be separated by a double yellow line at minumum.

Pavement markings and signage should indicate contraflow bike lane is exclusively for bicycle use.

Consider colorizing bike lane and/or physical separation between bike and travel lanes, such as soft hit posts.

Signalized intersections must be modified to accommodate bicyclists.

Design



Design Reference

CROW Design Manual (Netherlands) recommends five- to 6.5-foot bike lane widths

NACTO Bikeway Design Guide

Example

The City of San Francisco installed a contra flow bike lane on Lyell St. Photo Credit: Eric Fischer

Materials Cost Estimate

Varies by roadway (grinding and adding stripes is relatively low cost, but higher costs may be incurred for additional traffic control)

Enhanced Bikeway Option - Green Bike Lanes through Conflict Areas

Description

Colored bike lanes alert roadway users to the presence of bicyclists and are clear in assigning right-of-way to bicyclists. Motorists are expected to yield to bicyclists in these areas.

Two materials are typically used to color bike lanes. Painting bike lanes is the least expensive option but is slippery when wet. Colored and textured sheets of acrylic epoxy coating is moderate in cost and durability and maintains grip when wet. Colored asphalt is most durable and maintains grip when wet at the highest cost.

Application

Apply color selectively to highlight potential conflict zones or mark all facilities exclusively for bicycle use in high volume traffic situations.

May be used in combination with physical separation devices, e.g. hatched buffers, soft hit posts, where motorists do not merge over bike lane.

Normal white bike lane lines shall be provided along the edges of the colored lane to provide consistency with other facilities and to enhance nighttime visibility.

Color may be solid or dashed through potential conflict zones, including intersections.

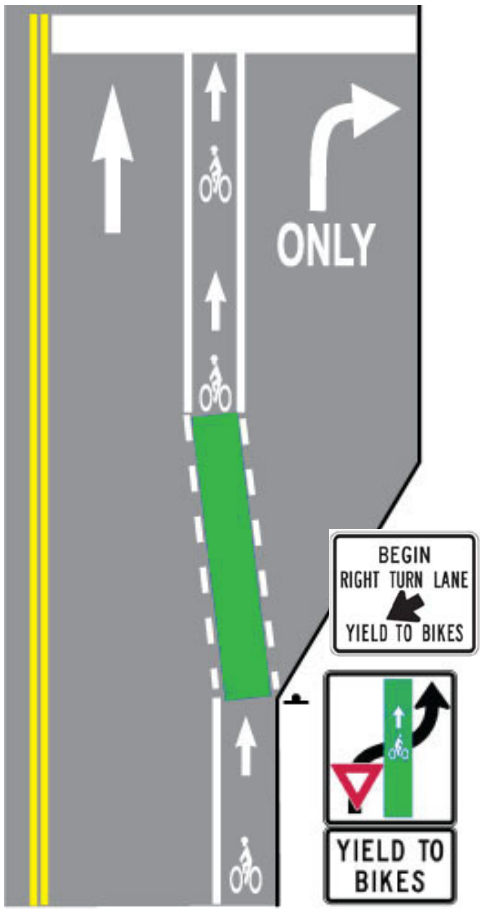
Green color may also be used in conjunction with other markings, such as the sharrow, to further identify and contrast bicycle facilities.

Design References

NACTO Urban Bikeway Design Guide

FHA April 2011 Memorandum – MUTCD Interim Approval for Optional Use of Green Colored Pavement for Bike Lanes (1A-14)

Design



Colorized bike lanes can be used in high-conflict areas, where motorists cross bicyclists' path. The City of Portland uses a graphic sign in advance of the lane, while MUTCD standard sign displays text.

Material Cost Estimate

Varies dramatically by materials used, i.e. thermoplastic, acrylic epoxy or colorized asphalt

Enhanced Bikeway Option - Intersection Crossing Markings

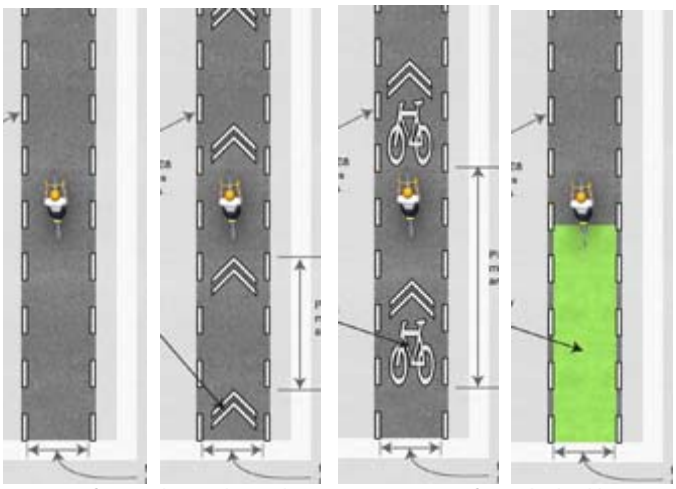
Description

Bicycle pavement markings delineate bicyclists' path of travel through intersections. Cities throughout the United States and Canada have used a variety of intersection crossing markings. The National Association of City Transportation Officials (NACTO) is a coalition of cities working to standardize innovative bicycle treatments not yet approved by the Federal MUTCD and AASHTO, including intersection crossing markings. NACTO developed the following design guidelines based on international best practices. In California, approvals are not required to use these markings on local roadways.

Intersection markings increase awareness for both bicyclists and motorists of potential conflicts and reinforce that bicyclists have priority over turning vehicles. They can facilitate the use of complicated intersections and delineate where and how bicyclists should cross. Indicating intersection crossings with dashed lines results in lower maintenance costs then colored markings.

Design Example

Dashed lines and chevrons delineate bicyclist path of travel through an intersection on the 9th Avenue cycletrack in New York City.



Options for markings through intersections vary from dashed lines to shared lane markings, or can use green paint. (Source: NACTO)

NACTO Design Guidelines

Required

Dotted lines shall bind the crossing space.

Crossing striping shall be at least six inches adjacent to motor vehicle travel lanes.

Recommended

Dashed lines should be two-foot lines spaced two to six feet apart.

Striping should be white, reflective and non-skid.

Crossing lane width should match the leading bicycle lane.

Optional

Chevrons, shared lane markings, or colored bike lanes may be used to increase visibility within conflict areas or across entire intersections.

Application

Wide, complex intersections.

Locations where motorists commonly encroach on bicyclists' space.

Mark across driveways or on-ramps with prevailing motorist speeds low enough for yielding to bicyclists.

Wayfinding Signage and Markings

Signs and/or pavement markings will be posted on designated roadways and trails to direct bicyclists to major destinations throughout Palo Alto. Customized signs and markings will be used on designated bicycle boulevards and integrated into the citywide system, where appropriate. Signs and markings should follow Manual on Uniform Traffic Control Devices (MUTCD) standards for installation, such as minimum height of signs above ground and horizontal placement from edge of the roadway or trail.

Identification / Confirmation Signs

Bicycle boulevard confirmation sign

Confirmation signs should be placed at the beginning of designated bikeways and repeated at appropriate locations, such as the far side of an intersection where two bikeways meet or every one-third to one-half mile depending on length segment, sight distance, and need for confirmation. Destination "blade" signs may be used in conjunction with confirmation signs to provide additional information.

For bicycle boulevards, identification signs shall be customized with Pantone Violet C coloring, the approved "Bike Palo Alto" logo, and the specific corridor or roadway name(s).

Standard confirmation sign with blades

Street Signs

Proposed street sign standard for designated bicycle boulevards

Along designated bicycle boulevards, additional route confirmation and wayfinding will be achieved through integrated street name signs that carry the bicycle boulevard marker symbol and color. Installation can occur as part of the city's non-conforming street sign upgrade program, or in conjunction with other bikeway or roadway maintenance projects.

Non-conforming street signs (existing)

Destination / Route Blade Signs

Bicycle boulevard destination blade signs (proposed)

"Blade" signs provide route or destination information at major decision points along or near a designated bikeway. Closest destinations should be listed on top, and no more than three blade signs should be used for any one location/pole. Destinations can include common neighborhood names, major parks, schools/universities, important roads/bikeways, general commercial areas, and adjacent communities.

If a sign is located on or directing to a bicycle boulevard, it shall be differentiated by its [violet] color. When not accompanied by a confirmation sign, blade signs should include a bicycle symbol. Use of established symbols/graphics for trails and destinations is encouraged, as are mileage indicators for longer destinations.

Existing (standard) blade signs

Route Guidance Pavement Markings

Custom Palo Alto bicycle boulevard roadway marking

Along bicycle boulevards, a customized pavement marker (left) may be used in addition to or in lieu of repeated confirmation signage. These markers can be used with arrows to provide route guidance through jogs or roadways changes, and at off-route locations leading toward a bicycle boulevard. In general, the custom markings should be placed in the center of the travel lane to denote bicycle priority. Through higher-traffic areas of bicycle boulevards, or wherever lane positioning and route confirmation are desirable on Class III facilities, shared lane markings (right) may also be used. Additional guidance on "sharrow" placement is provided separately in Appendix A.

Sharrows help confirm routes and guide cyclists on Class III facilities

Bike Boxes

Description

A bike box is a priority bicycle zone at the head of a signalized intersection. The bike box allows bicyclists to position themselves in front of the traffic queue on a red light and proceed first when that signal turns green. On a two-lane roadway, the bike box can facilitate left turning movements for bicyclists. Motor vehicles must stop behind the white stop line at the rear of the bike box. Bike boxes are also appropriate at signalized intersections along Class III (shared) bikeways where a lead-in bike lane can be provided (often accomplished by removing one or more parking spaces).

Application

- Use at signalized intersections with pedestrian countdown displays only.
- Right turns on red should be prohibited unless a dedicated right turn lane is provided to the right.
- Stop lines and optional lettering indicate where motor vehicles must stop.
- Dashed lines and coloration can extend into the intersection.

Design References

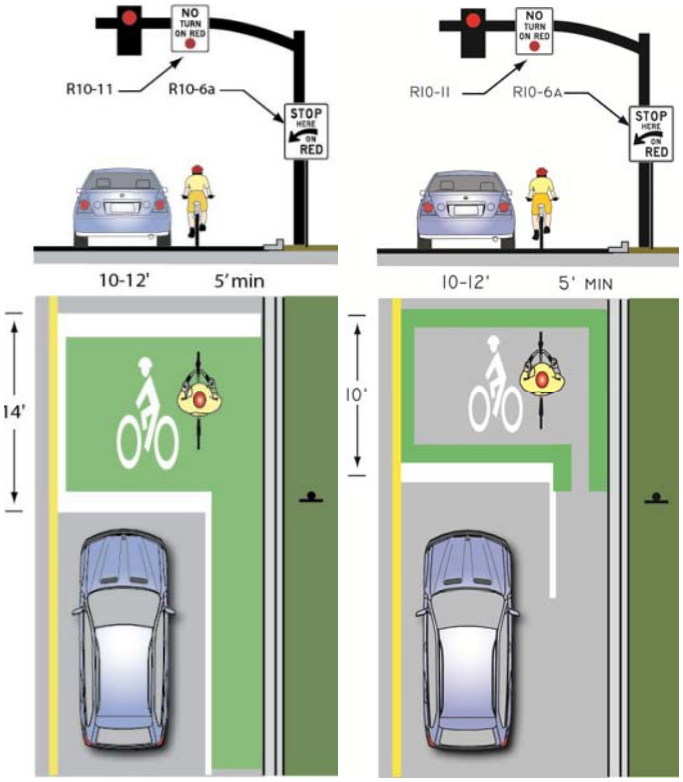
- NACTO *Urban Bikeway Guide*
- City of *Portland Bikeway Design Best Practices*
- CROW *Design Manual* (Netherlands)

Material Cost Estimate

$5 to $7 sf for thermoplastic, $250 for pavement markings, $300 for signing, assumes boxes on both sides of the street.

- Outlined bike box: $1,900
- 10’ by 12’ with coloration: $2,300
- 16’ by 12’ with coloration and access/egress lanes: $5,600

Design



San Luis Obispo uses a simpler version of a bike box. Source: Caltrans.

Caltrans installed a bike box in San Luis Obispo in 2010.

Crosswalk Design

Description

Crosswalks should be marked at unsignalized intersections when they help show pedestrians the shortest route across traffic with the least exposure to vehicular traffic and traffic conflicts, or help position pedestrians where they can best be seen by oncoming traffic. While yield lines are not required by the CA MUTCD, the National MUTCD requires them and "Yield Here to Pedestrians" signs at all uncontrolled crossings of a multi-lane roadway.

VTA *Pedestrian Technical Guidelines* state that, "curb radii at intersections within pedestrian areas should be 10 to 15 feet where curb bulbouts are not used." This practice reduces the crossing area.

Crosswalks can be improved with the following treatments to increase visibility.

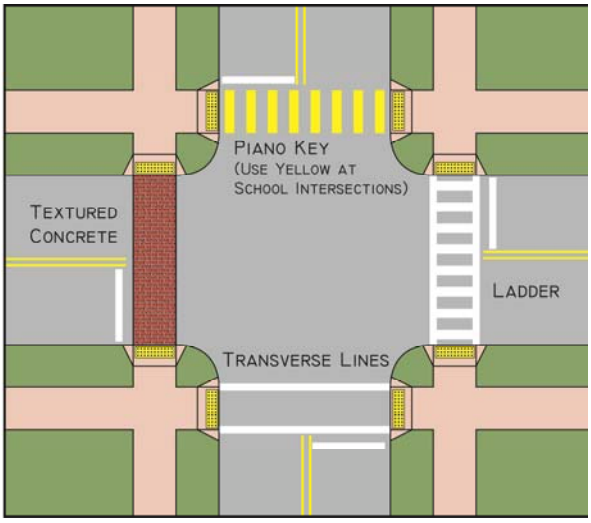
Advance Stop Bars are solid lines painted a minimum of 4 feet in advance of signalized crosswalks (on a multi-lane road with three or more lanes, an advance stop line is recommended at a point no further than 30 feet [20 feet preferred] per VTA standards) . A second stop bar for bicyclists placed closer to the centerline of the cross street than the drivers' stop bar increases the visibility of bicyclists waiting to cross a street. This treatment is typically used with other crossing treatments (i.e. curb extension) to encourage bicyclists to take full advantage of crossing design.

Yield teeth are triangles pointed downstream in a traffic lane, reminding and guiding motorists where to yield to pedestrians using an unsignalized crosswalk (such as a mid-block crossing or through a channelized right-turn lane). They should be accompanied by a sign indicating where motorists are expected to yield.

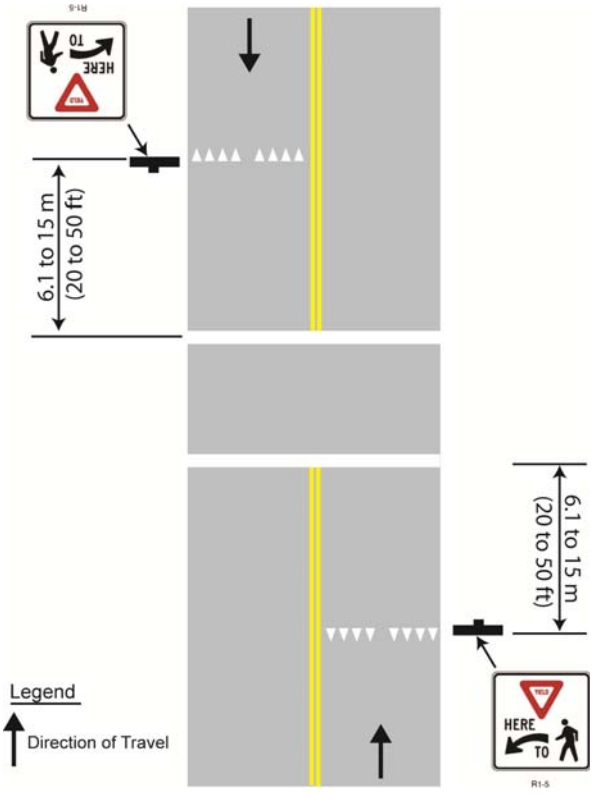
Yield to Pedestrians (R1-6) signs should be used to remind users of laws regarding the right of way at an unsignalized pedestrian crossing. Paddles are installed at the center stripe of the roadway on the leading edge of the crosswalk to warn approaching motorists to yield to crossing pedestrians. VTA recommends that overhead pedestrian crossing signs be used on streets with four or more lanes, two or three lane roads with widths greater than 50 feet at crossings where pedestrian crossing activity is more than 50 to 100 crossing per hour, and where sight distance of the driver may not allow view of roadside signs.

Beacons can be used to improve yielding and increase visibility. See following sheets for information.

Examples



Types of crosswalks.



Yield lines at m,idbloclk crosswalk. (MUTCD-CA, Figure 3B-15)

Crosswalk Design

Application

Use yield teeth at locations where motorists frequently disobey pedestrian right-of-way. Use with "YIELD HERE TO PEDESTRIANS" sign and place 20 to 50 feet in advance of uncontrolled crosswalk.

Bicycle stop bas are a recommended standard for all marked crosswalk locations, except where fewer than 25 percent of motorists make a right turn movement.

See VTA *Pedestrian Technical Guidelines* for crossing enhancement selection (Table 3.1)

Yield teeth encourage drivers to slow down and watch for pedestrians in a crosswalk.

Design References

VTA *Pedestrian Technical Guidelines* Section 3.1C Striping and 3.2A Marked Crosswalks.

CAMUTCD - Chapters 2, 7 and 9

AASHTO Guide for the Development of Pedestrian Facilities (p. 110)

VTA *Pedestrian Technical Guidelines* Section 3.1

Bicycle forward stop bars increase bicyclists' visibility at intersections.

Materials Cost Estimate

- Crosswalk, Thermoplastic: $5 to $7 per sf
- Crosswalk, Transverse: $320-$550 each
- Crosswalk, Permeable Pavement (brick, includes demo of existing): $14 per sf
- Crosswalk, Scored Concrete (includes demolition of existing): $9-$14 each
- Signs, High-Visibility: $430 each
- Signs, In-Pavement Yield Paddles: $220 each

In-street yield to pedestrians paddles.

Pedestrian Crossing Beacons/Actuated Signals

Description

These signals or flashing beacons are user- activated devices for use by pedestrian and/or bicycles only (as opposed to regularly timed or permanent blinking traffic signals). Often engaged by using a pedestrian push-button, loop and other detectors may also help detect bicycles.. A Florida study found that rapid flashing beacons had a compliance rate of 82%, compared to the base rate of 2 %. See other sheets for information related to crosswalk design and visibility enhancements at actuated crossings.

Rapid Flashing Beacons (also called active warning beacons) use high intensity, stutter flashing LED lights to increase visibility of midblock, pedestrian (or bicycle) actuated crossings. They use an irregular flashing pattern when activated (similar to that used by emergency flashers on police vehicles) but are otherwise "dark" when not in use. High-visibility signage should always accompany a flashing beacon.

Overhead Beacons are an older style of beacon often used for wider roadways without medians and other locations where signage visibility may be poor. They are typically more expensive than individual - mounted flashing beacons due to the need for mast arm installation.

HAWK (High Intensity Activated Crosswalk) signals (referred to in the MUTCD as pedestrian hybrid beacons) are used at midblock crossing locations and have displays similar to that of a traditional traffic signal. Pedestrians actuate HAWK signals by pushbutton to display a flashing yellow, to solid yellow, to solid red, at which time a walk indication activates. When the pedestrian clearance interval expires, the light turns flashing red and then off for motorists to proceed. HAWKs are also typically expensive due to the need for mast arms and potential coordination with adjacent signals.

Examples

RRFBs can be solar powered and are an inexpensive alternative to full signalization. Note: City of Palo Alto standards call for a circular, as opposed to a rectangular, beacon signal head.

An overhead solar-powered beacon assists a crossing of Sir Francis Drake in San Anselmo, CA.

Application

- The flashing beacon should be installed at least 100 feet from side streets or driveways that are controlled by a STOP or YIELD sign.
- Parking and other sight obstructions should be prohibited for at least 100 feet in advance of and at least 20 feet beyond the marked crosswalk, or site accommodations should be made through curb extensions or other techniques to provide adequate sight distance.
- The installation should include suitable standard signs and pavement markings. When used to assist bicycle crossings, a combined pedestrian and bicycle warning sign (W11-15) is strongly encouraged.

Pedestrian Crossing Beacons/Actuated Signals

Design References

- City of St. Petersburg, FL. 2007. *Increasing Motorist Yielding Compliance at Pedestrian Crosswalks From under 2% to as high as 94%.* http://www.stpete.org/stpete/bicycle/docs/ite_paper_07.pdf
- The application of experimental treatments within California should follow the California Traffic Control Devices Committee's (CTCDC) approval process (http://www.dot.ca.gov/hq/traffops/signtech/newtech/). Jurisdictions within California can apply to the CTCDC for permission to use experimental treatments. Note that the CTCDC has not approved the HAWK treatment to date. (See CTCDC's October 11, 2007 agenda and meeting minutes available on the Committee's website.)
- MUTCD Section 4F. Pedestrian Hybrid Beacons. Overhead flashing pedestrian beacons are governed under Section 4K.03 of the CA MUTCD.
- NACTO Urban Bikeway Guide
- USDOT. 2009. *Rectangular Rapid Flash Beacon*. FHWA-SA-09-009. http://safety.fhwa.dot.gov/intersection/resources/techsum/fhwasa09009/
- Bureau of Highway Operations (2010) HAWK Pedestrian Signals: A Survey of National Guidance, State Practice and Related Research http://on.dot.wi.gov/wisdotresearch/database/tsrs/tsrhawksignals.pdf
- California Vehicle Code 21650 (g): "*This section does not prohibit the operation of bicycles on any shoulder of a highway, on any sidewalk, on any bicycle path within a highway, or along any crosswalk or bicycle path crossing, where the operation is not otherwise prohibited by this code or local ordinance.*"

HAWK signal in Portland, OR assists with an arterial crossing on a bicycle boulevard. Note the use of the combined pedestrian/bicycle warning sign (W11-15).

Material Cost Estimate

Rapid Flashing Beacon: $10,000 to $15,000 for purchase and installation of two units.

HAWK Hybrid Pedestrian/Bicycle Signal: $50,000 each

Bike Signals/Crossbikes

Description

At special crossings of arterial roadways, or in locations that accommodate a high level of pedestrian and bicycle use, bike signals and crossbikes can improve visibility, assist with crossing, and separate bicyclists and pedestrians.

Bike Signals should not require the bicyclist to dismount. Where possible, it is ideal to provide a signal loop detector or remote detection rather than a push-button, because the latter requires the bicyclist to move out of the travel lane to actuate the signal.

"Crossbikes" can be used in higher-traffic areas where pedestrians and bicyclists are crossing together. They are most effective at trail crossings of arterial streets or at offset "T" intersections (such as those along El Camino Real) where higher visibility markings and added crosswalk width help minimize conflicts between pedestrians and bicyclists. They are also beneficial at trail crossings, bicycle boulevard crossings, and where the geometric design of an intersection includes a single crosswalk or 'stacked' crossing of an arterial.

Application

- At high demand trail crossings of arterial roadways and/or where Class I trails terminate at on-street facilities
- At "stacked" pedestrian crossings (i.e., where an off-set intersection or other circumstance limits crossings to one intersection leg only) that experience heavy bicycle demand and/or where dedicated turn phases allow a separate or protected non-motorized crossing
- At pedestrian scramble or "all way" phased intersections with heavy bicycle demand

Design References

- The application of experimental treatments within California should follow the California Traffic Control Devices Committee's (CTCDC) approval process (http://www.dot.ca.gov/hq/traffops/signtech/newtech/). Jurisdictions within California can apply to the CTCDC for permission to use experimental treatments.

Design

A bicycle signal is paired with a wider crosswalk to accommodate bicyclists in Berkeley, CA to assist with the Ohlone Greenway crossing of University Avenue.

Crossbikes are commonly used in Europe to separate pedestrian and bicycle crossings of major streets.

Material Cost Estimate

Bicycle signal installation cost varies depending on location and existing facilities. Crossbike treatments are generally similar in cost to high visibility crosswalks of the same width/length.

Bicycle Detection

Description

Design

Traffic Operations Policy Directive 09-06, issued August 27, 2009 by Caltrans modified CA MUTCD 4D.105 to require bicyclists to be detected at all traffic-actuated signals on public and private roads and driveways. If more than 50 percent of the limit line detectors need to be replaced at a signalized intersection, then the entire intersection should be upgraded so that every line has a limit line detection zone. Bicycle detection must be confirmed when a new detection system has been installed or when the detection system has been modified.

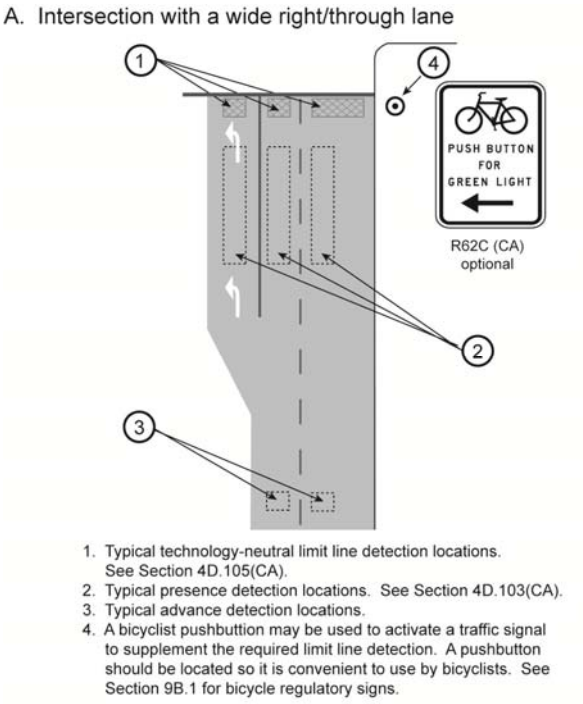
Microwave detection can count, as well as detect, bicycles as they approach an intersection. Palo Alto currently has grant funding to implement microwave detection in several locations. The cities of Pleasanton and Alameda are also using microwave radar detection and are testing its ability to extend green signal phases for slower moving bicyclists approaching an intersection.

Application

- CA Policy Directive 09-06 requires bicycle detection or fixed recall at all new and modified signals.
- Bicycle detection should be provided in a left-turn only lane where bicyclists regularly make left turn movements.
- The Reference Bicycle Rider must be detected with 95% accuracy within a 6' x 6' "limit line detection zone."

Design References

- National Cooperative Highway Research Program (2006). Improving Pedestrian Safety at Unsignalized Crossings, Report 562, 2006. http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_562.pdf
- Caltrans Policy Directive 09-06. Provide Bicycle and Motorcycle Detection on all new and modified approaches to traffic-actuated signals in the state of California. http://www.dot.ca.gov/hq/traffops/signtech/signdel/policy/09-06.pdf
- ITE Guidance for Bicycle—Sensitive Detection and Counters: http://www.ite.org/councils/Bike-Report-Ch4.pdf
- Santa Clara County, *County Expressway Bicycle Accommodation Guidelines* (2003)



Source: Caltrans Traffic Operations Policy Directive 09-06 Video Detection – Designs not available

A alternative to in-pavement loop detectors planned for use in Palo Alto is a pole-mounted microwave detection system called the "Intersector". More invormation is available at http://www.mssedco.com/intersector_sensor.htm

Pedestrian Scrambles

Description

Pedestrian scramble signals provide a dedicated traffic signal phase for all-way pedestrian and/or bicycle movement, lateral and diagonal between kitty-corners. During the pedestrian/bicycle phase of the scramble, all motor vehicle movements are stopped. Because scramble signals are not widely used in the United States, an education program should be implemented at the commencement of a pedestrian scramble.

Application

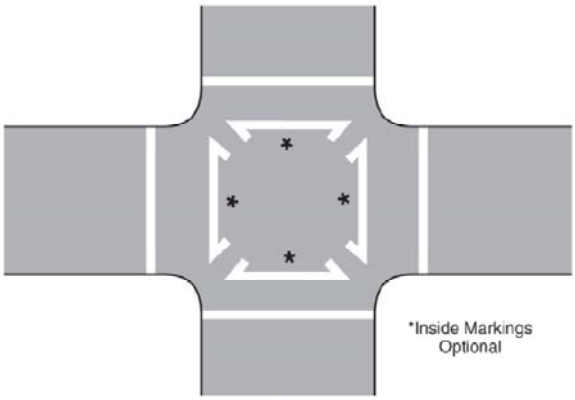
Use at intersections with very high pedestrian volumes and/or at intersections with a high pedestrian-motor vehicle collision rate.

Can facilitate movements at the terminus of a two-way cycle track or a Class I Path, where bicyclists need to cross the street diagonally to access the bike lanes in the correct direction.

Use an audible a signal to alert vision-impaired pedestrians of the walk interval.

May increase pedestrian violations due to increased delay; monitor and enforce.

Design



CAMUTCD example of exclusive pedestrian phasing crosswalk markings.

Design Reference

CAMUTCD provides guidance for exclusive pedestrian phasing.

Cities currently using this application include Oakland, Davis, and San Diego, California; Honolulu, Hawaii; and Portland, Oregon.

Materials Cost Estimate

$1,000 to modify signal operations

Additional cost for pavement treatments

Example

The City of Oakland installed a pedestrian scramble in its Chinatown, later adding pavement inlay designs to make crosswalks more visible.

Raised Crosswalks and Speed Tables/Humps

Description

Raised elements in the roadway vertically deflect traffic and are intended slow motorists and increase pedestrians' visibility. Speed humps are rounded raised areas, while speed tables are longer than speed humps and flat-topped. The VTA P*edestrian Technical Guidelines* notes that speed humps are uncomfortable for both vehicle occupants and bicyclists, and are not recommended. A raised crosswalk is a speed table that is marked and signed for pedestrian crossing. It extends fully across the street and can be loner and higher than a typical speed table. A raised intersection elevates the entire area, and improves the visibility of the crossing as a pedestrian area. Before installing raised crosswalks, designs should be approved by emergency vehicle operators including the fire department.

Application

Emergency vehicle response times should be considered where speed humps are used.

The ramp shapes of raised crosswalks and speed tables or humps are typically either sinusoidal, circular or parabolic, each offering motorists and bicyclists a differing level of comfort and effectiveness in reducing speed:

- **Sinusoidal ramps** are most comfortable for motorists and bicyclists but are least effective in reducing traffic speeds and are difficult to construct.
- **Circular ramps** offer a moderate comfort level for motorists and are moderately effective in reducing traffic speeds.

The height of raised crosswalk ends should be the same as the curb height but should not impede drainage. Detectible warning should be used where the raised crosswalk or intersection meets the sidewalk to warn pedestrians with visibility impairments.

Decorative surface material may be used to call attention to raised crosswalks.

The VTA *Pedestrian Technical Guidelines* recommends using speed tables and raised intersection in central business districts in "high pedestrian-use areas of or at interfaces between arterials and entrances to pedestrian supportive areas.."

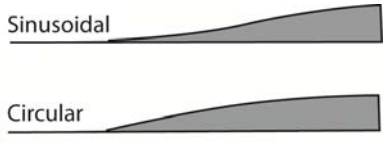
Design Reference

See also VTA *Pedestrian Technical Guidelines*, section 2.5 Traffic Calming.

Materials Cost Estimate

Costs can vary widely depending on use of decorative materials, existing grades, drainage issues, and use of curb extensions.

Design



Two types of raised crosswalk vertical deflection.

Example

Raised crosswalks calm traffic while enhancing pedestrian crossings.

Raised intersections also calm traffic, but can be expensive due to drainage issues.

Chicanes and Pinch Points

Description

Described as 'slow points' in the VTA *Pedestrian Technical Guidelines*, these features narrow a roadway mid-block. Chicanes create lateral shifts in a roadway with alternating curb extensions or islands. The intent of chicanes is to slow traffic speeds thereby increasing the comfort of bicyclists and pedestrians. Pinch points or chokers are a similar treatment that use curb extensions to create a narrow channel in the roadway midblock or at an intersection. Both treatments are appropriate along bicycle boulevards, although pinch points are preferred, as chicanes force bicyclists to share a narrower travel lane with motor vehicles. The intent of pinch points is to discourage cut-through traffic on residential roadways and decrease motorist speeds, thereby increasing the comfort of bicyclists. Work with emergency service providers when considering traffic calming or street closures/diverters.

Application

Use on low traffic volume residential streets.

Use in series' of three to effectively slow motorist speeds.

European manuals recommend extending the curb the one lane width with deflection angles of 45 degrees to prevent "straight line racing."

Consider leaving a 5-foot gap for bicyclists on bicycle boulevards to facilitate through-movements.

Consider integrating "Green Street" features into chicanes and curb bulb-outs (see VTA *Pedestrian Technical Guidelines*, 2.4D)

Consider bicycle access and circulation in development of slow points (VAT *Pedestrian Technical Guidelines*, Section 2.5); the Guidelines recommend that bulbouts be designed such that 14 feet of lane width remains, allowing enough space for cars and bicycles (Section 3.2B).

Design References

City of Portland recommends narrowing curb-to-curb width to 16 feet to avoid a requirement of advance warning sign installation.

City of Seattle recommends two-foot wide mountable curbs to facilitate emergency response.

Institute of Transportation Engineers - http://www.ite.org/traffic/chicane.asp

See also VTA *Pedestrian Technical Guidelines*, Section 2.5 Traffic Calming.

Materials Cost

$30,000 ea

Design

The City of Berkeley has installed a chicane along a bicycle boulevard that minimizes drainage costs by leaving a gap by the sidewalk.

This choker shortens a mid-block crosswalk and provides a channel for bicyclists and drainage.

Source: Project for Public Spaces.

Queuing Street

Description

Queuing streets are narrow residential streets that have low traffic speeds without the use of speed humps or bumps, which hinder emergency vehicles. They reduce pedestrian crossing distances, as well as maintenance and construction costs, and reduce impervious surfaces.

Application

Two-way streets should be between 20 and 28 feet. On a 28-foot street, two seven-foot parking lanes can be accommodated. On a 24-foot street, one parking lane is permissible, while no parking should be permitted on streets that are 20-feet wide.

Provide passing areas with a 20-foot wide clear area for parking of fire apparatus. (On streets with on-street parking, driveways tend to provide sufficient clear space for this.)

Use on residential or non-arterial streets only. Preferred for use on a connected street network with adequate street parking.

Prohibit on-street parking within 20-50 feet of the right-hand side of intersections to accommodate turning movements.

Minimum right-of-way standard is between 50 and 60 feet.

Design References

Oregon DOT's *Neighborhood Street Design Guidelines:* http://www.oregon.gov/LCD/docs/publications/neighstreet.pdf?ga+t

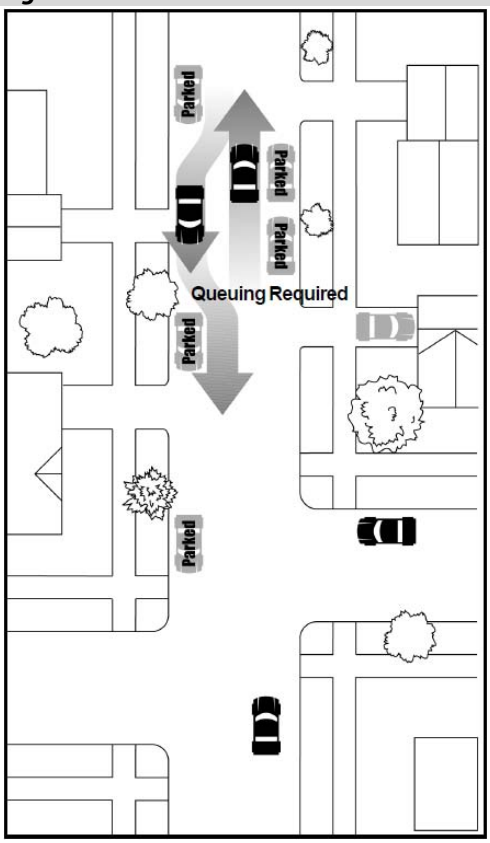
Institute of Urban and Regional Planning, University of California at Berkeley, *Residential Street Standards and Neighborhood Traffic Control:* http://web.mit.edu/ebj/www/Official%20final.pdf

Streets Wiki. *Skinny Streets:* http://streetswiki.wikispaces.com/Skinny+Streets

Materials Cost

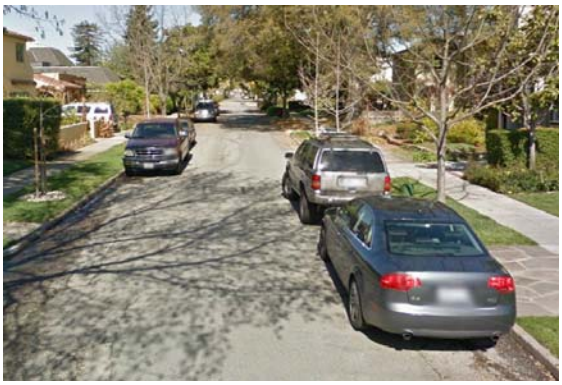
N/A

Design



Source: Oregon DOT

Example



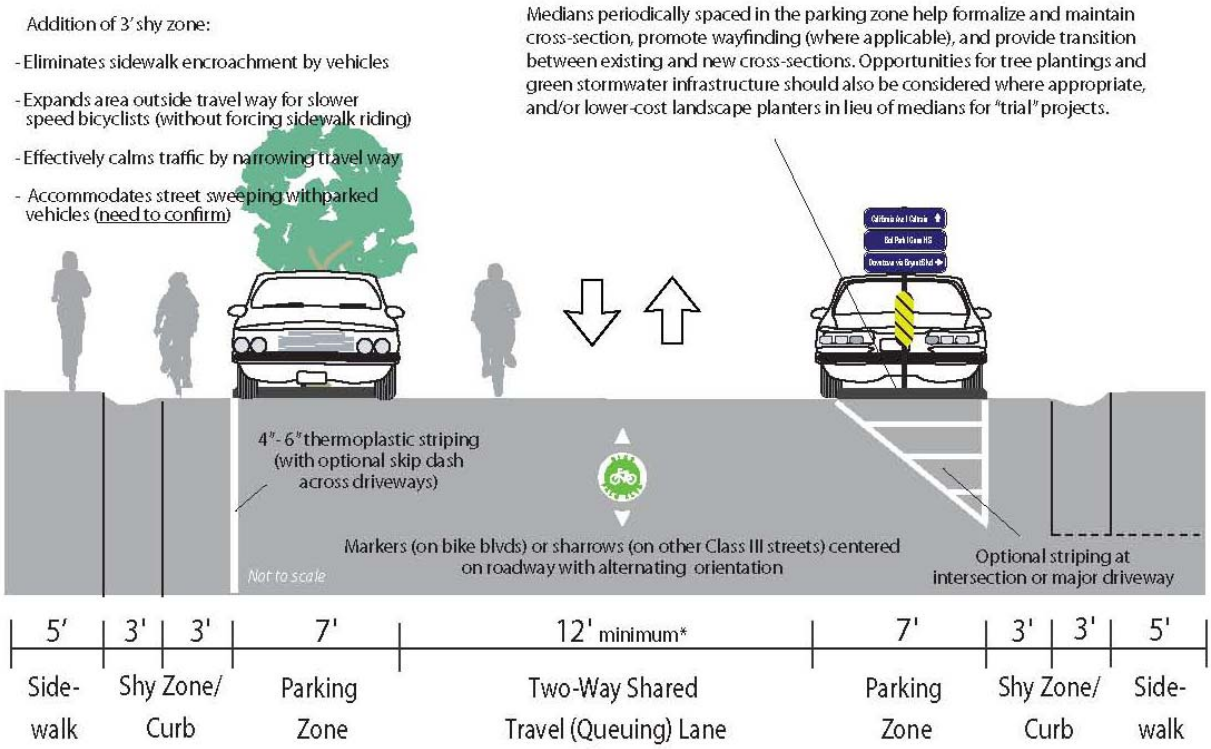
Existing narrow "queuing streets" help make Castilleja Avenue and the Southgate neighborhood an attractive environment for bicycling and walking.

Source: Google Streetview

Queuing Street

Additional Discussion

Proposed Conditions - Queuing Street (Non-Arterial or Bicycle Boulevard)



* Reflects existing standards for two-way, low-volume residential streets with parallel parking. Additional effective travel way width can be achieved by staggering parking/medians or reducing shy zone to 2'. For more information see: http://www.oregon.gov/LCD/docs/publications/neighstreet.pdf?ga=t and http://web.mit.edu/ebj/www/Official%20final.pdf and http://streetswiki.wikispaces.com/Skinny+Streets

Neighborhood Traffic Circles

Description

Traffic circles are raised islands placed in the middle of local roadway intersections that control turning movements and help reduce vehicle speeds by forcing slow turns in a predictable manner. Because traffic circles do not require complete stops and have been shown to dramatically improve safety, they are generally considered more bicycle-friendly than traditional two- or four-way stops controls.* Additional benefits include reductions in local air and noise pollution from the removal of stop –and-go traffic, as well as visual and environmental benefits of added landscaping and tree planting opportunities. Traffic circles can also include a paved apron to accommodate the turning radii of larger vehicles including fire trucks and school buses where necessary.

**A Seattle study of 119 intersections where traffic circles were installed over a four-year period revealed a 94% reduction in collisions within the first year and similar numbers sustained over a longer time period.*

Application

Traffic circles should generally be between 10 and 20 feet in diameter, and mountable curbs can be considered in areas with high truck or bus volumes (VTA *Pedestrian Technical Guidelines).*

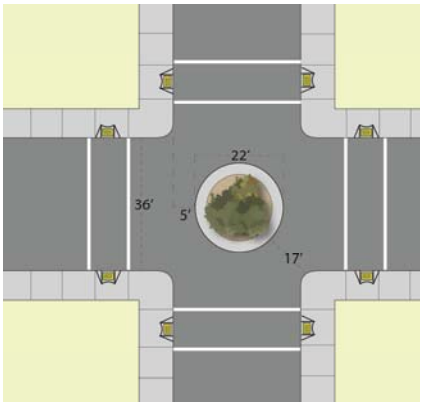
Location selection has typically been dependent on 85th percentile traffic speed, traffic volume, collision history, and community support.

Traffic circles may be installed independent of traffic calming where they are desirable to reduce travel delay and increase comfort and compatibility for bicyclists on designated bikeways (including bicycle boulevards).

Traffic circles should especially be considered where multiple bicycle boulevards or Class III bikeways intersect, in order to provide efficient traffic control for both corridors.

Traffic circles may not be appropriate where there is a dramatic difference in width of the intersecting roadways.

Design



Typical local roadway width in Palo Alto is 36 feet.

Design References

VTA recommends leaving 14 feet of clear roadway between the traffic circle and corners and including stop signs on all legs of a standard four-way intersection. At intersections with traffic volumes just shy of warranting stop controls, a modern roundabout should be considered.

See also VTA *Pedestrian Technical Guidelines*, section 2.5 Traffic Calming.

Institute of Transportation Engineers -www.ite.org/traffic/circle.asp

City of Olympia: http://olympiawa.gov/documents/PublicWorks/Technical_services/EDDS09/Chapter4_Drawings.pdf

Example

Traffic circles are great opportunities for natural landscaping and can reduce local air pollution and GHG emissions

Materials Cost

$20,000 - $50,000

Neighborhood Traffic Circles

Additional Discussion

Table A-1. Traffic Circle Design Guidelines (Olympia, WA)

STREET WIDTH	CURB RETURN RADIUS	OFF–SET DISTANCE	CIRCLE DIAMETER	OPENING WIDTH
20'	<15'	RECONSTRUCT CURBS		
	15'	5.5'	9'	16'+
	18'	5.0'	10'	17'+
	20'	4.5'	11'	18'–
	25'	4.0'	12'	19'+
24'	<12'	RECONSTRUCT CURBS		
	12'	5.5'	13'	16'
	15'	5.0'	14'	17'–
	20'	4.5'	15'	18'+
	25'	3.5'	17'	20'–
25'	<12'	RECONSTRUCT CURBS		
	12'	5.5'	14'	16'+
	15'	5.0'	15'	17'–
	18'	4.5'	16'	18'–
	20'	4.5'	16'	18'+
	25'	3.5'	18'	20'–
30'	10'	5.5'	19'	16'+
	12'	5.0'	20'	17'–
	15'	5.0'	20'	17'+
	18'	4.5'	21'	18'+
	20'	4.0'	22'	19'+
	25'	3.0'	24'	20'
32'	10'	5.5'	21'	16'+
	12'	5.0'	22'	17'–
	15'	4.5'	23'	18'–
	18'	4.0'	24'	19'–
	20'	4.0'	24'	19'+
	25'	2.5'	27'	20'
36'	10'	5.0'	26'	17'–
	12'	5.0'	26'	17'+
	15'	4.5'	27'	18'+
	18'	4.0'	28'	19'+
	20'	3.5'	29'	20'–
	25'	1.5'	33'	20'
40'	10'	5.0'	30'	17'+
	12'	4.5'	31'	18'+
	15'	4.0'	32'	19'–
	18'	3.5'	33'	20'–
	20'	3.0'	34'	20'
	25'	1.0'	38'	20'

Shared Space (Woonerfs)

Description

Shared Space streets, also known as woonerfs, living streets or home zones, are streets where pedestrians and bicyclists have priority over vehicles, yet where all modes of travel are allowed. Shared space can employ a variety of strategies to invite pedestrians and bicyclists and reduce motor vehicle speeds (typically to 15mph or less). Design elements include eliminating or reducing the number of signs, pavement markings, and curbs with the intention that people will rely on personal negotiation and attentiveness – rather than more passive adherence to traffic law – to navigate and move about safely. Other design elements include using pavers in addition to or instead of a formal sidewalk, pedestrian scale lighting, street trees, and street furniture.

In a neighborhood setting, shared space creates an environment where children could potentially play and pedestrians and bicyclists can move freely. In urban areas, shared spaces create opportunities for events, markets, and street shopping.

Application

Primarily successful in areas where access is prioritized over mobility and speed (e.g. retail corridors and on residential streets), and where high pedestrian and bicycle demand or play opportunities conflict with traditional sidewalk/crosswalk design.

Alleys and pedestrian lanes where service vehicle access must be maintained

Reduce motor vehicle speeds with traffic calming, street trees, and other features.

Meet Federal ADA access requirements, including providing a detectible warning and obstacle such as planter boxes between the sidewalk and street on curbless streets.

Design References

City of Seattle – Terry Ave North Street Design Manual

City of San Francisco – Better Streets Plan

American Planners Association – Planning and Urban Design Standards

FHWA – Pedestrian Facilities User Guide

CABE – Shared Space

Materials Cost

Variable. Usually developed as part of larger streetscape projects.

Design

Shared streets are usually distinguished by the removal or lowering of curbs, positioning of parking stalls, street trees and other furnishing elements, lack of pavement markings, and special surface treatments.

Many European countries use special signs to indicate shared space roadways in residential neighborhoods.

Festival Streets

Description

Festival Streets are local streets designed with high-quality urban design amenities that can be easily closed and programmed with community events. Examples include Davis Street in Portland's Chinatown, Lander Street in Seattle, and 3rd Avenue in Santa Monica.

Many options are available to define and separate space for pedestrians from the roadway area, which can be used in combination to provide both corridor-long barriers and more visible warnings. Examples include extruded curbs, parking stops, bollards or flexible bollards, planters, fencing, painted markings, paving materials, raised tactile devices, and other types of street furnishings.

Application

At the entrance, use signs, roadway narrowing, paving materials, street art, or a combination to inform motorists that they are entering a shared space.

Differentiate from other streets with alternate pavement materials and signage, and to reinforce with shortened sight lines (accomplished through placement of street furniture, parking, and/or landscaping), changes to the road geometry, and/or narrowing of the roadway.

Meet Federal ADA access requirements, including providing a detectible warning device and separation through planter boxes, bollards and other pbetween the sidewalk and street on curbless streets.

Design References

City of Seattle – Terry Ave North Street Design Manual

City of San Francisco – Better Streets Plan

City of Portland,

American Planners Association – Planning and Urban Design Standards

FHWA – Pedestrian Facilities User Guide

CABE – Shared Space

Design

Streets designed for shared travel and/or frequent vehicle closures, such as Davis St in Portland, OR, are increasingly popular as economic development and urban open space projects.

Bicycle Parking

Description

Short-term parking accommodates visitors, customers, messengers and others expected to depart within two hours; requires approved standard rack, appropriate location and placement, and weather protection.

Bicycle corrals consist of bicycle racks grouped together in a common area within the public right-of-way traditionally used for automobile parking. Bicycle corrals are reserved exclusively for bicycle parking and provide a relatively inexpensive solution to providing high-volume bicycle parking. Bicycle corrals move bicycles off the sidewalks, leaving more space for pedestrians, sidewalk café tables, etc. Because bicycle parking does not block sightlines (as large motor vehicles do), it may be possible to locate bicycle parking in 'no-parking' zones near intersections and crosswalks. Bicycle corrals may also be located on the sidewalk where roadway paving and development projects allow for large curb extensions into the parking zone, although a curb ramp, rolled curb or other device should be used to ensure bicycle access from the street is maintained.

Application

A standard inverted-U style rack is recommended for Palo Alto. The rack element (part of the rack that supports the bicycle) should keep the bicycle upright by supporting the frame in two places without the bicycle frame touching the rack. The rack should allow one or both wheels to be secured.

Bicycle racks should be securely anchored to a surface or structure. Empty racks should not pose a tripping hazard for visually impaired pedestrians. Position racks out of the walkway's clear zone.

Avoid use of multiple-capacity "wave" style racks, as users commonly misunderstand how to correctly park at wave racks, placing their bikes parallel to the rack and limiting capacity to one or two bikes.

Guidelines for bicycle corrals:

- Use with parallel or angled automobile parking.
- Each motor vehicle parking space can be replaced with approximately 6-10 bicycle parking spaces.
- Protect bicycles from motor vehicles with physical barriers such as curbs or bollards and through application of other unique surface treatments (e.g. green thermoplastic markings) as needed.
- Establish maintenance responsibility when facility is built, particularly regarding street sweeping.
- Bicyclists should be able to access the corral from both the sidewalk and the roadway.

Example

Standard bicycle 'staple' rack.

On-street bicycle parking may be installed at intersection corners or at mid-block locations.

Bicycle Parking

Discussion

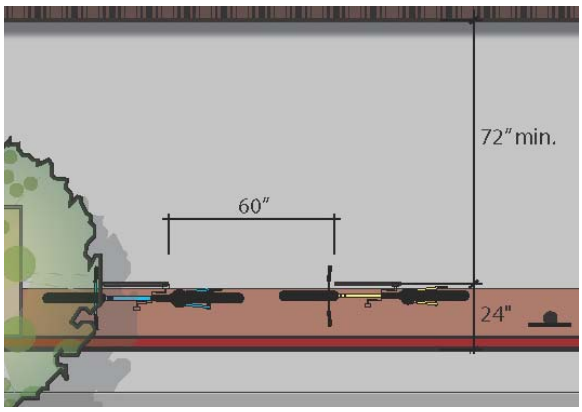
Summary of Recommended Design for Bicycle Parking

Design Issue	Recommended Guidance
Rack Spacing	Position racks with sufficient room between parked bicycles. Racks should be situated on 36" centers. A 6'aisle for bicycle maneuvering should be maintained beside or between each row of racks. For sidewalks with heavy pedestrian traffic, at least 7'of unobstructed right-of-way is required.
Minimum Rack Height	To increase visibility to pedestrians, racks should have a minimum height of 33 inches or be indicated or cordoned off by visible markers.
Signing	Where bicycle parking areas are not directly visible and obvious from the right-of-way, signs at least 12" square should direct them to the facility. The sign should include the name, phone number, and location of the person in charge of the facility, if applicable.
Lighting	Lighting of not less than one foot-candle illumination at ground level should be provided in all bicycle parking areas.
Frequency of Racks on Streets	In popular retail areas, two or more racks should be installed on each side of each block. Areas officially designated or used as bicycle routes may warrant the consideration of more racks.
Location and Access	Access to facilities should be convenient; where access is by sidewalk or walkway, ADA-compliant curb ramps should be provided. Employee parking facilities should be located near the employee entrance, and customer parking near public entrances. (Convenience should be balanced against the need for security if the employee entrance is not in a well traveled area). Bicycle parking should be clustered in lots not to exceed 16 spaces each.
Locations within Buildings	Provide bike racks within 50 feet of the entrance. Provide racks behind or within view of a security guard where possible. The location should be outside the normal flow of pedestrian traffic.
Locations near Transit Stops	To prevent bicyclists from locking bikes to bus stop poles, which can create access problems for transit users, particularly those who are disabled, racks should be placed in close proximity to transit stops where there is a demand for short-term bike parking.
Retrofit Program	In established locations, such as schools, employment centers, and shopping areas, the City should conduct bicycle audits to assess bicycle parking availability and access, and add racks if necessary.

Design References

- Association of Bicycle and Pedestrian Professionals Bicycle Parking Guidelines (2nd edition 2010)
- City of Oakland, CA Bicycle Parking Ordinance (2008)
- AASHTO Guide for the Development of Bicycle Facilities.
- Caltrans Highway Design Manual (Chapter 1000).
- MUTCD - California Supplement.

Design



Staple rack parking configuration and recommended clearances.

Maintenance

Description

Bicyclists often avoid shoulders and bike lanes filled with gravel, broken glass and other debris; they will ride in the roadway to avoid these hazards, causing conflicts with motorists. Debris from the roadway should not be swept onto sidewalks (pedestrians need a clean walking surface), nor should debris be swept from the sidewalk onto the roadway.

Bicycles are more sensitive to subtle changes in roadway surface than are motor vehicles. Various materials are used to pave roadways, and some are smoother than others. Compaction after trenches and other holes are filled can lead to uneven settlement, which affects the roadway surface nearest the curb where bicycles travel.

Pavement overlays represent good opportunities to improve conditions for bicyclists if done carefully. A ridge should not be left in the area where bicyclists ride (this occurs where an overlay extends part-way into a shoulder bikeway or bike lane). Overlay projects offer opportunities to widen a roadway, or to re-stripe a roadway with bike lanes.

Bikeways can become inaccessible due to overgrown vegetation. All landscaping needs to be designed and maintained to ensure compatibility with the use of the bikeways. After a flood or major storm, bikeways should be checked along with other roads, and fallen trees or other debris should be removed promptly.

Application

- Establish a seasonal sweeping schedule that prioritizes roadways with major bicycle routes.
- On all bikeways, use the smallest possible chip for chip sealing bike lanes and shoulders.
- If the condition of the bike lane is satisfactory, consider chip sealing only the travel lanes.
- Maintain a smooth surface on all bikeways that is free of potholes.
- Maintain pavement so ridge buildup does not occur at the gutter-to-pavement transition or adjacent to railway crossings.
- Inspect the pavement two to four months after trenching construction activities are completed to ensure that excessive settlement has not occurred.
- Check regulatory and wayfinding signs along bikeways for signs of vandalism, graffiti, or normal wear and replace signs as needed.
    - Ensure that shoulder plants do not hang into or impede passage along bikeways.

Guidance

Recommended Walkway and Bikeway Maintenance Activities

Maintenance Activity	Frequency
Inspections	Seasonal –beginning and end of summer
Pavement sweeping	As needed, weekly in fall
Pavement sealing	5 - 15 years
Pothole repair	1 month after report
Culvert and drainage grate inspection	Before winter and after major storms
Pavement markings replacement	1 – 3 years
Signage replacement	1 – 3 years
Shoulder plant trimming (weeds, trees, brambles)	Twice a year; middle of growing season / early fall
Tree and shrub trimming	1 – 3 years
Major damage response (washouts, flooding)	As soon as possible

Bicycle Access During Construction

Description

When construction impedes a bicycle facility, the provision for bicycle access should be developed during the construction project planning. Long detour routing should be avoided due to lack of compliance.

Advance warning of the detour should be placed at appropriate locations and clear wayfinding should be implemented to enable bicyclists to continue safe operation along travel corridor. Bicyclists shall not be led into conflicts with mainline traffic, work site vehicles, or equipment.

Application

Detours should be adequately marked with standard temporary route and destination signs (M409a or M4-9c). The Pedestrian/Bicycle Detour sign should have an arrow pointing in the appropriate direction. Detours should comply with bike lane standards; 4-feet minimum, 5-feet desirable, and 6-feet if available. Flexible delineator posts between the rightmost automobile travel lane and the bicycle area can be used when 6-feet are available in the bike area. If shared use, minimum outside shared-lane width of 16-feet.

When existing accommodations for bicycle travel are disrupted or closed in a long-term duration project and the roadway width is inadequate for allowing motor vehicles and bicyclists to travel side-by-side, "share the road" signage (W11-1 and W16-1) should be used to advise motorists of the presence of bicyclists in the travel lane.

Signs should be places such that they do not block the bicyclist's path of travel and they do not narrow any existing pedestrian passages to less than 1200 mm (48 in).

Design References

- MUTCD – California Supplement
- California Highway Design Manual
- California Highway Design Manual
- Caltrans Traffic Operations Policy Directive 11-01
- Santa Clara County, *County Expressway Bicycle Accommodation Guidelines* (2003)

Examples

National MUTCD

California MUTCD

Arterial Bike Route Signage

Description

'Share the Road' signs are intended to reduce motor vehicle/bicyclist conflict and are appropriate to be placed on arterial routes that lack paved shoulders or other bicycle facilities. They typically work best when placed near activity centers such as schools, shopping centers and other destinations that attract bicycle traffic.

Many cities around the country have been experimenting with a new type of signage that encourages bicyclists to take the lane when the lane is too narrow. This type of sign is becoming known as BAUFL (Bikes Allowed Use of Full Lane). It can be used where lanes are less than 14 feet wide with no parking and less than 22 feet wide with adjacent parallel parking. The CA MUTCD states that Shared Lane Markings (which serve a similar function as Bikes May Use Full Lane signage) should not be placed on roadways that have a speed limit above 40 mph. Dedicated bicycle facilities are recommended for roadways with speed limits above 40 mph where the need for bicycle access exists.

These types of signs are appropriate on busier streets where shared lane markings are not encouraged (at least to the extent as they are on slower speed shared roadways), such as along segments of El Camino Real, Alma Street, Embarcadero Road, and Oregon Expressway.

Application

Placement:

- At the beginning of the bikeway
- When a bikeway turns (particularly in advance of left turns to allow a bicyclist time to merge for the turn)
- When bikeways intersect
- At intervals of ½ to one mile (based on density of streets) along routes with no designated bicycle facilities.

Design References

- MUTCD – California Supplement
- City of Oakland. 2009. Guidelines for Bicycle Wayfinding Signage

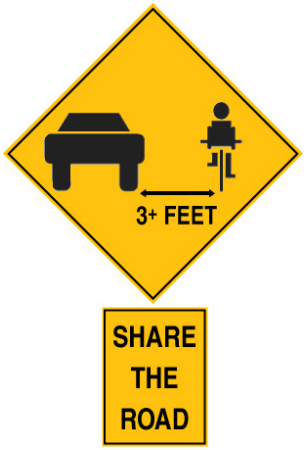
Materials Cost

- Sign, regulation: $150 each

Guidance

R4-11

Share The Road Signs (CA MUTCD)



Utah Share The Road Sign (Missouri Bicycle Federation)

Trail/Shared Use Path Lighting

Description

Lighting improves safety and enables the facility to be used year-round. However, lighting can be detrimental to sensitive habitats and undesired by neighbors. Lighting concerns are minimizing light pollution, maintaining a dark night sky, and protecting the light from vandalism.

Lights should not have a visible source, as it can blind users and pollute the night sky. Globes, acorns, and other light types that are not shielded on the top light the sky and should be avoided. Lights can have screens to avert the glare from neighbors, be programmed to be motion-actuated, or dim or turn off later in the night. Lighting should not be used near sensitive wildlife habitat areas.

Bollards provide an effective mounting location for pathway lighting. Their low height and frequent locations reduce light pollution by keeping the illumination source close to the trail surface. There are many types of lighting bollards available. Solar powered bollards lit by LEDs can last about 20 times longer than incandescent bulbs. Low-level lighting can be problematic due to their easy access for vandalism.

Inlaid lighting are usually dim lights which indicate the extent of the path. They can be artistic and can assist with placemaking on trails.

Solar Lighting can be used where running power to a trail would be costly or undesirable. Benefits include reduced carbon emissions, potential cost reduction of infrastructure and related maintenance, and increased flexibility in lighting design. Examples of existing multi-use trails lit by solar power include trails on the University of Wisconsin campus and the Metropolitan Branch Trail in Washington D.C.

Application

- Any trail built with transportation funding must be open 24/7 and should be lighted.
- Average maintained horizontal illumination levels of 5 lux to 22 lux should be considered (AASHTO). Where special security problems exist, higher illumination levels may be considered.
- The California Energy Commission defines mandatory standards for dark sky compliant lights, including minimum lamp efficacy requirements, cut-off requirements, automatic shutoff controls, and multi-level switching (See California Title 24, Section 6.)
- Light standards (poles) should meet the recommended horizontal and vertical clearances in AASHTO.
- Install fixtures near benches, drinking fountains, bicycle racks, trailheads, and roadway and trail crossings.

Design References

- Caltrans Highway Design Manual (Chapter 1000 Section 1003.1(16))
- AASHTO Guide for the Development of Bicycle Facilities, Chapter 2
- See *VTA Pedestrian Guidelines* Section 4.2B, Table 4.1 for recommended illuminance values for walkways.

Design Example

Bollard lighting can be used along trails to minimize night sky impacts.

Inlaid lightin at the Kansas City Art Institute (source: Bowman Bowman Novic, Inc.

Exhibit 1 Solar lighting is used along the Metropolitan Branch Trail in Washington, D.C. Source: http://www.thewashcycle.com

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Appendix B. Municipal Code Bicycle Parking Recommendations

B.1 Bicycle Parking Design Guidance

Palo Alto Municipal Code Section 18.54.060 discusses specific guidance for types of bicycle facilities. The recommendations are as follows, with recommended additional text in italics and removed text in strikethrough.

1. Short-Term Bicycle Parking ~~(Bicycle Racks)~~

Short-term bicycle parking is intended for shoppers, customers, and visitors who require bicycle storage for up to ~~several~~ *two* hours.

(A) Bicycle Rack

An acceptable bicycle rack is a stationary object to which the bicycle user can lock the frame and one or both wheels of a bicycle with a user-provided high-security U-shaped lock ("U-lock") or cable, and which is either anchored to an immovable surface or is heavy enough that it cannot be easily moved.

i. *Intended Use*

Bicycle racks located in publicly accessible areas are intended for short-term parking, to encourage shoppers, customers, and visitors to use bicycles.

ii. *Performance*

All bicycle racks provided pursuant to this ordinance shall support a bicycle by its frame in a stable upright position with both tires on the ground or floor, without damage to the bicycle *wheels, frame, components,* or its finish *and provide two points of contact with the bicycle's frame or wheel.*[6] The parts of the rack that secure the bicycle shall resist disassembly and cutting with manual tools. Bicycle racks should provide independent access to parked bicycles without the need for awkward movements even when the rack is fully loaded.

2. Long-Term Bicycle Parking

Long-term bicycle facilities are intended for bicyclists who need to park a bicycle and its components and accessories for *two hours or more* ~~extended periods during the day, overnight or for a longer duration~~. Long-term bicycle storage is typically for employees, students, residents and commuters. The facility ~~frequently~~ *should* protect~~s~~ the bicycle from inclement weather *with a free-standing shelter or an indoor cage or room.* ~~Four~~ Design alternatives for these facilities are as follows:

(A) Bicycle Locker

[6] Some popular bicycle racks do not technically comply with the requirement to have two points of contact with the frame; however, these rack designs provide the stability control intent by including the wheel. Specific examples used in Palo Alto include the Bike Arc and the Lightning Bolt racks.

A bicycle locker is a fully enclosed space for one bicycle, accessible only to the owner or operator of the bicycle. It protects the entire bicycle, its components and accessories from theft and inclement weather, including wind-driven rain. Bicycle lockers may be pre-manufactured or may be designed for individual sites.

i. Intended Use

Bicycle lockers are the preferred long-term storage option for employees or residents.

ii. Locking Device

Internal Lock. A bicycle locker must be equipped with an internally mounted key-actuated or electronic locking mechanism, and not lockable with a user-provided lock. Groups of internal-lock bicycle lockers may share a common electronic access mechanism provided that each locker is accessible only to its assigned user.

External Lock. An external-lock such as padlock hasps are not acceptable for most uses. External lock bike lockers may be permitted in shopping centers with the approval of the director on a case-by-case basis.

(B) Restricted-Access Bicycle Enclosure

A restricted-access bicycle enclosure is a locked area containing within it one bicycle rack space for each bicycle to be accommodated, and accessible only to the owners or operators of the bicycles parked within it. The maximum capacity of each restricted-access bicycle enclosure shall be 20 bicycles unless approved by Transportation Division staff. The doors of such enclosures must be fitted with key or electronic locking mechanisms that admit only users and managers of the facility. The enclosure doors must close and lock automatically if released.

~~In multiple-family residential developments, a common locked garage area incorporating bicycle racks shall be deemed a restricted-access bicycle enclosure provided that the garage is accessible only to the residents of the units for whom the garage is provided. In such cases it is preferable that the bicycle storage area within the garage be separately enclosed and secured to enable access only by bicycle owners.~~ (Note: text moved to B.iii.)

i. *Intended Use*

A restricted access enclosure is an alternative long term bicycle storage option for commercial and multifamily residential projects.

ii. Acceptable Racks

Bicycle parking facilities within a restricted-access enclosure can be racks, similar to those provided in short term storage (see previous section). Alternative rack types include wall-mounted racks or two-tier/double decker racks. A usable space two feet wide by six feet long shall be provided for each stored bicycle.

iii. Multi-Family Residential Developments

In multiple-family residential developments, a common locked garage area incorporating bicycle racks shall be deemed a restricted-access bicycle enclosure provided that the garage is accessible only to the residents of the units for whom the garage is provided. In such cases it is preferable that the bicycle storage area within the garage be separately enclosed and secured to enable access only by bicycle owners. The

required bicycle storage and household storage areas for each dwelling unit may be combined into a multifamily dwelling unit storage locker assigned to that unit, provided that the total space requirement shall be the sum of the household storage and bicycle storage requirements computed separately. (Note: text moved from B and C.)

iv. School Bicycle Enclosure

A school bicycle enclosure is a locked area at a primary, middle or secondary school, containing within it one bicycle rack space for each bicycle to be accommodated. The doors of such enclosures must be fitted with locking mechanisms that admit only school and maintenance staff, and must close and lock automatically if released. School bicycle enclosures should be kept locked except during student arrival and departure periods. The student bicycle parking requirement for a school may be provided by two or more enclosures where students arrive on bicycles from two or more points along the school perimeter. (Note: text moved from D).

~~(C) Multifamily Dwelling Unit Storage Locker~~ (Note: text moved to B.iii.)

~~A multifamily dwelling unit storage locker is a locked area separate from the dwelling unit, secured by a lock that can be opened only by the occupants of the respective dwelling unit.~~

~~i. *Intended Use*~~

~~A multifamily dwelling unit storage locker is intended for long-term storage of household possessions that are not kept in the dwelling unit, including bicycles.~~

~~ii. *Configuration*~~

~~In multiple-family developments, the required bicycle storage and household storage areas for each dwelling unit may be combined into a multifamily dwelling unit storage locker assigned to that unit, provided that the total space requirement shall be the sum of the household storage and bicycle storage requirements computed separately. A usable space 2' wide by 6' long shall be provided for each stored bicycle.~~

~~(D) School Bicycle Enclosure~~(Note: text moved to B.iii.)

~~A school bicycle enclosure is a locked area at a primary, middle or secondary school, containing within it one bicycle rack space for each bicycle to be accommodated. The doors of such enclosures must be fitted with locking mechanisms that admit only school and maintenance staff, and must close and lock automatically if released. School bicycle enclosures should be kept locked except during student arrival and departure periods. The student bicycle parking requirement for a school may be provided by two or more enclosures where students arrive on bicycles from two or more points along the school perimeter.~~

B.2 Bicycle Parking Location and Placement Guidance

Palo Alto Municipal Code Section 18.54.060B provides design standards for bicycle parking facilities. The following text presents the Municipal Code language, with recommendations for additions in italics and deletions in strikethrough. The recommendations are intended to clarify design requirements and allow for innovative bicycle parking facility types.

1. Location

~~(A) Neither short-term nor long-term bicycle parking areas shall be located inside occupied buildings.~~

(B) All bicycle parking areas shall be located at street floor level, or equivalent in a parking garage. ~~In underground garages, only long-term bicycle parking is allowed and such bicycle parking facilities must be located near employee elevators or stairwells.~~ (Note: moved to D).

(C) Short-term bicycle parking shall be located *in a well trafficked location visible from the entrance*, *preferably* within 50 feet of a main visitor entrance(s). Where there is more than one building on a site or where a building has more than one main entrance, the short-term bicycle parking must be distributed to serve all buildings or main entrance(s). *The main building entrance excludes garage entrances, trash room entrances, and other building entrances that are not publicly accessible.*

(D) ~~Long-term bicycle parking shall be situated at least as conveniently as the nearest convenient vehicle parking area.~~ *Long-term bicycle parking shall be located on site or within two hundred feet of the main building entrance. The main building entrance excludes garage entrances, trash room entrances, and other building entrances that are not publicly accessible. In underground garages, only long-term bicycle parking is allowed and such bicycle parking facilities must be located near employee elevators or stairwells.* (Note: moved from B).

(E) If required bicycle parking is not visible from the street or main building entrance, a sign must be posted at the main building entrance indicating the location of the bicycle parking.

2. Layout

(A) A bicycle parking space shall be at least two and a half feet in width by six feet in length to allow sufficient space between parked bicycles.

(B) Convenient access to bicycle parking areas shall be provided.

i. Where access is via a sidewalk or pathway, or where the bicycle parking area is next to a street, curb ramps shall be installed where appropriate.

ii. A ~~twenty-four~~ *thirty*-inch side clearance shall be provided between walls or other obstructions and the centerline of the ~~bicycles parked on the~~ nearest bicycle rack. *Large retail uses, supermarkets, grocery stores are encouraged to locate racks with a thirty-six inch clearance in all directions from any vertical obstruction, including but not limited to other racks, walls, and landscaping.*

iii. A minimum four foot aisle shall be provided to allow bicycles to maneuver in and out of the bike parking areas and between rows of bicycle parking facilities. An aisle into which the door of a bicycle locker opens shall be at least five feet wide. Aisle width shall be measured between the rectangular areas that bicycles will occupy when parked on bicycle racks and/or the surface area occupied by bicycle lockers. (Note: text moved from E.)

(C) Bicycle facilities shall be separated from vehicle parking and circulation areas by a physical barrier *such as a curb, wheel stop, pole, bollard, or similar feature capable of preventing automobiles from entering the designated bicycle parking area* ~~or by a distance sufficient to protect parked bicycles from damage by vehicles, including front and rear overhangs of parked or moving vehicles~~.

(D) Covered bicycle parking should be provided as specified below.

i. If more than 10 short-term spaces are required, at least fifty percent (50%) must be covered.

ii. *Short-term bicycle parking facilities serving community activity centers such as libraries and community centers should incorporate weather-protective enclosures shielding the designated bicycle area from typical inclement weather when feasible.*

iii. *Long-term bicycle parking shall be covered.*

~~(E) A four foot (4') wide aisle shall be provided to allow bicycles to maneuver in and out of the bike parking areas and between rows of bicycle parking facilities. An aisle into which the door of a bicycle locker opens shall be at least 5' wide. Aisle width shall be measured between the rectangular areas that bicycles will occupy when parked on bicycle racks and/or the surface area occupied by bicycle lockers.~~ Note: This recommendation was moved to (B. iii).

~~(F) Where a public sidewalk or walkway serves as an aisle of a bicycle parking area and bicycles are parked perpendicular to that sidewalk or walkway, an additional 12" of paved area shall be provided between the sidewalk and the area occupied by adjacent parked bicycles.~~

(G) *Bicycle parking facilities shall not impede pedestrian or vehicular circulation.*

i. *Bicycle parking racks located on sidewalks should be kept clear of the pedestrian through zone.*

ii. Where a public sidewalk or walkway serves as an aisle of a bicycle parking area and the doors of bicycle lockers open toward that sidewalk or walkway, the lockers shall be set back so an open door does not encroach onto the main travel width of the sidewalk or walkway.

3. Paving

Bicycle parking areas shall be paved. Aisles and primary access areas shall be paved with asphalt or concrete. Bicycle parking areas may be surfaced with alternate paving materials as approved by the director.

4. Lighting *and Visibility*

(A) Lighting of not less than one foot-candle of illumination at ground level shall be provided in both exterior and interior bicycle parking areas.

(B) In order to maximize security, whenever possible short-term bicycle parking facilities shall be located in areas highly visible from the street and from the interior of the building they serve (i.e. placed adjacent to windows).

5. Signage

(A) Where bicycle parking areas are not clearly visible to approaching bicyclists, signs shall be posted at the building entrance to direct cyclists to the facilities. (MUTCD sign D4-3 for bicycle parking). For bicycle parking areas intended for visitors, that entrance shall be the building's main entrance. For bicycle parking areas intended for employees, that entrance shall be the employee entrance served by the bicycle parking area.

(B) Long-term bicycle parking areas that incorporate bicycle lockers shall be identified by a sign at least 12"x12" in size that lists the name or title, and the phone number or electronic contact information, of the person in charge of the facility.

(C) Signs for restricted-access bicycle enclosures shall state that the enclosure shall be kept locked at all times.

6. Approval

(A) The director shall have the authority to review the design of all bicycle parking facilities required by this chapter with respect to safety, security, and convenience.

(B) Where bicycle lockers or restricted access bicycle enclosures are required for a use, the director may approve secure bicycle storage facilities providing the same level of security. The Transportation Division must approve bicycle parking areas located in parking garages.

B.3 Development Requirements

The Municipal Code requires bicycle parking by land use, specifying short- and long-term parking requirements as listed in **Table B-1.**

Table B-1. Minimum Off-Street Bicycle Parking Requirements

Use	Spaces	Parking Type Distribution
Residential Uses		
Single-Family Residential (Primary Unit)	None	N/A
Two-Family Residential (R-2 & RMD)	1 space per unit	100% long term
Multiple-Family Residential	1 space per unit	100% long term
Guest Parking	1 space per 10 units	100% short term
Educational, Religious, and Assembly Uses		
Business and Trade Schools	1 space per 40-person capacity or per 2,500 sf, whichever is greater	40% long term; 60% covered short term
Religious Institutions	1 space per 40 seats or 40-person capacity or per 2,500 sf, whichever is greater	20% long term; 80% covered short term, or as adjusted by the director as part of a conditional use permit
Mortuaries	2 spaces	100% short term
Private Schools and Educational Facilities		
Elementary	1 space per every 5 students	100% short term, enclosed
Grades 6-8	1 space per every 5 students	100% short term, enclosed
Grades 9-12	1 space per every 5 students	100% short term, enclosed
Private Clubs, Lodges, and Fraternal Organizations	1 space per 40 seats or 40-person capacity, based on maximum use of all space at one time	20% long term; 80% short term
Recreation Uses		
Commercial Recreation (health and fitness clubs)	1 space per 16-person capacity, or as adjusted by the director as part of a conditional use permit	20% long term; 80% covered short term, or as adjusted by the director as part of a conditional use permit
Community Facilities (swim club, tennis club, golf course, community centers, etc.)	None specified	None specified
Health Care Services		

Use	Spaces	Parking Type Distribution
Convalescent Facilities	1 space per 25 patient beds	2 long term spaces, remainder short
Hospitals	1 space per 25 patient beds	60% long term; 40% short term
Service Uses		
Animal Care Facilities	1 space per 3,500 sf (1 space minimum)	80% long term; 20% short term
Automobile Dealerships, Services & Service Stations	1 space per 10 employees	100% short term
Day Care Centers	1 space per 6 employees	100% short term
Day Care Homes	None	N/A
Financial Services	1 space per 2,500 sf	40% long term; 60% short term
General Business Services:		
Enclosed	1 space per 2,500 sf	80% long term; 20% short term
Open Lot	1 space per 5,000 sf	100% short term
Personal Services	1 space per 2,000 sf	20% long term; 80% short term
Residential Care Homes	None	N/A
Retail Uses		
Retail:		
Intensive	1 space per 2,000 sf	20% long term; 80% short term
Extensive	1 space per 3,500 sf	20% long term; 80% short term
Open Lot	1 space per 5,000 sf	100% short term
Eating and Drinking Services		
With drive-in or take-out facilities	3 spaces per 400 sf	40% long term; 60% short term
All others	1 space per 600 sf of public service area, plus 1 per 2,000 sf for other areas	None specified
Hotel/Motel/Inn	1 space per 10 guest rooms, plus requirements for accessory uses	100% short term
Shopping Center	1 per 2,750 sf	40% long term; 60% short term
Office Uses		
Administrative Offices:		

Use	Spaces	Parking Type Distribution
In the RP and ROLM districts	1 space per 3,000 sf	80% long term; 20% short term
In all other districts	1 space per 2,500 sf	None specified

Use	Spaces	Parking Type Distribution
Medical, professional, and general business offices		
In the RP and ROLM districts	1 space per 3,000 sf	60% long term; 40% short term
In all other districts	1 space per 2,500 sf	None specified
Manufacturing and Processing Uses		
Manufacturing		
In the RP and ROLM districts	1 space per 3,000 sf	80% long term; 20% short term
In all other districts	1 space per 5,000 sf	None specified
Research & Development		
In the RP and ROLM districts	1 space per 3,000 sf	80% long term; 20% short term
In all other districts	1 space per 2,500 sf	None specified
Warehousing & Distribution		
In the RP and ROLM districts	1 space per 3,000 sf	80% long term; 20% short term
In all other districts	1 space per 10,000 sf	None specified
All other uses		
	To be determined by the director	

Source: Palo Alto Municipal Code Section 18.52.040 Table 1.

Appendix C. BTA Requirements Checklist

The Bicycle Transportation Account (BTA) is the most common source of bicycle facility funding in the State of California. BTA funds can fund City projects that improve safety and convenience for bicycle commuters. In order for Palo Alto to qualify for BTA funds, its Master Plan must contain specific elements. **Table C-1** shows the requisite BTA components and their location within this plan. The table includes "Approved" and "Notes/Comments" columns for the convenience of the Caltrans official responsible for reviewing compliance.

Table C-1: BTA Requirement Checklist

Approved	Requirement	Page(s)	Notes/Comments
	Existing and future bicycle commuters	B-3 and B-4	See Tables B-2 and B-3.
	Land-use map/population density	3-21	Map 3-3
	Existing and proposed bikeways	3-21 and 6-3	Maps 3-3 and 6-1
	Existing and proposed bicycle parking facilities	3-26 and 5-12	Sections 3.4 and 5.2.10
	Existing and proposed multi-modal connections	5-4 and 6-10	Sections 5.1.4 and 6.1.6
	Existing and proposed facilities for changing and storage	3-26 and 5-12	Sections 3.4 and 5.2.10
	Bicycle safety and education programs	3-31 and 5-23	Sections 3.5.3 and 5.4
	Citizen and community involvement	1-4 and C-1	Section 1.5 and Appendix D
	Consistency with transportation, air quality, and energy plans	1-2 and D-1	Section 1.4 and Appendix E
	Project descriptions / priority listings	7-3	Table 7-1
	Past expenditures and future financial needs	7-24	Section 7.3

Demand and Benefits Model

A key goal of this Plan is to maximize the number of pedestrians and bicyclists in order to realize multiple benefits, including improved health, less traffic congestion, and better air quality levels. In order to achieve this, a better understanding of the number of existing and potential pedestrians and bicyclists is needed. The US Census collects only the primary mode of travel to work and it does not consider trips made by walking or bicycling when they are a component of a transit trip or if they are to school or for any non-work reason. Alta Planning + Design has developed a demand model that estimates usage based on available empirical data.

Calculations are included in this Plan to meet Caltrans Bicycle Transportation Account (BTA) requirements to provide "the estimated number of existing bicycle commuters in the Plan area and the estimated increase in the number of bicycle commuters resulting from implementation of the Plan." BTA compliance is important to Palo Alto's bicycle and pedestrian plan in order to grant proposed projects eligibility for funding from the State of California's BTA (approximately $7.2M, annually).

The model uses a market segment approach to estimate the number of bicycling or walking trips taken by populations that traditionally have a higher bicycle/walking mode split than work commuters (such as elementary school and college students). National transportation surveys, in particular the *National Household Travel Survey* (NHTS, 2009), have shown that commute trips are only a fraction of total trip an individual takes on a given day. The model uses the NHTS findings to estimate the number of non-work, non-school trips taken by commuters to determine the number of walking or bicycling trips that occur in a day.

Data Used in the Model

Journey-to-work information collected by the US Census Bureau's *American Communities Survey* (ACS) is the foundation of this analysis. The most recent ACS data available for the City of Palo Alto is the 2005-2009 five-year estimate. Model variables from the ACS include total population, employed population, school enrollment, and travel-to-work mode split.

The 2009 NHTS provides a trip type multiplier to estimate the number of utilitarian walking and bicycling trips made for non-commute reasons, such as shopping and running errands. Although these trips cannot be directly attached to a certain group of people (not all of the utilitarian bicycling trips are made by people who bicycle to work) these multipliers allow a high percentage of the community's walking and bicycling activity to be captured in an annual estimate.

Where available, local data were incorporated into this analysis. The VTA *2005-2006 On-Board Passenger Survey Final Report* states that 71 percent of passengers access transit by walking, while three percent bicycled. Data from the City/School Traffic Safety Committee, City/School Liaison, and Safe Routes to School Task Forces indicate that the average walking mode split to school is 23 percent, while the average bicycling mode split is 17 percent.

Existing Walking and Bicycling Trips

Table C-2 shows the results of the model, which estimates that almost 17,000 bicycle trips and more than 30,000 walking trips occur in Palo Alto each day. Based on the model assumptions, the majority of trips are non-work utilitarian trips, which include medical/dental services, shopping/errands, family personal business, obligations, transport someone, meals, and other trips.

Table C-2: Estimate of Current Walking and Bicycling Trips in Palo Alto

	Bicycling	Walking	Source
Commute Trips *(includes walking, bicycling, and walking or bicycling to transit trips)*			
Bicycle/ walking commuters	1,918	1,533	ACS 2005-2009
Weekday bicycle/walking trips	3,836	3,066	Number of walk or bike commuters multiplied by two for return trips
Total transit commuters	1,123		ACS 2005-2009 (Includes bus and Caltrain)
Bike- or walk-to-transit mode split	3%	71%	VTA 2005-2006 On-Board Passenger Survey Final Report
Bike- or walk-to-transit commuters	34	797	Number of transit commuters multiplied by mode split
Weekday bike- or walk-to-transit commute trips	67	1,595	Number of walk- or bike-to-transit commuters multiplied by two for return trips
Weekday bicycle/ walking commute trips	3,903	4,661	Number of commuters multiplied by two for return trips
School Trips			
K-12 bicycle/ walking commuters	2,341	3,167	School children population multiplied by mode split
Weekday K-12 bicycle/ walking trips	4,681	6,334	Number of student bicyclists multiplied by two for return trips
College Trips			
College bicycle/ walking commuters	986	242	Total full-time graduate and undergraduate enrollment (8,352) divided by 2007 university mode split (2.9% walk; 11.8% bicycle). Source: http://ucomm.stanford.edu/cds/2010.html
Weekday bicycle/ walking college trips	1,971	484	Number of college student bicyclists multiplied by two for return trips
Utilitarian Trips			
Daily adult bicycle/walking commute trips	5,874	5,145	Number of bicycle/walking trips plus number of bicycle/walking college trips
Daily bicycle/walking utilitarian trips	9,201	18,086	Utilitarian bicycle/walking trips multiplied by ratio of utilitarian to work trips (NHTS). Distributes weekly trips over entire week (vs. commute trips over 5 days)
Total Current Daily Trips	***19,757***	***29,565***	

Potential Future Walking and Bicycling Trips

Estimating future benefits requires additional assumptions regarding Palo Alto's future population and anticipated commuting patterns in 2035. The *Valley Transportation Plan* 2035 notes the Association of Bay Area Governments' (ABAG) projections for 27 percent population growth and 46 percent employment growth in Santa Clara County. The model uses these estimates to calculate the future conditions in Palo Alto. While the walking and bicycling mode splits would likely increase due to the improvements recommended in this Plan, they were kept the same for comparison purposes. **Table C-3** shows the projected future demographics used in the future analysis.

Table C-3: Estimate of Future 2035 Walking and Bicycling Trips in Palo Alto

	Bicycling	Walking	Source
Commute Trips			
Bicycle/ walking commuters	2,800	2,238	Employed population from VTA *Valley Transportation Plan* multiplied by mode split, (ACS 2005-2009)
Transit commuters	1,640		Ratio from ACS 2005-2009
Access to transit	3%	71%	VTA 2005-2006 On-Board Passenger Survey Final Report
Walk- or bike-to-transit commuters	49	1,164	Number of transit commuters multiplied by mode split
Weekday transit bicycle /walking commute trips	98	2,328	Number of transit bicycle/walking commuters multiplied by two for return trips
Weekday bicycle/ walking commute trips	5,699	6,805	Number of commuters multiplied by two for return trips
School Trips			
K-12 bicycle/ walking commuters	2,025	2,740	School children population multiplied by mode split
Weekday K-12 bicycle/ walking trips	4,050	5,479	Number of student bicyclists multiplied by two for return trips
College Trips			
College bicycle/ walking commuters	1,252	308	Employed population multiplied by commute mode split
Weekday bicycle/ walking college trips	2,503	615	Number of college student bicyclists multiplied by two for return trips
Utilitarian Trips			
Daily adult bicycle/walking commute trips	8,202	7,420	Number of bicycle/walking trips plus number of bicycle/walking college trips
Daily bicycle/walking utilitarian trips	12,847	26,082	Utilitarian bicycle/walking trips multiplied by ratio of utilitarian to work trips (NHTS). Distributes weekly trips over entire week (vs. commute trips over 5 days)
Total Future Daily Trips	***25,099***	***38,981***	

Appendix D. Public Outreach and Survey Summary

This appendix presents the community outreach conducted as part of this Bicycle and Pedestrian Plan. Outreach included the following components:

- Two meetings with Palo Alto Pedestrian and Bicycle Advisory Committee
- Two meetings with City/School Traffic Safety Committee
- Two meetings with the Planning and Transportation Commission
- Two presentations to City Council, including a Bicycle Tour
- Two Public Workshops
- One Online Survey with 515 responses
- Ongoing information and past presentations via Palo Alto Bicycle Program website and six-week public draft plan review period (plan and comments supplied/received) via dedicated (Alta-hosted) website

Each component provided essential data and information that informed the recommendations in this plan, as described in the following sections.

Pedestrian and Bicycle Advisory Committee

The Palo Alto Pedestrian and Bicycle Advisory Committee (PABAC) is a citizen advisory committee that reports to the Chief Transportation Official. PABAC members have interest in or knowledge of pedestrian and bicycling issues. PABAC's role is to review all issues related to walking and bicycling in the areas of engineering, enforcement, education, and encouragement.

During the development of this Plan, the consultant and City staff met with PABAC twice. PABAC provided input on the goals and objectives of this plan at the first meeting and on the recommendations at the second meeting.

Public Meetings

The public was actively engaged in the development of this plan. In addition to attending PABAC meetings, the public provided input on the policy and design priorities of this plan at an open house held in March 2011 and during a public review session of the draft BPTP in July 2011.

Community Survey

A community survey was administered in March and April 2011. The survey was available online and promoted via email list distributions and press release. Five hundred fifteen people responded to the survey and 457 of those respondents completed the questionnaire in its entirety. The questionnaire asked 39 questions regarding bicycle and pedestrian behavior, frequency and facility preference. Questions were phrased in stated preference and open-ended responses.

The following sections present the results of the most informative questions. Stated-preference questions are presented as response rates, which were calculated by the number of respondents that answered a question, not the total number of survey respondents. Some stated-preference questions permitted respondents to select multiple answers and therefore their response rate totals may exceed 100 percent. Responses to open-ended questions are presented in "wordclouds" to provide a sense of the most frequently cited words.[7]

Respondent Profile

Most respondents were between the ages of 35 and 64 (69 percent) and evenly split between males and females. Eighty eight percent of respondents live in Palo Alto and 62 percent work in Palo Alto.

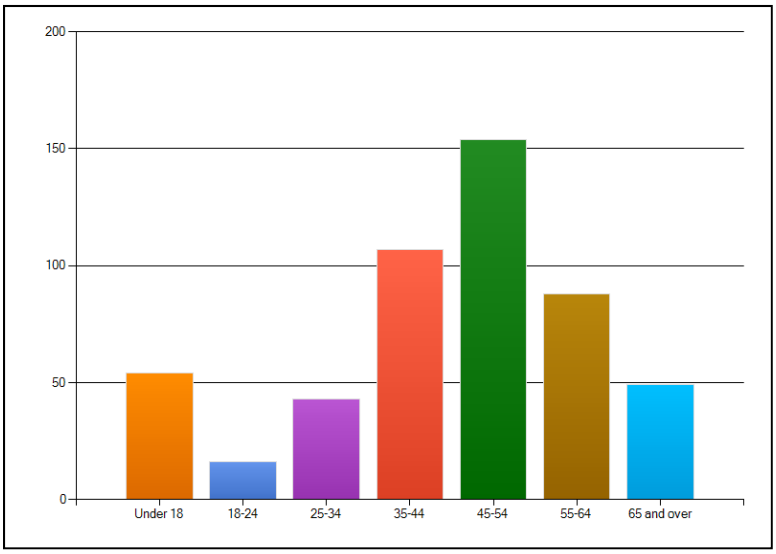

Figure D-1: Age of Respondents

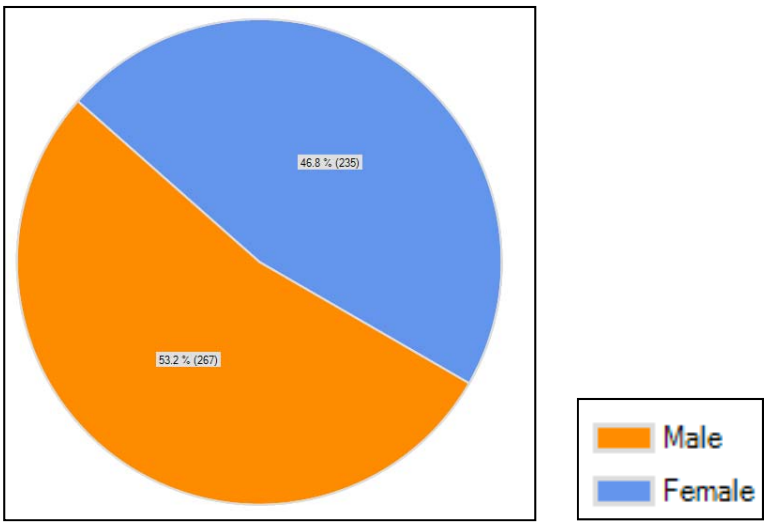

Figure D-2: Gender of Respondents

[7] Wordclouds are groupings of frequently cited words sized by citation frequency to create a visually stimulating graphic that provides a general sense of the question results.

Bicycling Confidence

Most respondents indicated having moderate to high confidence levels when riding a bicycle. Forty five percent of respondents are comfortable riding in most traffic situations regardless of the presence or type of bicycle facilities. Thirty two percent of respondents are comfortable riding in some traffic situations if appropriate bicycle facilities were provided.

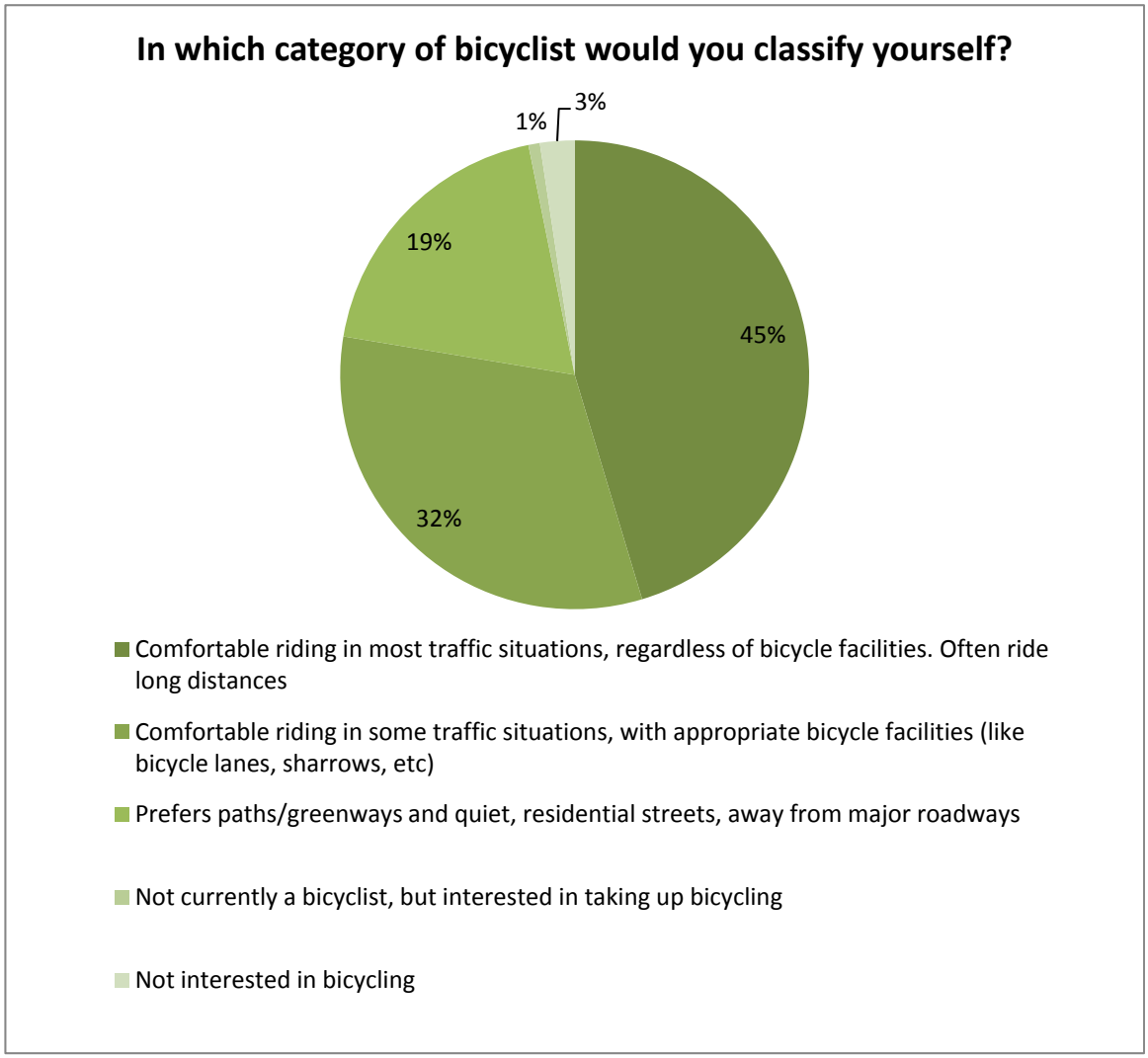

Figure D-3: Bicycling Confidence

Bicycling Frequency

The majority of respondents bicycle at least two to three times a week and three percent of respondents did not ride a bicycle. Respondents that bicycle infrequently or two to three times a month (22 percent) represent a part of the population that will potentially bicycle more if the City provides additional facilities.

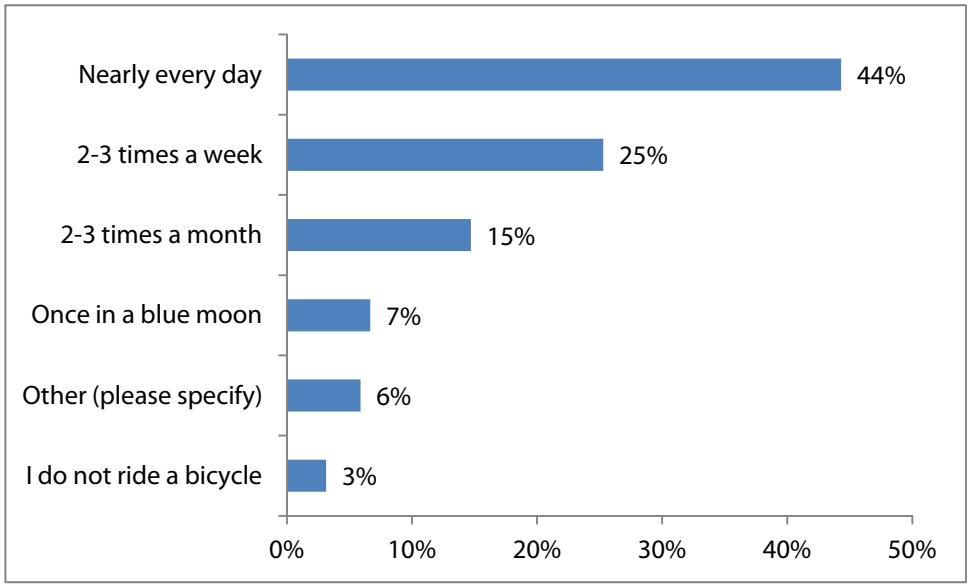

Figure D-4: Bicycling Frequency

Bicycling Trip Purpose

Overall, most respondents bicycle to get to and from work. Bicycling to and from school and for health/fitness were the second and third most popular trip purposes, with an even distribution of ages bicycling for health/fitness. The overwhelming majority (85 percent) of respondents under 18 years of age bicycle to get to and from school. **Figure D-5** presents the complete response results.

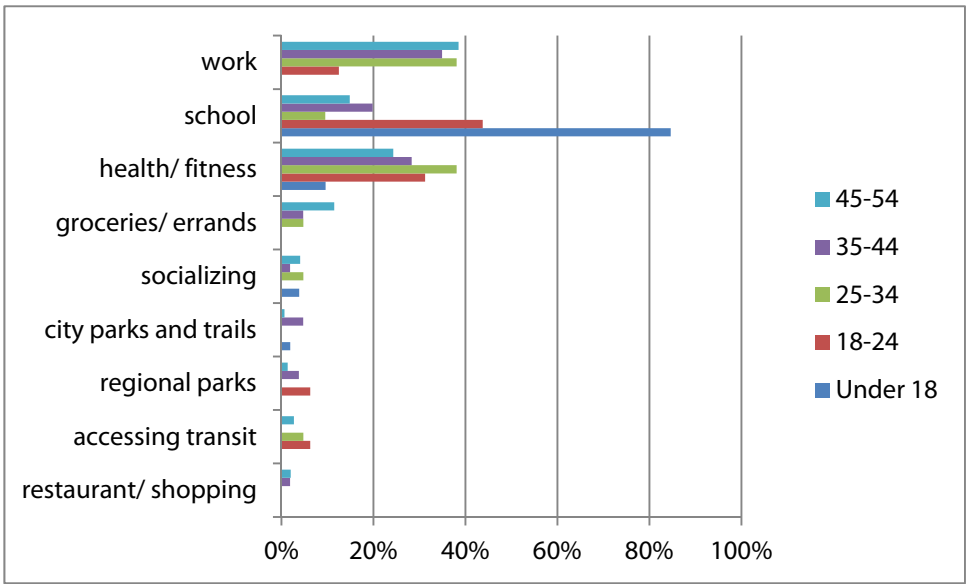

Figure D-5: Bicycling Trip Purpose

Cycletrack Preference

The majority (61 percent) of respondents would definitely feel safer riding on a cycletrack than in a bicycle lane and another 22 percent of respondents would probably feel safer. **Figure D-6** presents the complete results of this question.

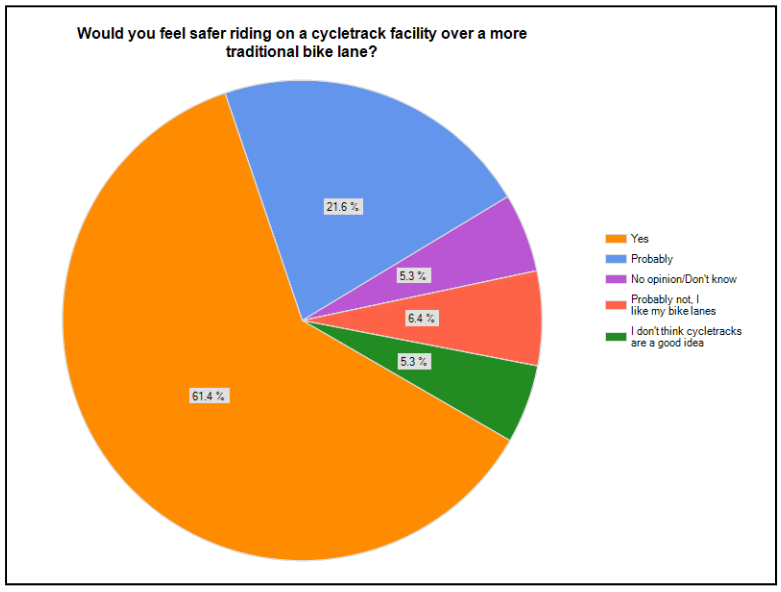

Figure D-6: Cycletrack Preference

A comparison of cycletrack preference and respondent bicycling confidence reveals preference for cycletracks regardless of confidence level. Seventy five percent of bicyclists who are comfortable riding in some traffic situations in addition to 49 percent of bicyclists that are comfortable riding in most traffic situations would definitely feel safer in using a cycletrack.

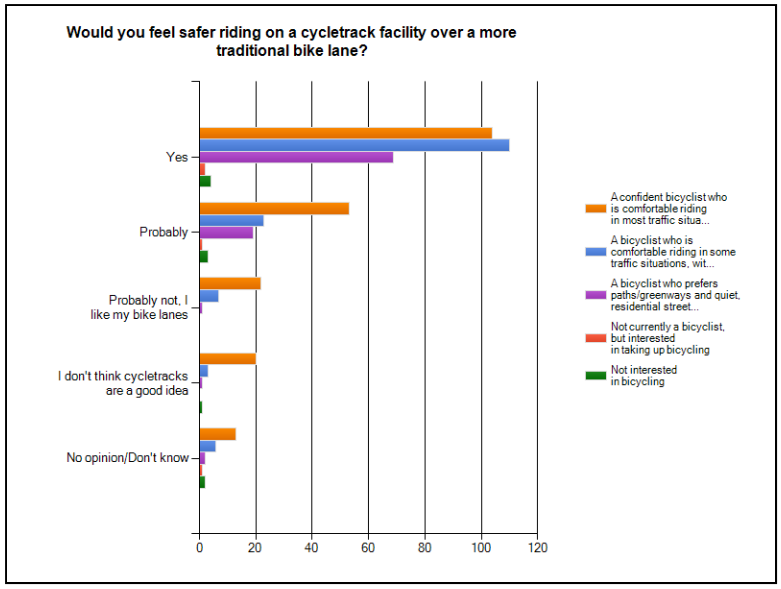

Figure D-7: Cycletrack Preference by Respondent Bicycle Confidence

When asked what streets are good candidates for cycletracks, 26 and 24 percent of people who responded to this question cited El Camino Real and Middlefield Road, respectively.

Desired Locations for Green Bike Lanes

Respondents were asked to identify locations where they would like to see green bike lanes. Of the 233 respondents to this question, 25 percent would like to see green bike lanes on El Camino Real and many of these respondents specifically identified El Camino Real at Embarcadero. Forty-four percent of respondents identified Page Mill with many citing the 280 interchange as the most desired location for green bike lanes. **Figure D-8** presents the most cited roadways for green bike lanes.

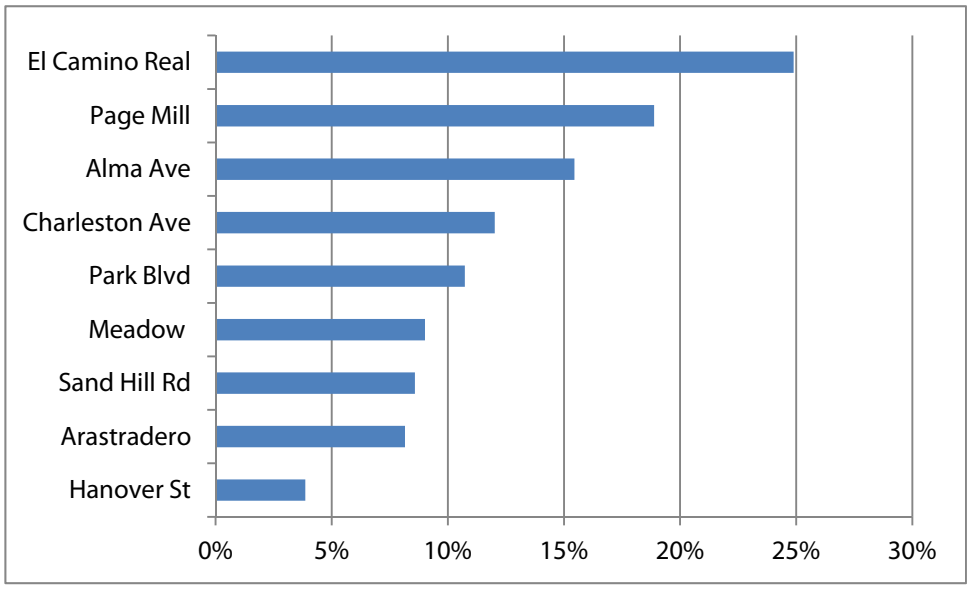

Figure D-8: Desired Locations for Green Bike Lanes

Desired Location for Bike Boxes

Respondents were asked to identify desired locations for bike boxes. Of the 190 respondents to this question, 17 percent cited various intersections on Middlefield Road including El Camino Real, San Antonio, California, and East Meadow. **Figure D-9** presents the most cited roadways where respondents desire bike boxes. Most respondents cited "major intersections" for all of the roadways.

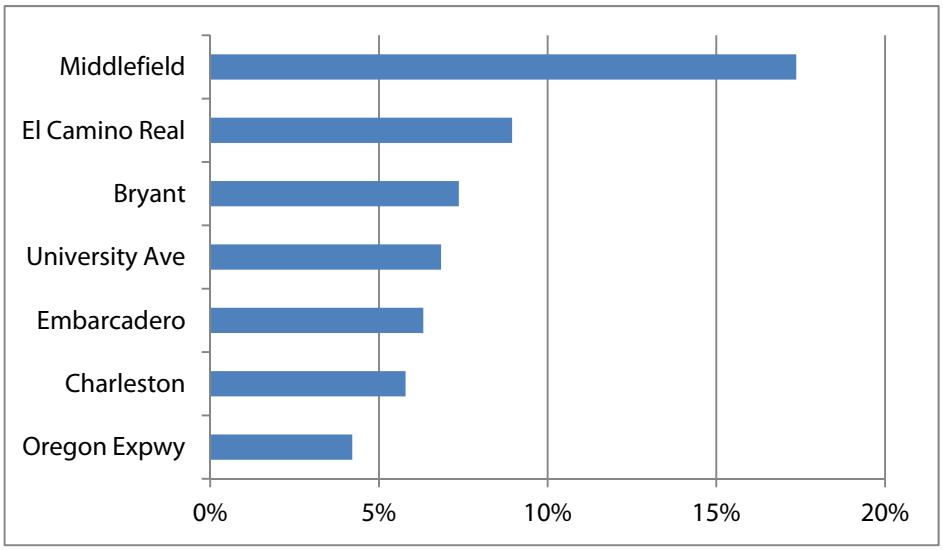

Figure D-9: Desired Locations for Bike Boxes

Back-In Angled Parking Preference

Fifty-four percent of respondents would definitely support a back-in angled parking pilot program and another 20 percent would probably support such a program.

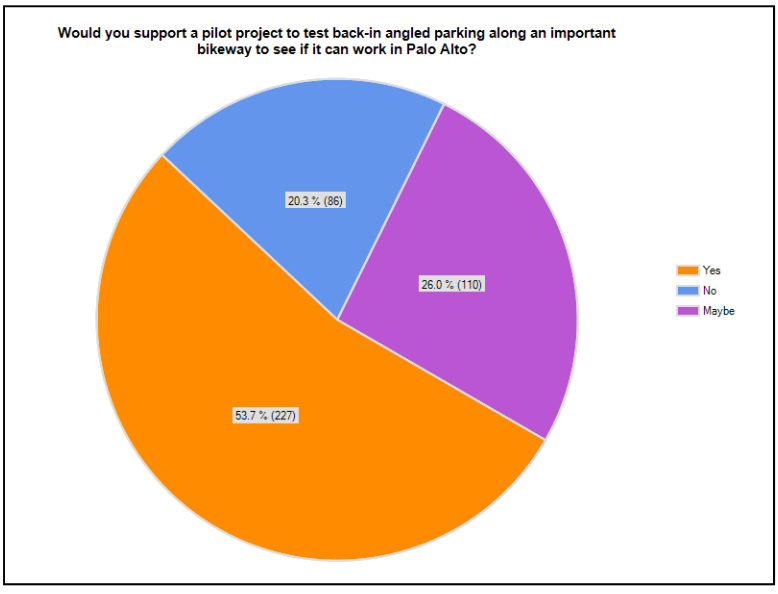

Figure D-10: Back-In Angled Parking Preference

Desired Locations for Bike Parking

Forty-two percent of the 233 respondents to this question would like to see more bike parking along California Avenue. Thirty and 27 percent of respondents would like to see more bike parking in the downtown area and along University Avenue, respectively. **Figure** D-11 presents a wordcloud of desired bike parking locations sized by citation frequency, in which the font size is related to the frequently with which the words were mentioned.

Figure D-11: Desired Locations for Bike Parking Wordcloud

Walking Trip Purpose

Thirty five percent of respondents most commonly walk for health/fitness. Other common trip purposes (cited by 10 to 20 percent of respondents each) include restaurant/shopping, grocery/errands, city parks/trails and schools. A comparison of trip purpose and age reveals that older respondents walk mostly for health/fitness while younger and college-aged respondents walk to get to and from school. **Figure** D-12 presents the complete results on why people walk in Palo Alto.

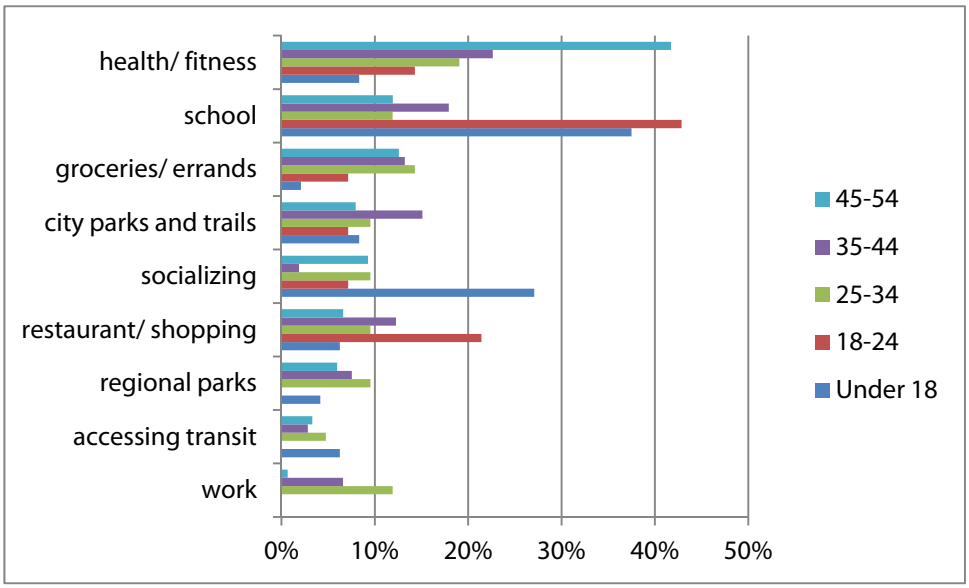

Figure D-12: Walking Trip Purpose by Age

Desired Walking Frequency

Sixty percent of respondents would like to walk more than they currently do. Of these respondents, 54 percent rate "pedestrian countdown signals" and 51 percent rate "more visible" crosswalks as very important.

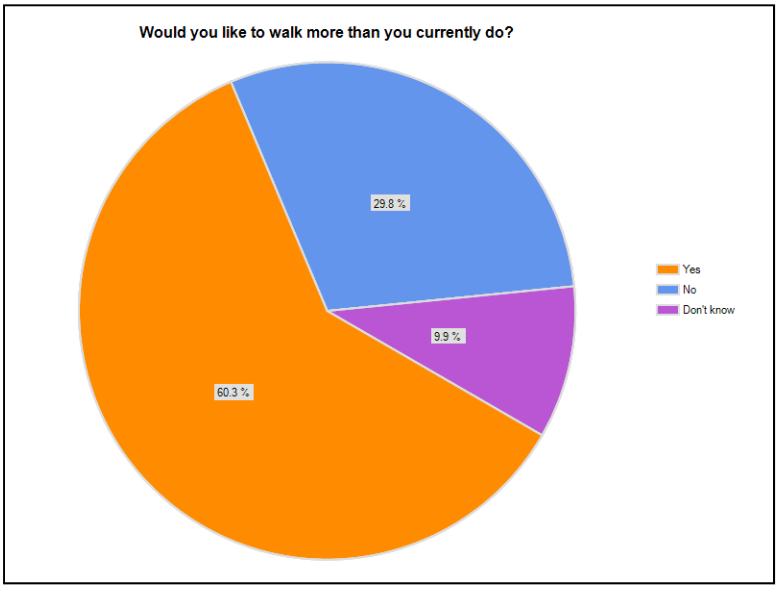

Figure D-13: Desired Walking Frequency

Importance of Pedestrian Improvements

Respondents feel that crossing improvements are "very important." Fifty-four percent and 47 percent of respondents feel that pedestrian countdown signals and crosswalks that are more visible are very important,

respectively. While decorative crosswalks are a crossing improvement, 35 percent of respondents cited them as not important.

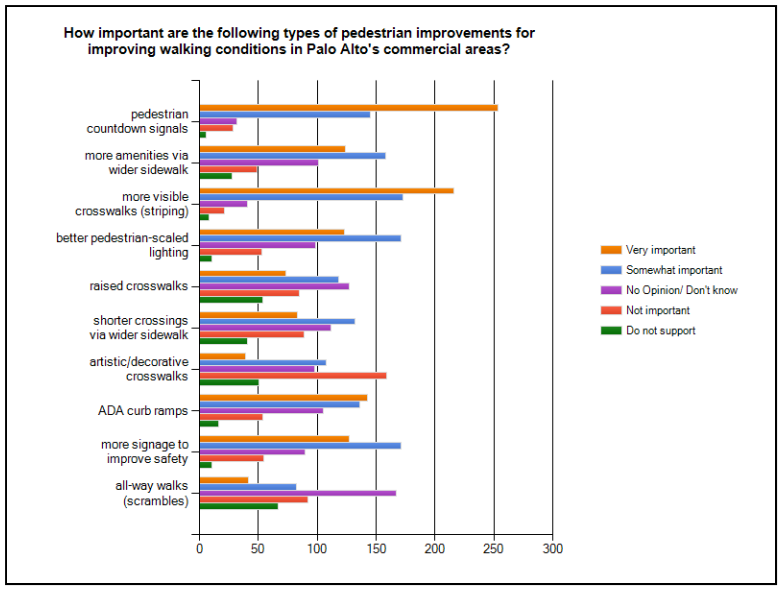

Figure D-14: Importance of Pedestrian Improvements

Location of Preferred Pedestrian Improvements

Respondents were asked to identify preferred pedestrian improvements and locations for those improvements within the downtown or commercial areas. Respondents cited University Avenue the most, followed by El Camino Real, California Avenue, and Middlefield Road. **Figure** D-15 presents a wordcloud of the response results, which sizes words according to citation frequency.

Respondents cited motorist speeding, red light running and failure to yield to pedestrians as frequently occurring on all of the aforementioned streets. In addition, respondents cited that the sidewalks on these streets are too narrow.

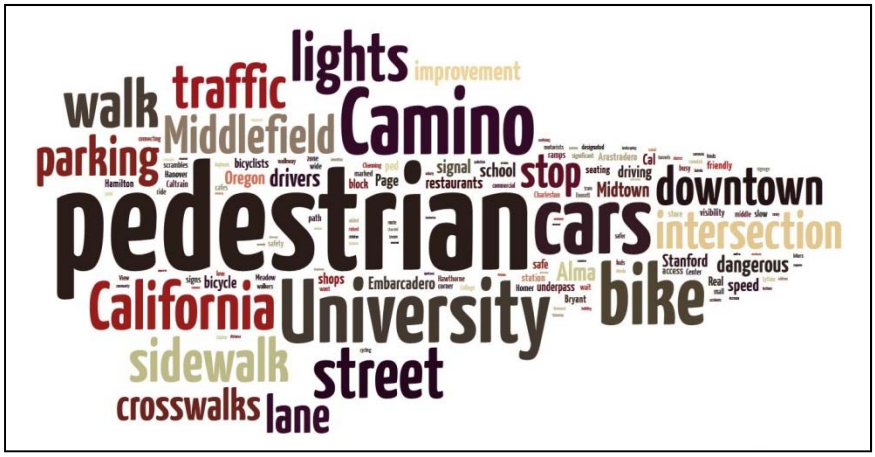

Figure D-15: Location of Preferred Pedestrian Improvements Wordcloud

Importance of Off-Street Trail Improvements

Sixty-one percent of respondents feel that expanding the trail network is very important. Respondents also feel that better street crossings and pavement resurfacing are important improvements while widening existing trails is the least important improvement. **Figure** D-16 presents the complete results of this question.

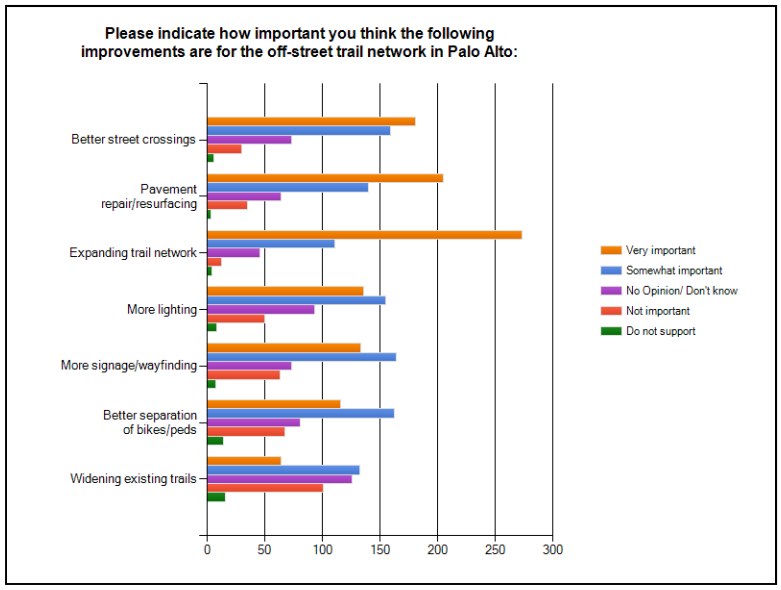

Figure D-16: Importance of Trail Improvements

Importance of Bicycle Facility Improvements

The most respondents (48 percent) feel that expanding the bicycle network should be the City's highest priority when improving bicycle facilities. **Figure** D-17 presents the complete results to this question.

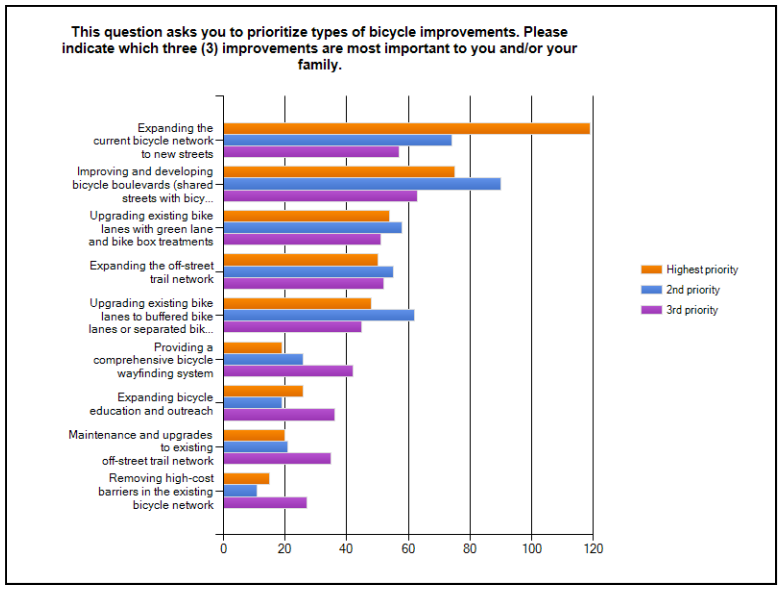

Figure D-17: Importance of Bicycle Facility Improvements

Transit Use Frequency

Of the 56 percent of respondents that answered this question, 75 percent rode Caltrain in the two weeks prior to completing the questionnaire. **Figure** D-18 presents the complete results to this question.

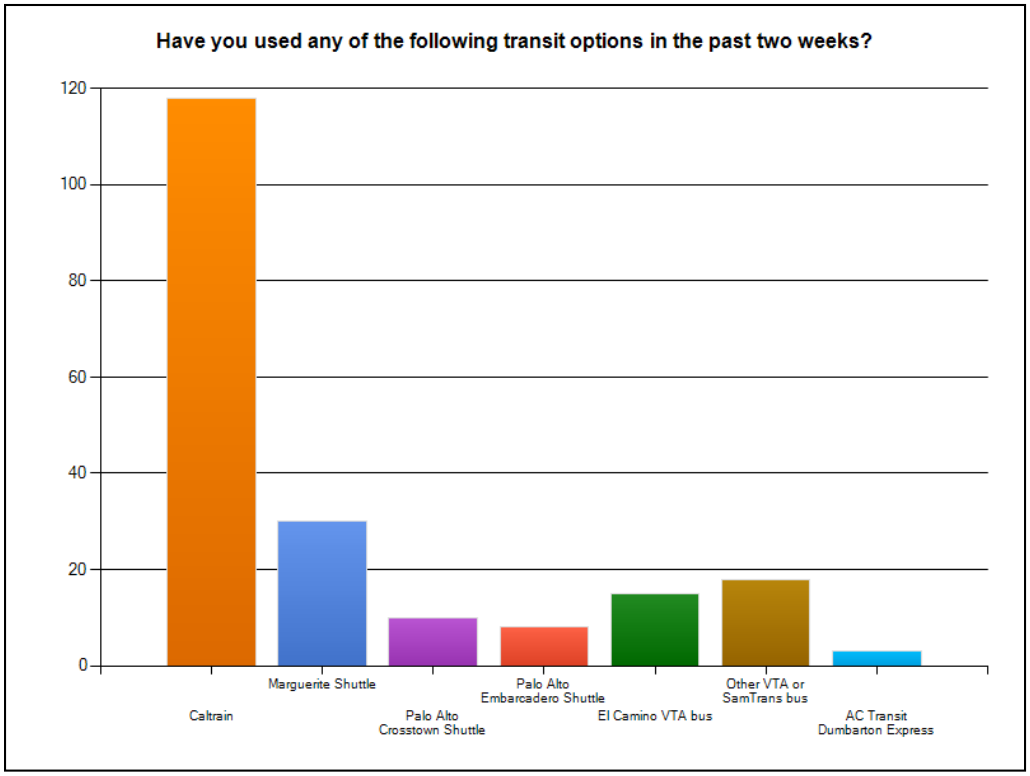

Figure D-18: Transit Use Frequency

Appendix E. Policy and Plan Framework

Planning Overview

The Bicycle and Pedestrian Transportation Plan is influenced by a number of existing plans, policies, and programs that are highly supportive of non-motorized travel and integrated planning. This appendix is a resource summary and select index of those documents and initiatives.

E.1.1 Federal

Numerous plans and policies at the Federal, State, Bay Area and County level guide bicycle and pedestrian planning. These various frameworks establish priorities that can directly influence and show support for non-motorized investments within the City of Palo Alto. The most relevant technical guidelines that directly affect bicycle and pedestrian facility planning and design are also included.

Policy Statement on Bicycle and Pedestrian Accommodation Regulations and Recommendations (March 2010)

This official United States Department of Transportation (DOT) Policy Statement reflects and clarifies the Department's support for the development of fully integrated active transportation networks, and emphasizes the multiple benefits of walking and bicycling. Although not associated with new or modified federal programs or guidelines, the statement does encourage specific actions for improving bicycling and walking conditions, including considering bicycling and walking as equals with other transportation modes, avoiding minimum standards for bicycle and pedestrian facilities, where feasible, in anticipation of future growth in demand, and collecting data on walking and biking trips.

Manual on Uniform Traffic Control Devices (MUTCD) - (2009)

The *Manual on Uniform Traffic Control Devices* (MUTCD), which is administered by the Federal Highway Administration (FHWA), is a compilation of national standards for all traffic control devices, including road markings, highway signs, and traffic signals. It is updated periodically to accommodate the nation's changing transportation needs and address new safety technologies, traffic control tools and traffic management techniques. The MUTCD, the most recent version of which was published in December 2009, includes a separate chapter (Chapter 9) on traffic control standards and guidelines specific to bicycle facilities.

American Association of State Highway and Transportation Officials (AASHTO) - Guide for the Planning, Design, and Operation of Bicycle Facilities (2010 Draft)

Although the principle design reference document published by the American Association of State Highway and Transportation Officials (AASHTO) is often considered A Policy on Geometric Design of Highways and Streets (5th Edition), the Guide for the Planning, Design, and Operation of Bicycle Facilities has emerged as the more relevant and defining publication for technical issues dealing with bicycle facilities. This document - first published in 1981, revised in 1999, and currently making its way through a significant update process – is intended as a design resource for "proven and tested" national best practices in bicycle design. New elements

incorporated into the current draft include guidance on the use of shared lane markings, or "sharrows," and additional information on the design of shared use (bicycle and pedestrian) facilities.

E.1.2 State

A lot has changed at the statewide policy level since the development of Palo Alto's 2003 Bicycle Transportation Plan. Since 2006, the state legislature has signed into law three bills that directly and indirectly support bicycle facility development: the Global Warming Solutions Act, the Sustainable Communities Act, and the Complete Streets Act. Additionally, Caltrans adopted Deputy Directive 64-R-1, which directs Caltrans to provide for bicyclists and pedestrians in all roadway projects.

Assembly Bill 32: Global Warming Solutions Act (2006)

The 2006 Global Warming Solutions Act sets discrete actions for California to reduce greenhouse gas (GHG) emissions to 1990 levels by 2020, which represents a 25% reduction statewide. These actions focus on increasing motor vehicle and other sector efficiencies, and include identification of bicycling as one of several strategies to reduce California's emissions that contribute to global warming.

Senate Bill 375: Sustainable Communities (2008)

Put simply, SB 375 directly links land use planning with greenhouse gas emissions. The law requires the California Air Resources Board to set emissions reduction goals for metropolitan planning organizations. The GHG reduction targets for the Bay Area (adopted in September 2010) are a 7 percent reduction in per capita emissions by 2020 and 15 percent by 2035. Significant reductions in vehicle miles traveled (VMT) is also one of the targets of SB375, which is necessary to meet the state's emission reduction goals.

A Joint Policy Committee comprised of the Association of Bay Area Governments (ABAG), the Metropolitan Transportation Commission (MTC), Bay Area Air Quality Management District, and Bay Conservation and Development Commission is developing the Sustainable Communities Strategy (SCS), pursuant to SB 375. The SCS will include land use and transportation strategies that will allow the region to meet its GHG reduction targets, and will guide the Regional Housing Needs Allocation, the Regional Transportation Plan, and the Regional Transportation Improvement Program. Once those plans are in place, SB 375 will also relax California Environmental Quality Act (CEQA) requirements for certain projects that implement the region's Sustainable Communities Strategy.

Assembly Bill 1358: Complete Streets (2008)

AB 1358 requires the legislative body of any city or county, upon revision of a general plan or circulation element, to ensure that streets accommodate all user types, e.g. pedestrians, bicyclists, transit riders, motorists, children, persons with disabilities, and elderly persons. This requirement took effect as of January 1, 2011, meaning it applies to the Palo Alto Comprehensive Plan update process. The Bicycle and Pedestrian Transportation Plan will help clarify and expand measures to "accommodate" non-motorized users in Palo Alto.

Caltrans Deputy Directive 64-R1: Complete Streets (2008)

Similar to AB 1358, the California Department of Transportation Complete Streets Directive provides guidance for transportation facilities under state jurisdiction. The Directive codified the Department's intention to integrate motorized, transit, pedestrian and bicycle travel by creating complete streets that provide safe travel for all road users, beginning early in system planning and continuing through project delivery and maintenance and operations. In and around Palo Alto there are three such facilities – State Highways 101 and 82 (El Camino Real), and Interstate 280 to the west.

California Manual On Uniform Traffic Control Devices (CMUTCD – 2011 Draft)

This California Manual on Uniform Traffic Control Devices (California MUTCD) is published by the State of California Department of Transportation (Caltrans) and is issued to adopt uniform standards and specifications for all official traffic control devices in California, in accordance with Section 21400 of the California Vehicle Code. The California MUTCD uses a format similar to the national MUTCD. It incorporates FHWA's MUTCD in its entirety and explicitly shows which portions thereof are applicable or not applicable in California.

Caltrans Highway Design Manual

The Highway Design Manual (HDM) is currently being updated. The document provides detailed guidance related to planning and design of roadways, including bicycle and pedestrian facilities. Chapter 1000 discusses bikeway planning and design. A draft version is available online: (www.dot.ca.gov/hq/oppd/hdm/hdmtoc.htm).

California Vehicle Code, Streets and Highways Code

- The California Vehicle Code (CVC) regulates many aspects of transportation within the state, particularly vehicle use and registration, and enumerates the powers and duties of the Department of Transportation (Caltrans). Division 11 of the code also provides the legal framework, or "rules of the road," for motor vehicles, bicycles, and pedestrians operating on public roadways in California.
    - CVC Section 21200 – 21212 deals specifically with bicycle use and establishes that all persons riding a bicycle are considered "vehicles," subject to most rules and regulations provided elsewhere in the Vehicle Code. This includes the right to access all state highways except where bicycles are specifically excluded by official signage for the safety of all users, and the obligation to signal at all turns.
    - CVC Section 21949-21971 deals with pedestrian rights and responsibilities. It declares "safe and convenient pedestrian travel and access, whether by foot, wheelchair, walker, or stroller" a right of all state residents and establishes priority right-of-way for pedestrians crossing within "any marked crosswalk or within any unmarked crosswalk at an intersection" with few exceptions.
- The Streets and Highways Code enumerates additional provisions for the definition, use, administration, and financing of the state's highway and public transportation rights-of-way. Chapter 8 is concerned with non-motorized transportation, and further establishes the purpose and

administrative requirements for the Bicycle Transportation and Pedestrian Safety Accounts – programs dedicated to funding non-motorized improvements.

  - Section 890 – 894.2 includes the definition of three specific classes of "bikeway" facilities: a.) Class I bikeways, which provide a completely separated right-of-way designated for the exclusive use of bicycles and pedestrians with crossflows by motorists minimized. (b) Class II bikeways, such as a "bike lane," which provide a restricted right-of-way designated for the exclusive or semiexclusive use of bicycles, but with vehicle parking and crossflows by pedestrians and motorists permitted. (c) Class III bikeways, namely on-street "bike routes," which provide a right-of-way designated by signs or permanent markings and shared with pedestrians or motorists.

- Section 891.2 of the Bicycle Transportation Account Requirements enables cities and counties to prepare bicycle transportation plans, and identifies the elements to be included in order to make plan recommendations eligible for funding from the statewide Bicycle Transportation Account (BTA requirements).

E.1.3 Bay Area

Sustainable Communities Strategy (SCS) and Regional Transportation Plan (RTP)

The Association of Bay Area Governments (ABAG) and Metropolitan Transportation Commission (MTC) - the latter of which is the federally designated Metropolitan Planning Organization (MPO) for the San Francisco Bay Area region - are currently developing a Sustainable Communities Strategy to guide the update to the *Regional Transportation Plan* (RTP), planned for completion in 2013. The RTP defines the vision, strategy, and technical framework (e.g. demographic and travel forecasts) for planning and funding transportation improvements across all modes in the nine-county Bay Area. As required by federal law, MTC's RTP also establishes a 20-year budget – known separately as the Transportation Improvement Program (TIP) - that provides a comprehensive listing of surface transportation projects that may receive federal funds or that are subject to a federally required action or are regionally significant.

The update process for the current RTP, last adopted in 2009, calls for assessing three investment scenarios relative to a set of specific performance targets of congestion, vehicle miles traveled, emissions, and equity. The analysis applies land use and pricing sensitivity tests to each of the investment scenarios to see how such policy measures could help the region achieve the targets. Pursuant to SB375, the RTP and related Sustainable Communities Strategy efforts must also assess the relationship between vehicle miles traveled and regional jobs/housing targets, proximity to transit, and the regional targets for reducing automobile and GHG emissions (which for the Bay Area are a 7 percent reduction in per capita emissions by 2020 and 15 percent by 2035). Also pursuant to SB 375, the RTP/SCS will identify priority transit projects and corridors to incentivize development and investment – namely by the relaxation of CEQA requirements that stress accommodation of motor vehicle operations and can often hinder urban infill development.

Bay Area FOCUS Program

In conjunction with the Sustainable Communities Strategy, ABAG and MTC have implemented the FOCUS program, which unites efforts of four regional agencies into a single program that links land use and

transportation by encouraging the development of complete, livable communities in areas served by transit, and promoting conservation of the region's most significant resource lands.

Through FOCUS, regional agencies will direct existing and future incentives to Priority Development Areas and Priority Conservation Areas. Priority Development Areas are locally-identified infill development opportunity areas near transit. Priority Conservation Areas are regionally significant open spaces for which there exists a broad consensus for long-term protection. Priority Development Areas are generally areas of at least 100 acres where amenities and services can be developed to meet the day-to-day needs of residents in a pedestrian-friendly environment served by transit.

Regional Travel Demand Model

The recent policy changes mandated by SB375 and incorporated into the RTP/SCS efforts (namely the legally binding emphasis on "smart growth" land use scenarios and GHG reduction targets) are especially important for re-orienting the way MTC - and by extension all county and local jurisdictions - forecast future travel demand and assess the environmental impacts of individual transportation projects. Currently, all congestion management agencies in the Bay Area must develop a countywide travel model that is consistent with MTC's modeling methodology and databases. The purpose of this requirement is to bring a uniform technical basis for analysis to congestion management decisions and environmental determinations under CEQA.

Rather than extrapolate existing trends of sprawling land use patterns and assume steady annual growth in vehicle miles travelled, future travel demand forecasting in the Bay Area will be driven more than ever by policy priorities that embrace the efficiencies of compact, walkable design and pedestrian and bicycle activity. This is especially important for determining the feasibility of non-motorized projects, which in many cases (particularly for urbanized areas) involve reductions to roadway capacity and/or automobile levels-of-service (LOS).

Regional Bicycle Plan for the San Francisco Bay Area (2009)

The *Regional Bicycle Plan for the San Francisco Bay Area* (RBP) is a component of MTC's regional transportation plan *(Transportation 2035)*. The RBP's main purpose is to establish the network of regionally significant bicycle facilities (Regional Bicycle Network, or RBN) as well as to provide a high-level policy framework for MTC's approach to bicycle planning, including the definition of "routine accommodation" of bicycles for transportation facility design and programs. Additional RBP goals and policies include a 25% reduction in fatalities and injuries each from 2000 levels by 2035; emphasis of regional coordination on gap closure and consistent wayfinding; promotion of education and encouragement programs to raise bicycling awareness; transit support facilities; and a commitment to improving bicycle data collection and accessibility. The current plan estimates approximately $1.9 billion (2007 dollars) in capital project and program funding needs, and includes several on-street bicycle corridors in Palo Alto as part of the RBN.

San Francisco Bay Trail

Embedded within the Regional Bicycle Network is the San Francisco Bay Trail Plan, a proposal for the development of a 400-mile regional hiking and bicycling trail around the perimeter of San Francisco and San Pablo Bays. The plan was prepared by the Association of Bay Area Governments pursuant to Senate Bill 100, which mandated that the Bay Trail do the following:

- Provide connections to existing park and recreation facilities
- Create links to existing and proposed transportation facilities
- Be planned in such a way as to avoid adverse effects on environmentally sensitive areas

The concept plan for the trail includes a primary "spine" with spurs and connections that extend into and connect with local trail and bikeway facilities. Also included in the plan are additional policy discussions and a set of design guidelines specific to the Bay Trail development.

E.1.4 County and Peninsula Region

Valley Transportation Plan 2035 (VTP 2035)

The Valley Transportation Plan 2035 is Santa Clara County's long-range planning document that feeds into (and is consistent with) MTC's Regional Transportation Plan and incorporates specific needs identified by the Valley Transportation Authority (VTA) and individual municipalities, including Palo Alto. The VTP 2035 considers all travel modes and addresses the linkages between transportation and land use planning, air quality, and community livability.

VTP 2035 is framed around the notion that Santa Clara County is expected to grow by over 500,000 residents and 400,000 jobs by 2035 (increases of 27.5 and 45.6 percent, respectively), and that this growth will not be accommodated by increasing roadway capacity. With a roadway network that is essential "built out," VTP 2035 stresses the need to embrace carpooling, transit, biking, walking, technological efficiencies, and making shorter and/or fewer trips.

As with the Regional Transportation Plan, VTP 2035 includes a capital improvement program that is strongly weighted towards new investments in transit along with the maintenance and operation of the existing roadway network. As a policy, upgrades to pedestrian and bicycle facilities are strongly encouraged (and depending on the context, mandated) as part of regular street maintenance, bridge, and transit projects.

Notwithstanding VTP 2035's process of analysis and evaluation, things change and VTA regularly updates the plan at a minimum of every four years in a cycle coinciding with the update of the RTP. Plan updates will include the project planning, selection, programming, and delivery processes described above.

Bicycle Expenditure Program (BEP)

VTP 2035 identifies a need for bicycle capital projects totaling over $330 million. A Countywide Bicycle and Pedestrian Technical Advisory Committee comprised of 16 voting members, one from each of the 15 cities and one from the county identified and prioritized the list of projects.

The three major categories of projects that the CBP addresses are Cross-County Bicycle Corridors (CCBC), 24 On-Street Bicycle Routes, and 17 Trail Networks. These components are in various stages of completion with existing, planned, and undeveloped segments. When completed, the CCBC will be the most direct and convenient routes for bike trips to local and regional destinations across city or county boundaries. This list is used by VTA and local agencies in such activities as development review, transit planning, highway projects review, prioritizing local streets and roads projects, and collision monitoring. Only projects in the CBP are eligible for outside (non-BEP) funds that are controlled by the VTA.

Across Barrier Connections (ABC)

ABC is a list of locations of freeways, creeks, rivers, and active rail lines in the county presenting impenetrable barriers to bicycle circulation. Although the county has over 90 pedestrian/bicycle crossings, approximately 100 more are needed to provide a basic level of connectivity across these barriers.

Community Design and Transportation Program

The Community Design and Transportation (CDT) Program is VTA's Board-adopted program for integrating transportation and land use. Similar to the regional FOCUS program, CDT is a sustainable planning framework that considers all transportation modes and stresses the importance of a healthy pedestrian environment, concentrated mixed-use development patterns oriented to transit; and innovative urban design that embraces the interrelationships of buildings and streets along with the importance of people-oriented public spaces.

The CDT Program provides planning and capital grant funds for transportation-related projects that implement land use policies supportive of the CDT Principles, improve community access to transit, provide multimodal transportation facilities, and enhance the pedestrian environment along transportation corridors, in core areas and around transit stations. VTA receives funding for these grant programs from MTC's Transportation for Livable Communities (TLC) Program. The policies for funding the TLC Program come through the development of the RTP. The current allocation methodology is based on Santa Clara County's population share of the regional total and on the amount MTC requires for dedication to the county share (currently split on a 25 percent share for counties and a 75 percent share for MTC). VTA currently expects to allocate about $360 million to this program over the 25-year life of the VTP 2035 plan.

A central principle of the CDT Program is design for pedestrians. The county's transportation system and built environment currently focuses on cars rather than people. Pedestrian-oriented places encourage walking and exploration. Design elements of these places include safe and direct walking routes, wide sidewalks, and amenities such as street trees, lighting and benches.

Bicycle Share Program

In late 2008, a groundswell of interest in developing bike sharing programs swept the county. In 2009, VTA worked with the Silicon Valley Bike Coalition (SVBC), local employers, and cities to develop a bike sharing program. The initial steps include a pilot program that will identify consumer needs and markets, a management and operating approach, and key programs.

This program is expected to:

- Address land use inefficiencies of many suburban sprawl employment sites located far from transit.
- Provide access to the first and last mile from major transit stations.
- Supplement VTA and employer shuttles between transit and employer sites.
- Relieve overcrowding and the routine "bumping" of passengers with bicycles on Caltrain (and on VTA buses).

The Safe Routes to Transit (SR2T) program provided $500,000 to the VTA Pilot Bike Sharing program. In 2010, $4.3 million was secured through MTC's Climate Initiatives Program to develop an initial bike share

program with 1,000 bicycles along the Caltrain corridor in the cities of San Francisco, Redwood City, Palo Alto, Mountain View, and San Jose. A hundred bicycles (out of 1,000) are earmarked for Palo Alto, which will consist of large "hub" stations at the Palo Alto Transit Center and California Ave Caltrain stations; and a small number of "pod" stations at select sites to be determined by the VTA and City of Palo Alto.

VTA Bicycle Technical Guidelines

The Bicycle Technical Guidelines (BTG) are Palo Alto's current guide for designing most bicycle facilities. The Guidelines provide information for Member Agencies in planning, design, and maintenance of bicycle facilities and bicycle-friendly roadways.

Santa Clara Countywide Bicycle Plan (2008)

VTA's Countywide Bicycle Plan (CBP) refines and expands MTC's Regional Bicycle Network and complements local jurisdictions' bicycle plans, which are more focused on improvements serving local needs. The CBP contains policies and implementing actions that shape interagency coordination and region wide capital priorities, as well as a financially unconstrained master list of bicycle infrastructure projects. These projects are eligible for consideration for inclusion in the future as funding and leveraging opportunities become available.

Santa Clara County Countywide Trails Master Plan and Uniform InterJurisdictional Trail Design, Use, and Management Guidelines

The *Countywide Trails Master Plan* (1995) provides information and guidance for developing trails and multi-use paths in Santa Clara County. The Uniform Interjurisdictional Trail Design, Use, and Management Guidelines include comprehensive and detailed information about developing trails. In addition, the Santa Clara Valley Water District (SCVWD) has published *Guidelines and Standards for Land Use Near Streams* (2006)[8] in collaboration with the Water Resources Protection Collaborative. The guidelines provide proposed guidelines and standards for developing trails adjacent to water resources.

The Santa Clara County Parks Department has recently completed the Stanford trail segment (project S-1 from the County Plan) to Page Mill Rd and Arastradero Rd as part of 2005 expansion agreement under the existing Mayfield Agreement.

Grand Boulevard Initiative

The Grand Boulevard Initiative (GBI) is a collaboration of 19 cities, Santa Clara and San Mateo Counties, local and regional agencies and other stakeholders intended to improve the performance, safety, and aesthetics of the El Camino Real corridor from the Diridon Transit Hub in San Jose to Mission St in Daly City. The ultimate goal is for the corridor to achieve its full potential as a place for residents to work, live, shop and play, creating links between communities that promote walking and transit and an improved and meaningful quality of life. The GBI builds upon and supports several other transit and land use planning initiatives in Santa Clara County including the 522 Rapid bus service and service improvements being explored as part of VTA's BRT Strategic Plan. El Camino is also part of VTA's countywide Community Design & Transportation (CDT)

[8] http://www.valleywater.org/EkContent.aspx?id=2279&terms=+LAND+USE+NEAR+STREAMS

Program Cores, Corridors, and Station Areas framework, which shows VTA and local jurisdiction priorities for supporting concentrated development in the County.

Caltrain Station Access Program

The *2008 Caltrain Bicycle Parking and Access Plan* provides thorough bicycle facility data and improvement recommendations for the ten highest bicycle ridership stations in the system.

In 2010 Caltrain also began development of a Comprehensive Access Program that, when fully established, will include a Policy Statement, Strategic Plan, Capital Improvement Program, and Monitoring Program. In May 2010, the Caltrain Board of Directors adopted a Policy Statement that specifically prioritizes walking, transit, and biking – i.e. "green" and cost-effective modes – over the automobile as a way to maximize access and ridership over the long term. In order to customize each station's access improvement strategies, Caltrain has also identified four station typologies based on adjacent land use characteristics (**Figure** E-1). Once these types are applied in the Strategic Plan (anticipated in early 2011), a revised list of multi-modal improvements for all stations will follow. The suggested improvements provided in the Palo Alto Bicycle and Pedestrian Transportation Plan should assist Caltrain in revising the list of these multi-modal improvements.

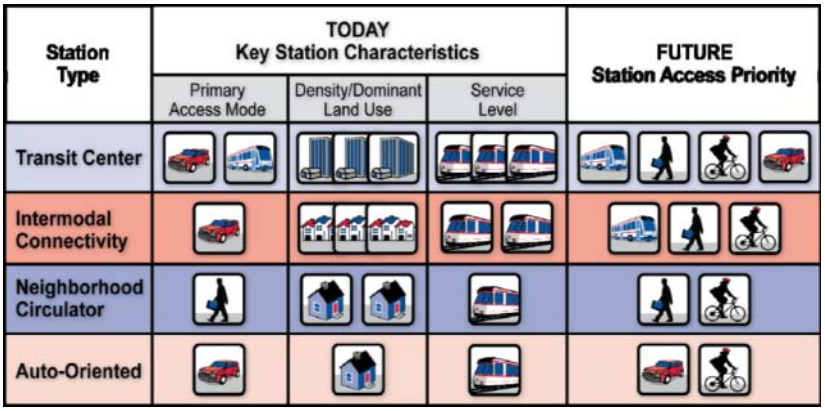

Figure E-1: Caltrain Station Typologies

(Source: Caltrain Access Policy Statement, May 2010)

E.1.5 City of Palo Alto

Comprehensive Plan

The City of Palo Alto's Comprehensive Plan establishes clear support and priority for investing in non-motorized transportation, improving access to transit, and other strategies that reduce dependence on single-occupant vehicles and improve the overall efficiency of the transportation system. These priorities are well represented in the adopted City budget and 2011-2015 Capital Improvement Program, which includes general funds for bicycle plan implementation and specific earmarks for larger projects that support walking and biking (such as the current planning and conceptual design for a new Highway 101 ped/bike crossing at Adobe Creek). The largest share of investment targeted at the public right-of-way, however, is pavement and utility maintenance, including the undergrounding of utilities and upgrades to sewer and water systems. Coordinating these programs is a high priority for the city and can be invaluable to leveraging non-motorized improvements. The current effort to update the Comprehensive Plan, and the annual budget revision process, are great opportunities to enhance coordination and keep the overall goals and policies of the Comprehensive Plan as relevant and up-to-date as possible.

Table E-1 lists key components of the *Comprehensive Plan* that relate to bicycling and walking, many of which the *Bicycle and Pedestrian Transportation Plan* (BPTP) address. **Table 2-1 in Chapter 2 of the Plan** lists the components of the Transportation Element. In addition, the following table highlights considerations that the City may want to take into account when updating the *Comprehensive Plan.*

Table E-1: City of Palo Alto Comprehensive Plan - Goal, Policy, Program Summary Table*

Goals	Policies and Programs (edited for relevancy)	Plan Relationship/Recommendation
Land Use and Design Element		
Goal L-3:	***Safe, Attractive Residential Neighborhoods, Each With Its Own Distinct Character and Within Walking Distance of Shopping, Services, Schools, and/or other Public Gathering Places.***	
	Policy L-15: Preserve and enhance the public gathering spaces within walking distance of residential neighborhoods. Ensure that each residential neighborhood has such spaces.	This policy provides significant support for the BPTP. In addition, the BPTP existing conditions notes the value of public gathering spaces and recommends amenities and designs to enhance pedestrian space.
	Policy L-17: Treat residential streets as both public ways and neighborhood amenities. Provide continuous sidewalks, healthy street trees, benches, and other amenities that favor pedestrians.	
Goal L-4:	***Inviting, Pedestrian-scale Centers That Offer a Variety of Retail and Commercial Services and Provide Focal Points and Community Gathering Places for the City's Residential Neighborhoods and Employment Districts.***	
	Policy L-21: Provide all Centers with centrally located gathering spaces that create a sense of identity and encourage economic revitalization. Encourage public amenities such as benches, street trees, kiosks, restrooms and public art.	Recommendations for Pedestrian Zones support the development and preservation of Pedestrian-Scale Centers .
	Policy L-22: Enhance the appearance of streets and sidewalks within all Centers through an aggressive maintenance, repair and cleaning program; street improvements; and the use of a variety of paving materials and landscaping.	
	Program L-18: Identify priority street improvements that could make a substantial contribution to the character of Centers, including widening sidewalks, narrowing travel lanes, creating medians, restriping to allow diagonal parking, and planting street trees.	This program directly supports the BPTP. BPTP recommendations for pedestrian enhancements, intersection improvements, and bikeways are in line with this program.
	Policy L-24: Ensure that University Avenue/Downtown is pedestrian-friendly and supports bicycle use. Use public art and other amenities to create an environment that is inviting to pedestrians.	The BPTP focuses recommendations for bicycle and pedestrian improvements in the University Ave/Downtown area.

Goals	Policies and Programs (edited for relevancy)	Plan Relationship/Recommendation
	Policy L-25: Enhance the character of the South of Forest Area (SOFA) as a mixed-use area.	The BPTP recommends additional signing to facilitate bicycle use of the Homer Ave Caltrain undercrossing.
	Policy L-27: Pursue redevelopment of the University Avenue Multi-modal Transit Station area to establish a link between University Avenue/Downtown and the Stanford Shopping Center.	The BPTP supports the redevelopment of the Transit Station and recommendas additional improvements to enhance bicycle and pedestrian access, circulation, and use.
	Policy L-29: Encourage residential and mixed use residential development in the California Avenue area.	This policy supports land uses that encourage walking and bicycling. Proposed improvements in the BPTP would facilitate travel along this corridor.
	Policy L-31: Develop the Cal-Ventura area as a well-designed mixed use district with diverse land uses, two- to three-story buildings, and a network of pedestrian-oriented streets providing links to California Avenue.	The BPTP recommends a feasibility, design, and planning study for the Bol Park/Cal-Ventura Trail Connector.
	Policy L-35: Establish the South El Camino Real area as a well-designed, compact, vital, Multi-neighborhood Center with diverse uses, a mix of one-, two-, and three-story buildings, and a network of pedestrian-oriented streets and ways.	
	Program L-33: Study ways to make South El Camino Real more pedestrian-friendly, including redesigning the street to provide wider sidewalks, safe pedestrian crossings at key intersections, street trees, and streetscape improvements.	The BPTP recommends a bike lane on El Camino Real from Sand Hill Rd to Page Mill Rd, as well as crossings and intersection improvements at Arastradero Rd and Los Robles Ave.
	Program L-34: Provide better connections across El Camino Real to bring the Ventura and Barron Park neighborhoods together and to improve linkages to local schools and parks.	The BPTP recommends crossing improvements across Matadero/Margarita Ave, which is a proposed bicycle boulevard.
	Policy L-39: Facilitate opportunities to improve pedestrian-oriented commercial activity within Neighborhood Centers.	The BPTP continues support for this policy and includes revised design guidelines for bicycle and pedestrian facilities that should be considered during Architectural Review Board deliberations and decisions.
	Program L-40: Make improvements to Middlefield Road in Midtown that slow traffic, encourage commercial vitality, make the street more pedestrian-friendly, and unify the northeast and southwest sides of the commercial area, with consideration given to traffic impacts on the residential neighborhood.	The BPTP recommends shared lane treatments on Middlefield Rd from Coleridge Ave/Embarcadero Rd to Marion Ave, as well as crossing improvements at California Ave.
	Program L-41: Support bicycle and pedestrian trail improvements along a restored Matadero Creek within Hoover Park.	The BPTP recommends a Class I Multi-Use Trail along Matadero Creek, including the section within Hoover Park.

Goals	Policies and Programs (edited for relevancy)	Plan Relationship/Recommendation
	Policy L-42: Encourage Employment Districts to develop in a way that encourages transit, pedestrian and bicycle travel and reduces the number of auto trips for daily errands.	
	Policy L-43: Provide sidewalks, pedestrian paths, and connections to the citywide bikeway system within Employment Districts. Pursue opportunities to build sidewalks and paths in renovation and expansion projects.	The BPTP recommends key corridors within and to Employment Districts to enable workers to commute by foot and bicycle.
	Policy L-44: Develop the Stanford Research Park as a compact employment center served by a variety of transportation modes.	Chapter 5 discusses opportunities for bicycle and pedestrian improvements within the Stanford Research Park area, including sidewalk gap infill, completing the Hanover St bike lanes at the approaches to Page Mill Rd, extension of the Bol Park/Hanover St path along Page Mill Road, as well as long-term improved trail connections to the VA hospital and across Matadero Creek.
	Policy L-61: Promote the use of community and cultural centers, libraries, local schools, parks, and other community facilities as gathering places. Ensure that they are inviting and safe places that can deliver a variety of community services during both daytime and evening hours.	The BPTP recommends bicycle and pedestrian facilities that provide safe and comfortable access to these destinations for all abilities of pedestrians and bicyclists.
	Program L-68: To help satisfy present and future community use needs, coordinate with the School District to educate the public about and to plan for the future use of school sites, including providing space for public gathering places for neighborhoods lacking space.	The BPTP recommends extending and expanding the Safe Routes to School Program in coordination with PAUSD.
	Program L-69: Enhance all entrances to Mitchell Park Community Center so that they are more inviting and facilitate public gatherings.	The BPTP identifies existing park trails in Mitchell Park and supports this policy.
	Program L-70: Study the potential for landscaping or park furniture that would promote neighborhood parks as outdoor gathering places and centers of neighborhood activity.	
	PolicyL-62: Provide comfortable seating areas and plazas with places for public art adjacent to library and community center entrances.	
	PolicyL-64: Seek potential new sites for art and cultural facilities, public spaces, open space, and community gardens that encourage and support pedestrian and bicycle travel and person-to-person contact, particularly in neighborhoods that lack these amenities.	The BPTP continues support for this policy and includes revised design guidelines for bicycle and pedestrian facilities that should be considered during Architectural Review Board deliberations and decisions.

Goals	Policies and Programs (edited for relevancy)	Plan Relationship/Recommendation
	Policy L-66: Maintain an aesthetically pleasing street network that helps frame and define the community while meeting the needs of pedestrians, bicyclists, and motorists.	The BPTP notes the importance of enhancing public space and providing pedestrian-scale design and amenities. Innovative facility designs integrate aesthetically pleasing designs into bicycle and pedestrian accommodations.
	Policy L-67: Balance traffic circulation needs with the goal of creating walkable neighborhoods that are designed and oriented towards pedestrians.	The BPTP identifies opportunities where roadway capacity allows for bicycle and pedestrian accommodation while minimizing impacts to automobile traffic circulation.
	Policy L-68: Integrate creeks and green spaces with the street and pedestrian/bicycle path system.	The BPTP recommends a series of Class I Multi-Use Paths along creek corridors, such as the Matadero Creek Trail.
	Policy L-69: Preserve the scenic qualities of Palo Alto roads and trails for motorists, cyclists, pedestrians, and equestrians.	Innovative facility designs integrate aesthetically pleasing designs into bicycle and pedestrian accommodations.
	Program L-71: Recognize Sand Hill Road, University Avenue, Embarcadero Road, Page Mill Road, Oregon Expressway, Interstate 280, Arastradero Road (west of Foothill Expressway), Junipero Serra Boulevard/ Foothill Expressway, and Skyline Boulevard as scenic routes.	Where appropriate the BPTP recommends bicycle and pedestrian treatments and/or improvements along these roadways, which may reduce traffic congestion and improve the scenic nature of these routes.
	Policy L-70: Enhance the appearance of streets and other public spaces by expanding and maintaining Palo Alto's street tree system.	BPTP recommendations for Pedestrian Zones and curb extensions note the desire for street trees.
	Policy L-79: Design public infrastructure, including paving, signs, utility structures, parking garages and parking lots to meet high quality urban design standards. Look for opportunities to use art and artists in the design of public infrastructure. Remove or mitigate elements of existing infrastructure that are unsightly or visually disruptive.	Innovative facility designs integrate aesthetically pleasing designs into bicycle and pedestrian accommodations.
Natural Environment Element		
Goal N:1	***A Citywide Open Space System that Protects and Conserves Palo Alto's Natural Resources and Provides a Source of Beauty and Enjoyment for Palo Alto Residents***	
	Policy N-2: Support regional and sub-regional efforts to acquire, develop, operate, and maintain an open space system extending from Skyline Ridge to San Francisco Bay.	This policy supports walking and bicycling to parks and trails through parks. The BPTP identifies existing parks trails as well as future opportunities.

Goals	Policies and Programs (edited for relevancy)	Plan Relationship/Recommendation
Goal N-2:	***Conservation of Creeks and Riparian Areas as Open Space Amenities, Natural Habitat Areas, and Elements of Community Design***	
	Policy N-10: Work with the Santa Clara Valley Water District and other relevant regional agencies to enhance riparian corridors and provide adequate flood control by use of low impact restoration strategies.	The BPTP recommends the use of the Santa Clara Valley Water District (SCVWD) 's *Guidelines and Standards for Land Use Near Streams* (2006)..
	Program N-11: Work with the Santa Clara Valley Water District to develop a comprehensive riparian corridor restoration and enhancement program that identifies specific stretches of corridor to be restored, standards to be achieved, and sources of funding. Include provisions for tree planting to enhance natural habitat.	The BPTP recommends new creek trail segments for further consideration, which should conform to SCVWD design guidelines.
Goal N-3:	***A Thriving "Urban Forest" That Provides Ecological, Economic, and Aesthetic Benefits for Palo Alto***	
	Program N-16: Continue to require replacement of trees, including street trees lost to new development, and establish a program to have replacement trees planted offsite when it is impractical to locate them onsite.	BPTP recommendations for Pedestrian Zones and curb extensions note the desire for street trees.
	Program N-19: Establish one or more tree planting programs that seek to achieve the following objectives: a 50 percent tree canopy for streets, parks, and parking lots; and the annual tree planting goals recommended by the Tree Task Force and adopted by the City Council.	The BPTP does not directly address this program, but priority consideration should be given to existing and proposed bicycle boulevards. In addition, the BPTP recommends a future study by Parks to identify a Palo Alto Greenway network that may be a priority for canopy coverage. Finally, the BPTP recommends the development of a Complete Streets project checklist that could include review of potential tree protection issues and replacement opportunities.
	Program N-20: Establish procedures to coordinate City review, particularly by the Planning, Utilities, and Public Works Departments, of projects that might impact the urban forest.	The BPTP recommends the development of a Complete Streets project checklist that could include review of potential tree protection issues and replacement opportunities.
Goal N-4:	***Water Resources that are Prudently Managed to Sustain Plant and Animal Life, Support Urban Activities, and Protect Public Health and Safety***	
	Policy N-21: Reduce non-point source pollution in urban runoff from residential, commercial, industrial, municipal, and transportation land uses and activities.	This policy supports development of the BPTP, which will decrease transportation-related pollution by shifting trips from single-occupancy vehicles.
	Policy N-22: Limit the amount of impervious surface in new development or public improvement projects to reduce urban runoff into storm drains, creeks, and San Francisco Bay.	The BPTP does not directly address these issues, but it recommends development of a Complete Streets project checklist that could include review and incorporation of green stormwater

Goals	Policies and Programs (edited for relevancy)	Plan Relationship/Recommendation
	Program N-36: Complete improvements to the storm drainage system consistent with the priorities outlined in the City's 1993 Storm Drainage Master Plan, provided that an appropriate funding mechanism is identified and approved by the City Council.	infrastructure or other improvements consistent with the Drainage Master Plan.
Goal N-5:	***Clean, Healthful Air for Palo Alto and the San Francisco Bay Area***	
	Policy N-28: Encourage developers of new projects in Palo Alto, including City projects, to provide improvements that reduce the necessity of driving alone.	This policy supports the development of the BPTP, and the Plan includes standards and guidelines that can be used by developers implementing bicycle and/or pedestrian improvements.
Community Services Element		
Goal C-1:	***Effective and Efficient Delivery of Community Services***	
	Policy C-4: Maintain a close, collaborative relationship with the PAUSD to maximize the use of school services and facilities for public benefit, particularly for young people, families, and seniors.	This policy is related to BPTP Objective 3.
Goal C-3:	***Improved Quality, Quantity, and Affordability of Social Services, Particularly for Children, Youth, Seniors, and People with Disabilities***	
	Program C-18: Encourage the continuation and development of after-school and evening programs for children and youth. Maximize participation in such programs by increasing the number of locations where the programs are provided and by supporting transportation options to these locations.	The Five "E's" program recommendations in the BPTP supports this policy by proposing educational programs that teach youth and adults safe bicycling and walking practices.
	Policy C-19: Continue to support provision, funding, or promotion of services for persons with disabilities through the Human Relations Commission, the Parks and Recreation Division, and other City departments. Support rigorous compliance with the Americans with Disabilities Act (ADA).	The BPTP identifies funding sources that can be used to improve ADA-compliance.

Goals	Policies and Programs (edited for relevancy)	Plan Relationship/Recommendation
Goal C-4:	***Attractive, Well-maintained Community Facilities That Serve Palo Alto Residents***	
	Program C-20: Conduct comprehensive analyses of long-term infrastructure replacement requirements and costs.	Appendix A includes recommendations for maintenance and life-cycle cost analysis for bicycle and pedestrian projects.
	Program C-21: Incorporate as an additional criterion used in prioritizing sidewalk repairs, a standard related to the level of pedestrian usage.	The BPTP supports this criterion, although an initial step is recommending pedestrian counts at key locations throughout the city. Also, proximity to or within a priority pedestrian area may be a substitute for actual pedestrian volumes if none are available.
	Policy C-26: Maintain and enhance existing park facilities.	The BPTP provides recommendations for additional park trail opportunities, as well as linking existing park trails into the on-street networks.
	Policy C-27: Seek opportunities to develop new parks and recreation facilities to meet the growing needs of residents and employees of Palo Alto.	The BPTP recommends new Class I Multi-Use Parks and trails that enhance recreational opportunities and connect recreational destinations.
	Policy C-28: Use National Recreation and Park Association Standards as guidelines for locating and developing new parks.	The BPTP recommends that parks be provided within a half-mile of all residential neighborhoods and employment areas (based on the National Recreation and Park Association's definition of walking distance).
Goal C-5:	***Equal Access to Educational, Recreational, and Cultural Services for All Residents.***	
	Policy C-29: Strategically locate public facilities and parks to serve all neighborhoods in the City.	The BPTP recommended trail and Class I Multi-Use Path system provides an interconnected network throughout the city.
	Policy C-30: Facilitate access to parks and community facilities by a variety of transportation modes.	The BPTP recommends bicycle and pedestrian facilities that provide safe and comfortable access to parks, schools, and community facilities.
	Policy C-31: Facilitate access to educational, recreational, and cultural services by continuing to provide financial assistance programs for residents with low-incomes and/or disabilities.	The Plan peripherally addresses this policy by prioritizing pedestrian access and safety improvements to such facilities.
	Policy C-32: Provide fully accessible public facilities to all residents and visitors.	The BPTP recommends bicycle and pedestrian facilities that provide safe and comfortable routes for pedestrians and bicyclists of all abilities.

Municipal Code

Non-motorized travel and improvements are supported on a daily basis by the Palo Alto Municipal Code, which regulates the standard of developments and use of city streets, among other functions. Recent best practice revisions to the code include Transportation Impact Fees for mitigating congestion in certain areas, strong requirements for bicycle parking with new projects, and urban design guidelines that foster pedestrian-friendly streetscapes. The Municipal Code also codifies certain roadway functions and purposes, such as specific arterial speed limit exceptions and major truck routes, and includes the School Commute Corridors Network. The School Commute Corridors Network designates a sub-set of Palo Alto's street system for special consideration in infrastructure improvement and travel safety enhancement. The purpose of this network is to give priority for pedestrian and bicycle facilities improvements, sidewalk replacement, street re-paving, and other enhancements to travel safety where it can most directly affect access to Palo Alto's schools. Much of the existing and proposed bikeway system encompasses the School Commute Corridors Network, as have ongoing capital improvement efforts related to the Palo Alto Safe Routes to School and neighborhood traffic calming programs.

The City of Palo Alto requires residents to license their bicycle. Bicycle licenses help the Police Department return a stolen bicycle to its owner and identify victims of collisions. The Fire Department and many local bicycle shops issue bicycle licenses for two dollars that expire in three years.

Abandoned bicycles are a nuisance to the community and other bicyclists. When left in a public place, abandoned bicycles create an eyesore and can obstruct pedestrian travel. When left on bicycle racks, abandoned bicycles take up a parking space that another bicyclist could use. If a bicycle is locked to public property, the Police Department will tag it with a 72-hour warning before cutting the lock.

Due to fiscal constraints, the Police Department does not currently remove abandoned bicycles on a consistent basis. However, residents may bring an abandoned bicycle to the Police Department office. The Police Department releases abandoned bicycles every Wednesday.

Climate Action Plan

Expanding efforts to reduce the number of school commutes by car is one of several recommendations from the 2007 Palo Alto Climate Protection Plan (CPP), which targets a 15 percent reduction in greenhouse gas emissions from 2005 levels by 2020 to comply with state reductions goals. Identifying automobile travel as comprising 36 percent of total GHG emissions within Palo Alto, the plan recommends hiring a full-time TDM coordinator position as soon as possible and in the medium-term expanding pedestrian-friendly zoning regulations and completing transit projects on El Camino Real and the Palo Alto Intermodal Transit Center. Disappointingly, the CPP does not reference the 2003 *Bicycle Transportation Plan* or efforts to accelerate its implementation – despite the fact that 83 percent of auto-related emissions are from discretionary, non-commute trips within Palo Alto (i.e., a significant percentage could be converted to zero-emission walking or biking trips).

Stanford University

The commitment to projects and programs that enhance walking and biking (and promote transit access) is reinforced by Palo Alto's close relationship with Stanford University. Development of University property is regulated by a General Use Permit (GUP) agreement with the County, which essentially caps the number of peak period trips to and from campus at 2001 levels. As the campus has sought to expand, this agreement has helped focus new investments in transit (of which the Marguerite Shuttle is a highlight) and the development of a comprehensive and successful Transportation Demand Management program. The agreement, however, does not include the Stanford Research Park or Stanford Medical Center, both of which generate high travel demand and are located in key gap sections of the proposed bicycle network.

The traffic mitigation and public benefit package approved in May 2011 as part of the Stanford Medical Center expansion identifies $3.53 million in pedestrian and bicycle-related improvements. This package includes $2.5 million in direct spending to enhance the pedestrian and bicycle connections from the Palo Alto Transit Center to the intersection of El Camino Real and Quarry Rd. In addition, the Medical Center will contribute almost $200,000 for a ped/bike Caltrain undercrossing.

Transportation Demand Management

Way2Go Program

The City's Way2Go Program is the foundation for a variety of alternative commute programs at the City and school levels. In addition to encouraging carpooling, Way2Go programs engage City officials and staff to actively participate and provide focused programs aimed at reducing vehicle miles traveled in Palo Alto.

Safe Routes to School

The City, in collaboration with the Palo Alto Unified School District and parent volunteers from the Palo Alto Council of PTAs, began to coordinate efforts to reduce congestion and improve safety for students on their way to and from school in 1994, using the traditional three E's of engineering, education, and enforcement. Since 2000, when this partnership was expanded to include the 4th 'E' of encouraging alternatives to single family driving to school, the City has seen a significant and on-going increase in biking and walking to school as a direct result of these efforts. **Table E-2** presents the number of students programs reached during the 2009/10 school year.

Table E-2: Existing School Programs and Number of Students Reached

Grade	Program	Responsible Party	Number of Students (2009/10)
K	Pedestrian safety class seminar and practice	Safe Moves	875
1	Pedestrian safety participatory assembly	Safe Moves	920
2	Pedestrian safety participatory assembly	Safe Moves	834
3	Bicycling life skills—three lessons: Class-based discussion and video: bike safety basics Key traffic skills for bicyclists (grade level assembly) On-bike event: students rotate through 5 stations	Classroom teachers Palo Alto Fire Department Parent volunteers Palo Alto Medical Foundation Stanford University Cycling Club	862
5	Bike/Traffic Safety Refresher Grade level assembly, with PowerPoint and "The Bicycle Zone" video	Palo Alto Fire Department	840
6 Middle School	Making Safe Choices: Drive Your Bike PowerPoint	Rich Swent, League Certified Instructor with Silicon Valley Bicycle Coalition	859
Total			***5,180***

Bike to Work and School Day

The City currently encourages residents to bicycle and walk by participating in Bike to Work Day and supporting the school district programs. Encouragement programs are essential to institutionalizing bicycling and walking as integral and widely-adopted transportation modes. Bike to Work Day is typically the second or third Thursday in May, which is Bike to Work Month. In the San Francisco Bay Area, 511.org leads a region-wide campaign promoting Bike to Work Month and Day. This campaign includes:

- Team Bike Challenges in which companies compete for bicycling the most miles to work during the month of May
- Energizer Stations located throughout the Bay Area, offering promotional materials and snacks to encourage bicycle riding to work

The City of Palo Alto sponsors four energizer stations for Bike to Work Day. Stanford University and Hewlett Packard also sponsor energizer stations bringing the total in Palo Alto to ten for most years.

In past years, Gunn High School promoted a Pedaling for Prizes promotion where students could win prizes including the grand prize of a bicycle. Palo Alto High School also sponsored energizer stations and students who bicycled were rewarded with treats.

Walk and Roll

International Walk to School Day is the first Wednesday in October. Palo Alto joins students from around the world in walking to school, with the intent of instilling a healthy commute habit for the remainder of the year. Activities such as Walking School Busses and Art Contests raise awareness about walking for transportation. Bicycling, skating, scootering, carpooling, and transit are all encouraged to help reduce the number of cars around schools.

Many Palo Alto schools participate in a Walk and Roll Day for Earth Day every April. This event reminds students and parents that schools support and encourage walking and bicycling to school.

Youth Bicycle Education

Palo Alto schools currently offer bicycle and pedestrian safety education courses for kindergarteners through third grade, and fifth and sixth grades. This program reaches over 5,000 students and includes instruction of all sixth graders by a League of American Bicyclists certified instructor (LCI). With the recently awarded Safe Routes to School VERBS grant, the City will update and expand this program.

The Parks and Recreation Department also provides youth bicycle education through the Enjoy Catalog. Participants must register online at the website provided in the following section: Adult Bicycle Education.

Adult Bicycle Education

Children mimic the behavior of their parents. Safe and lawful riding among children relies on their parents' modeling appropriate bicycling behavior. To ensure parents model the appropriate behavior, the Palo Alto Parent Teacher Association provides elementary parent education twice annually. This program teaches parents how to teach bicycle riding skills to their children In previous years, this program reached 120 parents annually, which will increase with the VERBs funded expansion of the program.

Student Hand Tallies and Parent Surveys

The City currently coordinates classroom tally counts by teachers in grades K-5 each fall to evaluate the effectiveness of its current education and outreach efforts. These tallies also allow a snapshot of mode share over time. Through the VERBS grant, an annual parent survey will be developed to identify parents' perceptions of barriers to walking and bicycling, which can be compared to data that have been collected since 1994.

Operation Safe Passage

The Palo Alto Police Department administers Operation Safe Passage, a program to enforce traffic violations committed by motorists, pedestrians, and bicyclists in and around all schools during peak commute hours. Police officers commonly focus on the following violations:

- Failing to stop for school buses with flashing stoplights

- Speeding vehicles
- Failing to yield to pedestrians
- Jaywalking
- Juvenile bicyclists without required helmets or not properly worn
- Seat belt and child restraint seat violations
- Cell phone or texting violations
- Stop sign violations

Crossing Guards

Crossing guards are critical to ensuring lawful use of roadway crossings among children and demand greater respect and yield compliance of motorists. Twenty-nine locations have crossing guards citywide. Table E-3 lists the crossing guard locations and the schools they serve.

Table E-3: Crossing Guard Locations

Intersection	Schools Served
El Camino Real/Arastradero	Gunn, Terman
El Camino Real/Maybell	Gunn, Terman
El Camino Real/Matadero	Gunn, Terman, Barron Park
El Camino Real/Los Robles	Gunn, Terman, Barron Park
El Camino Real/Stanford	Palo Alto, Jordon, Escondido
Arastradero/Donald	Gunn, Terman, Juana Briones
Arastradero/Coulombe	Gunn, Terman, Juana Briones
Maybell/Coulombe	Gunn, Terman, Juana Briones
Barron/El Centro	Barron Park
Alma/Charleston	Gunn
Alma/Meadow	Gunn, JLS
Meadow/JLS/Waverley	JLS
Charleston/Nelson	JLS, Fairmeadow, Hoover
Charleston/Carlson	JLS, Fairmeadow, Hoover
Middlefield/Meadow	JLS, Fairmeadow, Hoover
Middlefield/Mayview	JLS, Fairmeadow, Hoover
Middlefield/Charleston	JLS, Fairmeadow, Hoover
Louis/Greer	JLS, Palo Verde
Louis/ Loma Verde	Palo Verde
Louis/ Amarillo	Ohlone
Louis/North California	Jordan
North California/Newell	Jordan
Embarcadero/Newell	Walter Hays, Jordan
Embarcadero/Middlefield	Walter Hays, Jordan
Addison/Middlefield	Addison
Channing/Alester	Duveneck
Newell/ Dana	Duveneck
Los Altos Ave/El Camino Real	Santa Rita
Bryant/El Carmelo	El Carmelo

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Appendix F. Funding

Funding for bicycle and pedestrian facilities and programs originate at all levels of government. This chapter provides a menu of potential funding sources and is intended to be a resource for City staff. Summaries of federal funding sources begin this chapter, followed by summaries of state, regional, and local sources.

Federal Funding Sources

SAFETEA-LU, the Safe, Accountable, Flexible, and Efficient Transportation Equity Act: A Legacy for Users, is the primary federal funding source for bicycle projects. SAFETEA-LU is the fourth iteration of the transportation vision established by the Intermodal Surface Transportation Efficiency Act (1991). Also known as the federal transportation bill, Congress passed the $286.5 billion SAFETEA-LU bill in 2005. SAFETEA-LU expired in 2009, at which time Congress approved extending funds through 2010.

The next multi-year federal transportation bill reauthorization is anticipated in 2011. Funding for bicycle projects is likely to change. Historically, these modes have received larger allocations with each new multi-year transportation bill.

Caltrans, the State Resources Agency and regional planning agencies administer SAFETEA-LU funding. Most, but not all of these funding programs emphasize transportation modes and purposes that reduce auto trips and provide inter-modal connections. SAFETEA-LU programs require a local match of between zero percent and 20 percent. SAFETEA-LU funds primarily capital improvements and safety and education programs that relate to the surface transportation system.

To be eligible for Federal transportation funds, States are required to develop a State Transportation Improvement Program (STIP) and update it at least every four years. A STIP is a multi-year capital improvement program of transportation projects that coordinates transportation-related capital improvements planned by metropolitan planning organizations and the state.

To be included in the STIP, projects must be identified either in the Interregional Transportation Improvement Plan (ITIP), which is prepared by Caltrans, or in the Regional Transportation Improvement Plan (RTIP), which in the Bay Area is prepared by the Metropolitan Transportation Commission. Bicycle projects are eligible for inclusion. Caltrans updates the STIP every two years.

The following programs are administered by the Federal government.

Transportation Enhancements

The Transportation, Community and System Preservation (TCSP) Program provides federal funding for transit oriented development, traffic calming and other projects that improve the efficiency of the transportation system, reduce the impact on the environment, and provide efficient access to jobs, services and trade centers. The program provides communities with the resources to explore the integration of their transportation system with community preservation and environmental activities. TCSP Program funds require a 20 percent match. Congress appropriated $204 million to this program in Fiscal Year 2009. Funding has been extended under a continuing resolution for FY 2010.

Online resource: http://www.fhwa.dot.gov/tcsp/

Rivers, Trails and Conservation Assistance Program

The Rivers, Trails and Conservation Assistance Program (RTCA) is a National Parks Service program that provides technical assistance via direct staff involvement, to establish and restore greenways, rivers, trails, watersheds and open space. The RTCA program provides only for planning assistance—there are no implementation monies available. Projects are prioritized for assistance based upon criteria that include conserving significant community resources, fostering cooperation between agencies, serving a large number of users, encouraging public involvement in planning and implementation and focusing on lasting accomplishments.

Online resource: http://www.nps.gov/ncrc/programs/rtca/contactus/cu_apply.html

National Scenic Byways Program

The National Scenic Byways Program identifies roads with outstanding scenic, historic, and cultural, natural, recreational, and archaeological qualities as National Scenic Byways. The program provides funding for scenic byway projects and for planning, designing, and developing scenic byway programs. There is a 20 percent match requirement. National Scenic Byways Program can be used to fund on-street and off-street bicycle facilities, intersection improvements, user maps and other publications. Within Santa Clara County, Highway 1 is a National Scenic Byway, and Highways 280 and 35 are State Scenic Byways.

Nationally, $3 million were available each fiscal year between 2006 and 2009. Grant applications for National Scenic Byways Programs are forwarded to the FHWA division office by the state or tribal scenic byways coordinator.

Federal Fact Sheet: http://www.fhwa.dot.gov/safetealu/factsheets/scenic.htm

National Scenic Byways Program: http://www.bywaysonline.org/grants/

State-Administered Funding

The State of California uses both federal sources and its own budget to fund the following bicycle projects and programs.

Bicycle Transportation Account

The Bicycle Transportation Account (BTA) provides state funding for local projects that improve the safety and convenience of bicycling for transportation. Because of its focus on transportation, BTA projects must serve a transportation purpose. Funds are available for both planning and construction. Caltrans administers BTA funds, and requires eligible cities and counties to have adopted a Bicycle Transportation Plan. This Bicycle Master Plan meets BTA requirements for state funding. City Bicycle Transportation Plans must be approved by the local Metropolitan Transportation Commission (MPO) prior to Caltrans approval. Out of $7.2 million available statewide, the maximum amount available for individual projects is $1.2 million.

Online resource: www.dot.ca.gov/hq/LocalPrograms/bta/btawebPage.htm

Federal Safe Routes to School (SRTS) and California Safe Routes to School (SR2S)

Caltrans administers funding for Safe Routes to School projects through two separate and distinct programs: the state-legislated Program (SR2S) and the federally-legislated Program (SRTS). Both programs competitively award reimbursement grants with the goal of increasing the number of children who walk or bicycle to school.

California Safe Routes to School Program expires December 21, 2012, requires a 10 percent local match, is eligible to cities and counties, and targets children in grades K-12. The fund is primarily for construction, but applicants may use up to 10 percent of the program funds for education, encouragement, enforcement, and evaluation activities. Cycle 9 provided $24.25 million for FY 10/11.

The Federal Safe Routes to School Program has been extended through December 31, 2010, and may be included in the future federal transportation bill. Cities, counties, school districts, non-profits, and tribal organizations are eligible for the 100 percent reimbursable funds that target children in grades K-8. Applicants may use funds for construction or for education, encouragement, enforcement, and evaluation activities. Construction must be within two miles of a grade school or middle school. Cycle 2 provided $46 million for FY 08/09 and 09/10.

Online resource: http://www.dot.ca.gov/hq/LocalPrograms/saferoutes/saferoutes.htm

Recreational Trails Program

The Recreational Trails Program (RTP) of SAFETEA-LU allocates funds to states to develop and maintain recreational trails and trail-related facilities for both non-motorized and motorized recreational trail uses. Examples of trail uses include hiking, bicycling, in-line skating, equestrian use, and other non-motorized and motorized uses. The State Department of Parks and Recreation administers RTP funds in California and cities are among the eligible applicants. A minimum 12 percent of local match is required. California received a $1.3 million apportionment for FY 2010 and continuation of the program is dependent on Federal authorization of a new transportation bill. RTP projects must be ADA-compliant and may be used for the following activities:

- Maintenance and restoration of existing trails
- Purchase and lease of trail construction and maintenance equipment
- Construction of new trails, including unpaved trails
- Acquisition of easements or property for trails
- State-administrative costs related to this program (limited to seven percent of a State's funds)
- Operation of educational programs to promote safety and environmental protection related to trails (limited to five percent of a State's funds).

Online resource: http://www.parks.ca.gov/default.asp?page_id=24324

California Conservation Corps

The California Conservation Corps (CCC) is a public service program that occasionally provides assistance on construction projects. The CCC may be written into grant applications as a project partner. In order to utilize

CCC labor, project sites must be public land or publicly-accessible. CCC labor will not perform regular maintenance, but will perform annual maintenance, such as the opening of trails in the spring.

Online resource: http://www.ccc.ca.gov/

Transportation Planning Grant Program

The Transportation Planning Grant Program, administered by Caltrans, provides two grants for bicycle project planning and construction.

The Community-Based Transportation Planning Grant funds projects that exemplify livable community concepts, including bicycle improvement projects. Eligible applicants include local governments, MPOs, and RPTAs. A 20 percent local match is required and projects must demonstrate a transportation component or objective. There is $3 million available annually statewide. The maximum grant award is $300,000.

The Environmental Justice: Context Sensitive Planning Grants promote context sensitive planning in diverse communities and funds planning activities that assist low-income, minority, and Native American communities to become active participants in transportation planning and project development. Grants are available to transit districts, cities, counties, and tribal governments. This grant is funded by the State Highway Account at $1.5 million annually statewide. The maximum grant award is $300,000.

Online resource: www.dot.ca.gov/hq/tpp/grants.html

Highway Safety Improvement Program

The Highway Safety Improvement Program funds are allocated to States as part of SAFETEA-LU. The goal of HSIP funds is to achieve a significant reduction in traffic fatalities and serious injuries on all public roads. As required under the Highway Safety Improvement Program (HSIP), California Department of Transportation has developed and is in the process of implementing a Strategic Highway Safety Plan (SHSP). A portion of the HSIP funds allocated to each state is set aside for construction and operational improvements on high-risk rural roads. If the state has a Strategic Highway Safety Plan, the remainder of the funds may be allocated to other programs, including projects on bicycle pathways or trails and education and enforcement. The local match varies between 0 and 10 percent. The maximum grant award is $900,000.

Caltrans issues an annual call for projects for HSIP funding to cities and counties. Projects must be in a publicly owned right of way or bicycle/pedestrian path that corrects or improves the safety of its users and must meet the goals of the Strategic Highway Safety Plan.

Federal HSIP online resource: http://www.fhwa.dot.gov/safetealu/factsheets/hsip.htm

Caltrans HSIP online resource: http://www.dot.ca.gov/hq/LocalPrograms/hsip.htm

Environmental Enhancement and Mitigation Funds

The Environmental Enhancement Mitigation Program (EEMP) provides grant opportunities for projects that indirectly mitigate environmental impacts of new transportation facilities. Projects should fall into one of the following three categories: highway landscaping and urban forestry, resource lands projects, or roadside recreation facilities. Funds are available for land acquisition and construction. The local Caltrans District must support the project. The average award amount is $250,000.

Online resource: http://resources.ca.gov/eem/

State Highway Operations and Protection Program

The State Highway Operations and Protection Program (SHOPP) is a Caltrans funding source with the purpose of purpose of maintaining and preserving the investment in the State Highway System and supporting infrastructure. Projects typically fall into the following categories: collision reduction, major damage restoration, bridge preservation, roadway preservation, roadside preservation, mobility enhancement, and preservation of other transportation facilities related to the state highway system. In the past, SHOPP funds have been used to construct bicycle projects, including curb ramps, overcrossings, bike paths, sidewalks, and signal upgrades to meet ADA requirements. Jurisdictions work with Caltrans' districts to have projects placed on the SHOPP list.

The total amount available for the four-year SHOPP period between 2010/11 and 2013/14 fiscal years is $6.75 billion, which is a reduction in funding from prior SHOPP programs. Past project awards have ranged from approximately $140,000 to $4.68 million.

The American Recovery and Reinvestment Act (ARRA) granted funding to this program in California.

Online resource: http://www.dot.ca.gov/hq/transprog/shopp.htm

Petroleum Violation Escrow Account (PVEA)

In the late 1970's, a series of Federal court decisions against selected United States oil companies ordered refunds to the States for price overcharges on crude oil and refined petroleum products during a period of price control regulations. To qualify for PVEA funding, a project must save or reduce energy and provide a direct public benefit within a reasonable time frame. In the past, the PVEA has been used to fund programs based on public transportation, computerized bus routing and ride sharing, home weatherization, energy assistance and building energy audits, highway and bridge maintenance, and reducing airport user fees. In California, Caltrans administers funds for transportation-related PVEA projects. Local agencies must contact their local legislator (Senate or Assembly) to initiate PVEA funding requests. PVEA funds do not require a match and can be used as match for additional Federal funds.

Online resource: http://www.dot.ca.gov/hq/LocalPrograms/lam/prog_g/g22state.pdf

Office of Traffic Safety (OTS) Grants

Grants from the Office of Traffic Safety are supported by Federal funding under the National Highway Safety Act and SAFETEA-LU. In California, the grants are administered by the Office of Traffic Safety.

Grants are used to establish new traffic safety programs, expand ongoing programs, or address deficiencies in current programs. Bicycle safety is included in the list of traffic safety priority areas. Eligible grantees are governmental agencies, state colleges, state universities, local city and county government agencies, school districts, fire departments, and public emergency services providers. Grant funding cannot replace existing program expenditures, nor can traffic safety funds be used for program maintenance, research, rehabilitation, or construction. Grants are awarded on a competitive basis, and priority is given to agencies with the greatest need. Evaluation criteria to assess need include potential traffic safety impact, collision statistics and rankings, seriousness of problems, and performance on previous OTS grants.

The California application deadline is January of each year. There is no maximum cap to the amount requested, but all items in the proposal must be justified to meet the objectives of the proposal.

California OTS online resource: http://www.ots.ca.gov/Grants/default.asp

Community Development Block Grants

The CDBG program funds projects and programs that develop viable urban communities by providing decent housing and a suitable living environment and by expanding economic opportunities, principally for persons of low and moderate income. Federal Community Development Block Grant Grantees may use CDBG funds for activities that include (but are not limited to) acquiring real property; building public facilities and improvements, such as streets, sidewalks, and recreational facilities; and planning and administrative expenses, such as costs related to developing a consolidated plan and managing CDBG funds. The state makes funds available to eligible agencies (cities and counties) through a variety of different grant types. Grantees enter into a contract with the state. Eligible agencies are determined based on a formula, and are listed on the HUD website.

California received a $42.8 million allocation for all CDBG programs in FY 2010. The maximum grant amount is $800,000 for up to two eligible projects or $400,000 for a public service program.

Online resource: http://www.hud.gov/offices/cpd/communitydevelopment/programs/index.cfm

Eligible CDBG Agencies in California: http://www.hud.gov/local/ca/community/cdbg/#state

Locally-Administered Funding

Local funding sources are generally administered by Metropolitan Planning Organizations, Congestion Management Agencies, Transportation Improvement Authorities, or other regional agencies. Counties or cities may administer some funding sources. These funding sources are supported by federal, state, or local revenue streams.

Regional Surface Transportation Program

The Regional Surface Transportation Program (RSTP) is a block grant program that provides funding for bicycle projects, among many other transportation projects. Under the RSTP, Metropolitan planning organizations, such as the Metropolitan Transportation Commission's (MTC), prioritize and approve projects that will receive RSTP funds. Metropolitan planning organizations can transfer funding from other federal transportation sources to the RSTP program in order to gain more flexibility in the way the monies are allocated. In California, 76 percent of RSTP funds are allocated to urban areas with populations of at least 200,000. The remaining funds are available statewide.

Online resource: http://www.mtc.ca.gov/funding/STPCMAQ/

Transportation for Livable Communities Program

The Transportation for Livable Communities Program (TLC) provides grant monies to public agencies to encourage land use decisions that support compact, bicycle-friendly development near transit hubs. MTC's Transportation Plan 2035 stipulates all eligible TLC projects to be within Priority Development Areas (PDAs), which focus growth around transit. MTC selects projects based on their status (planned or proposed) and

their development intensity. MTC administers the TLC program with funds from the Regional Surface Transportation Project and caps grants at $400,000. Funds may be used for capital projects or planning.

Online resource: www.mtc.ca.gov/planning/smart_growth/tlc_grants.htm

Transportation Fund for Clean Air

Administered by the Bay Area Air Quality Management District (BAAQMD), the Transportation Fund for Clean Air (TFCA) is a grant program funded by a $4 surcharge on motor vehicles registered in the Bay Area. This surcharge generates approximately $22 million per year in revenue. TFCA's goal is to implement the most cost-effective projects in the Bay Area that will decrease motor vehicle emissions, and therefore improve air quality. Projects must be consistent with the 1988 California Clean Air Act and the Bay Area Ozone Strategy. TFCA funds covers a wide range of project types, including bicycle facility improvements such as bike lanes, bicycle racks, and lockers; arterial management improvements to speed traffic flow on major arterials; and smart growth.

Online resource: http://www.baaqmd.gov/Divisions/Strategic-Incentives/Funding-Sources/TFCA.aspx

Bicycle Facilities Program

The BAAQMD Bicycle Facility Program (BFP) provides grant funding to reduce motor vehicle emissions through the implementation of new bikeways and bicycle parking facilities in the Bay Area. The TFCA program funds the BFP. Projects must cost between $10,000 and $120,000 and the applicant must have secured 50 percent in matching funds. The BAAQMD typically releases a call for projects in June or July, requiring an application submittal in September and announcing project awards in November.

Online resource: http://www.baaqmd.gov/Divisions/Strategic-Incentives/Bicycle-Facility-Program.aspx

Safe Routes to Transit (SR2T)

Regional Measure 2 (RM2), approved in March 2004, raised the toll on seven state-owned Bay Area bridges by one dollar for 20 years. This fee increase funds various operational improvements and capital projects that reduce congestion or improve travel in the toll bridge corridors.

MTC allocates the $20 million of RM2 funding to the Safe Routes to Transit Program, which provides competitive grant funding for capital and planning projects that improve bicycle access to transit facilities. Eligible projects must reduce congestion on one or more of the Bay Area's toll bridges. Transform and the East Bay Bicycle Coalition administer SR2T funding. Awarded in five $4 million grant cycles, the first round of funding was awarded in December 2005. Future funding cycles will be in 2011 and 2013.

Online resource: http://www.transcoalition.org/c/bikeped/bikeped_saferoutes.html

TDA Article 3

Transportation Development Act (TDA) Article 3 funds are state block grants awarded annually to local jurisdictions for transit and bicycle projects in California. Funds originate from the Local Transportation Fund (LTF), which is derived from a quarter-cent of the general state sales tax. LTF funds are returned to each county based on sales tax revenues.

Eligible bicycle projects include construction and engineering for capital projects, maintenance of bikeways, bicycle safety education programs (up to five percent of funds), and development of comprehensive bicycle facilities plans. A city or county may apply for funding to develop or update bicycle plans not more than once every five years. TDA funds may be used to meet local match requirements for federal funding sources. Two percent of the total TDA apportionment is available for bicycle and pedestrian funding.

Online resource: http://www.mtc.ca.gov/funding/STA-TDA/

Regional Bicycle Program

The Regional Bicycle Program funds construction of bikeways on the Regional Bikeway Network for the Bay Area. MTC administers RBP funds to county CMA's based on population, bikeway network capital cost, and unbuilt network miles.

Online resource: www.mtc.ca.gov/planning/bicyclespedestrians/regional.htm

County and Local Sources

Table F-1 lists the existing funding sources that are currently or could be used to fund bicycle and/or pedestrian improvements. Additional funding sources that could also pay for the improvements recommended by the BPTP are listed following the table.

Table F-1: Existing and Potential Funding - Palo Alto CIP and Other Plans

Project or Program	Responsible Division/ Sponsoring Agency	Funds/ Cost Allocation	Description
Palo Alto Capital Improvement Program 2011-2015			
Direct Funding			
Bicycle Plan Imple-mentation	Planning and Community Environment	$200,000	$50k/yr; From budget: "Six bike boulevards are yet to be implemented: Homer Ave; Matadero Ave/ Margarita Ave; Castilleja/Park Boulevard/ Wilkie Way; Everett Ave/ Palo Alto Ave; Chaucer/Boyce/ Melville; and Bryant St bike boulevard extension.
Sidewalk Repairs	Public Works	$3,374,000	$650k/yr; Backlog of sidewalk replacement is estimated to be complete in 2016. $50,000 will continue to be allocated for high pedestrian-use areas.
Safe Routes to School	Planning and Community Environment	$400,000	Includes expenditures for capital projects that help improve the School Commute Corridors Network and Neighborhood Traffic Calming Program
		$528,000	2010 VTA VERBS grant award of $528k for non-infrastructure projects and programs (education, encouragement, capacity building)
San Antonio Median Improvements	Public Works	$630,000	Project under construction with grant of $900,000 from Highway Safety Improvement Program (HSIP) to implement Phase II improvements (for a total project cost of $1.53 million).

Project or Program	Responsible Division/ Sponsoring Agency	Funds/ Cost Allocation	Description
Charleston/ Arasatradero Corridor Project	Public Works/Planning and Community Environment	$4,000,000	Total budget of $5.2 million including trial project and past expenditures; fund sources currently not identified for Phase II
El Camino/ Stanford Intersection	Planning and Community Environment	$1,668,000	$1.82 million total includes funds from '06-10 budget; 2006 VTA Community Design and Transportation (CDT) grant of $1.334 million.
101 Pedestrian/ Bicycle Overpass	Public Works/Planning and Community Environment	$250,000	$376k total budget for planning and design, including '06-10 expenditures; preferred alternative soon to be approved
Dinah/Summer Hill Shared Use Path	Planning and Community Environment	$300,000	Funds to leverage private redevelopment project to create a 15' x 130' public share used path; 2011 outlay
California Ave Streetscape Improvements	Public Works/Planning and Community Environment	$1,600,000	2010 VTA CDT grant; local match of $500k
Off-Road Pathways Maintenance	Public Works	$500,000	$100k/yr: The 9-mile off-road trail system in Palo Alto is 35 years old and has not been maintained or repaired. Cracks, pot holes, and base failures in areas cause significant safety issues. This project removes and replaces severely damaged sections of asphalt, repairs cracks and base failures, and resurfaces worn or uneven surfaces of off-road asphalt pathways and bicycle trails. Priority will be given to the repair of the most uneven sections of pathway. The project does not create new off-road trails.
Potential Direct and/or Partial "Accommodation" Funding			
Street Median Improvements	Public Works	$468,000	Renovates medians, planters, and islands by repairing or installing irrigation systems, replacing meters and backflow devices, signage and re-landscaping as necessary. The City maintains approximately 388 medians, islands, gateways, and traffic diverters throughout Palo Alto. These projects will be used for budget planning. Once individual projects are developed and funding is identified, the projects will be brought to Council on an individual basis with individual scopes of work. Fiscal Year 2012 work schedule includes: 7 cul-de-sacs, Island Drive, and Evergreen Park Barriers; Fiscal Year 2013 work schedule includes: medians for Page Mill/Oregon Expressway; Fiscal Year 2014 TBD

Project or Program	Responsible Division/ Sponsoring Agency	Funds/ Cost Allocation	Description
Thermoplastic Striping and Marking	Public Works/Planning and Community Environment	$250,000	$50k/yr to restripe roadways
Street Maintenance	Public Works	$18,768,000	This project provides for annual resurfacing, slurry seal, crack seal, and reconstruction of various city streets recommended in the City Auditor's report on street maintenance. The list of streets to be included in this project will be prioritized and coordinated with Utilities Department undergrounding projects. $630k estimate for 2011 according to VTA, including $549 VTA STP funds
Traffic Signal Upgrades	Public Works/ Planning and Community Environment	$670,000	
Adaptive Traffic Signal Control Project	Public Works/Planning and Community Environment	$476,000	May include $98k in local match from traffic signal upgrades CIP, along with federal earmark of $368k according to VTA records. $103k for design and $373k for construction at 9 identified intersections; additional funding anticipated from Stanford Hospital Expansion mitigation.
Sign Reflectivity Upgrade	Public Works	$300,000	Approximately $50k/yr to ensure compliance with the Manual on Uniform Traffic Control Devices (MUTCD) minimum reflectivity standards. City will phase in this project over a six-year period to ensure compliance by the 2018 deadline.
Parks - Benches, Signage, Fencing, Walkways, and Perimeter Landscaping	Community Services	$700,000	Average $150k/yr; Fiscal Year 2012 through Fiscal Year 2015 - To be determined
Open Space Trails and Amenities	Community Services	$741,000	$150k/yr: This project restores trails, fences, picnic areas, and campgrounds at Foothills Park, the Baylands, and the Pearson-Arastradero Nature Preserves to ensure that facilities are safe, accessible, and maintained for recreational uses. Staff continues to aggressively pursue grant funding opportunities for trail and open space amenity improvements. In the past five years, $435,000 from grant programs augmented the City's contribution to trails improvements.
Indirect and/or Potential Project Integration Opportunities			
Street Light Improvements	Public Works	$550,000	$135k/yr starting 2012; This project replaces street light poles, pole foundations, luminaires, and wiring as needed to maintain or improve street lighting. How do they determine?

Project or Program	Responsible Division/ Sponsoring Agency	Funds/ Cost Allocation	Description
City Facility Parking Lot Maintenance	Public Works	$300,000	100k/yr 2012-214, includes walkway and patio repair at main library, Junior museum, Lucie Stern Center; money does not include plans for Cubberly, for which reimbursement is expected through PAUSD, Foothill College, and/or parking fees.
ADA Compliance	Public Works	$600,000	Mostly earmarked for "buildings and facilities"; some path of travel improvements planned for 2013 and 2015 at city facilities
Art in Public Spaces	Community Services	$225,000	Approx. $50k/yr
City Park Improvements	Public Works	$1,700,000	Average $340k/yr; Fiscal Year 2012 - Wallis and El Palo Alto Parks Fiscal Year 2013 - Robles, Seal, and Werry Parks Fiscal Year 2014 - Baylands Athletic Center Parking lot improvements Fiscal Year 2015 - TBD
Rinconada Park Improvements	Public Works	$775,000	2012 outlay: This project's Fiscal Year 2010 funding has been deferred and the project will be re-evaluated during the Fiscal Year 2011 Capital Improvement Program prioritization process. Access and renovation
Hopkins Park improvements	Community Services	$95,000	2012: This project will enhance the quality and condition of Hopkins Park and address accessibility needs with sidewalk ramping and pathway repairs. This project will upgrade/renovate two mini parks on Palo Alto Ave along San Francisquito Creek, and the gateway area at the intersection of Palo Alto Ave and Middlefield Road.
Monroe Parks improvements	Community Services	$250,000	2011: This project will provide necessary upgrades to pathways, benches, trash, and recycling receptacles and play equipment at Monroe Park. Funding focuses on repairing existing infrastructure and does not entail full-scale park renovation.
Foothills Park Improvements	Community Services	$150,000	2012 - Asphalt paving of roads within park.
Cogswell Plaza Improvements	Community Services	$150,000	2011 - Funding focuses on repairing existing infrastructure and does not entail full-scale park renovations.
Smart Grid Technology Installation	Utilities	$11,500,000	Approximately $2-3 million/yr to implement portions of the Smart Grid Road Map that can be cost effectively applied to the City's electric, gas, and water utilities system resulting in operational cost savings, environmental benefits, and an increase the quality of life and productivity of the residents and businesses of Palo Alto.
Underground Systems Rehabilitation Projects (various)	Utilities	$4,430,000	Various location-specific projects, 2011-2015. Significant rehabilitation of underground electrical systems in Underground Districts 12, 15, 16, 20, and 24 with likely potential impacts and restoration to roadways and sidewalks

Project or Program	Responsible Division/ Sponsoring Agency	Funds/ Cost Allocation	Description
Under-grounding Projects - District 42, 43, 46, and 47	Utilities	$8,800,000	Various location-specific projects, 2011-2015. Removal of overhead electrical lines and replacement with underground systems, involving likely impacts and restoration to roadways and sidewalks.
Gas System Extensions	Utilities	$3,500,000	$700k/yr unidentified
Gas System Improvements	Utilities	$1,000,000	$200k/yr unidentified
Gas System Rehabilitation Projects 20-25	Utilities	$21,054,000	Average allocation of $4.25 million/year to design and replace leaking, inadequately sized, and structurally deficient gas mains and services. By researching the maintenance and leak histories of the mains in the gas distribution system, staff identifies mains and services with these problems. This gas system analysis, along with computer modeling of the proposed improvements to the gas distribution system and coordination with Public Works Paving CIP, is used to select candidates for main and service replacement.
Water System Rehabilitation Projects 24-29	Utilities	$33,532,000	Approximately 24 miles of the total 214 miles in the City's water distribution system are still in need of replacement or rehabilitation. Each year an average of $6.7 million is planned for a set of prioritized projects along the most deteriorated portions of the system.
Sewer System Extensions	Utilities	$3,750,000	$750k/yr: This project provides for the installation of sewer lateral connections, additions of existing mains, and extensions of mains for new or existing customers.
Wastewater Rehabilitation Projects 23-28	Utilities	$16,132,000	Each year an average of $3.3 million is allocated to projects that will implement high priority rehabilitation, augmentation, and lateral replacement work, which reduces inflow of rainfall and ground water into the collection system. The project will be comprised of streets identified in the Master Plan or video inspection work as deficient and in need of enlargement or rehabilitation. Priority will be given to areas identified by Public Works as targeted work zones ensuring infrastructure coordination among the different City departments.
Storm Drainage Funds - Channing/ Lincoln Storm Drain Improvements	Utilities	$5,600,000	2011-2014: This project consists of the installation of 5,800 linear feet of 36-inch to 60-inch diameter storm drain along Channing and Lincoln Avenues.
Matadero Creek Storm Water Pump Station and Trunk Line Improvements	Utilities	$2,155,000	2015 outlay: The streets in this area of the City are lower than the creek water level during storm events. Upgrades to the pump station and the storm drain pipelines leading to it will allow storm runoff to be pumped into Matadero Creek regardless of the creek level.

Project or Program	Responsible Division/ Sponsoring Agency	Funds/ Cost Allocation	Description
Storm Drain Rehabilitation	Utilities	$3,000,000	An average of $600k/yr for projects that will implement the recommendations established by the 1993 Storm Drain Condition Assessment Report. The specific pipes and drainage structures selected for replacement and/or rehabilitation will be determined based on their 1993 condition score and recommendations by field maintenance staff.
Stanford University Hospital Expansion - Proposed Mitigation and Public Benefit Package			
Direct Funding			
Citywide Transportation Impact Fees	Public Works/Planning and Community Environment	$2,200,000	Mitigation for public facilities and services that relieve citywide traffic congestion, namely City of Palo adaptive signal control technologies, expanded crosstown shuttle program, and new Everett Ave Caltrain undercrossing.
Palo Alto Intermodal Transportation Center Pedestrian and Bicycle Enhancements	Public Works/Planning and Community Environment	$2,250,000	For improvements between Palo Alto Intermodal Center and intersection of El Camino/Quarry Rd, with the majority for landscaped passive/active green space according to the proposal
Wayfinding Improvements	Public Works/Planning and Community Environment	$400,000	Pedestrian, bicycle, and transit wayfinding improvements on Quarry Rd between El Camino and Welch
Pedestrian Access Improvements	Stanford Medical Center	$700,000	Enhanced pedestrian connection between Medical Center and Palo Alto Shopping Center, from Welch Road to Vineyard Lane
Potential Direct and/or Partial "Accommodation" Funding			
Stanford University Medical Center Sustainability Fund	TBD	$4,000,000	Details to be determined by City of Palo Alto and Stanford Medical Center
Full-Time Transportation Demand Management (TDM) Coordinator	Stanford Medical Center	$100,000	Funding per year for coordinator position similar to Stanford University's program for Stanford Medical Center employees

Project or Program	Responsible Division/ Sponsoring Agency	Funds/ Cost Allocation	Description
Alpine Rd/I-280 Northbound Ramp Signalization	Caltrans/Santa Clara County	$30,000	Fair share contribution towards potential signal project
Ped/Bike Caltrain Undercrossing	City of Menlo Park	$183,000	Fair share mitigation cost for future potential project in Menlo Park
Planned Intersection Improvements	City of Menlo Park	$514,000	Contribution to planned improvements, including the intersections of Bayfront Expwy/University Ave and Willow/Middlefield Rd.
Traffic Signal Upgrades	City of Menlo Park	$72,000	Fair share mitigation for impacts at specified intersections, including along Sand Hill and Middlefield Rd
County/Regional Projects and Expenditure Programs			
Direct Funding			
Regional Bicycle Share Program	VTA/BAAQMD	Approximately $560,000	Palo Alto approximate portion of $6.9 million pilot program coordinated with VTA, BAAQMD, San Mateo County, and SFMTA, with majority of funds from MTC Climate Initiatives and Safe Routes to Transit grants. Includes 400 bicycles for San Jose and 100 for the City of Palo Alto focused on Caltrain corridor. Expected schedule includes planning/design for 2011, implementation in summer 2012.
Medians and Pedestrian Bulb-Outs on Junipero Serra Rd Near Stanford University	County of Santa Clara	$1,700,000	VTA Local Streets and County Rds Program
Palo Alto Bicycle Boulevards Network Project	VTA Bicycle Expenditure Plan	$5,000,000	Assumes implementation of 2003 Plan recommendations
Palo Alto California Ave. Caltrain Undercrossing Improvement	VTA Bicycle Expenditure Plan	$13,000,000	
Palo Alto US 101/Adobe Creek Ped./Bicycle Grade Separation	VTA Bicycle Expenditure Plan	$6,000,000 - 10,000,000	
Palo Alto South Palo Alto Caltrain Pedestrian/Bicycle Grade Separation	VTA Bicycle Expenditure Plan	$13,000,000	

Project or Program	Responsible Division/ Sponsoring Agency	Funds/ Cost Allocation	Description
Matadero Creek 101 Undercrossing	VT Bicycle Expenditure Plan	$2,000,000	
Partial and "Accommodation" Funding			
Page Mill/I-280 Interchange Improvements	County of Santa Clara	$4,950,000	City Staff is coordinating with County of Santa Clara and Caltrans to develop concept improvement plans.
Oregon Expressway Intersection Improvements	County of Santa Clara	$6,600,000	Multiple intersection and adaptive traffic signal improvements. Includes bicycle boulevard signal treatment at Ross Rd (similar to Bryant St at Embarcadero Ave)
Palo Alto Smart Residential Arterials Program	VTA/City of Palo Alto	$6,250,000	As shown in VTP 2035's Roadway Maintenance Program Project List
Palo Alto Intelligent Transportation Systems	VTA/City of Palo Alto	$1,800,000	As shown in VTP 2035's Roadway Maintenance Program Project List
Palo Alto Intermodal Transit Center	VTA/City of Palo Alto	$59,000,000	Unspecified improvements
El Camino Real BRT	VTA	$233,000,000	$2 million shown in MTC TIP for 2010-2012
Potential Coordination Funding and/or Indirect Value			
US 101 Pedestrian/ Bicycle Overpass at University Ave	East Palo Alto/San Mateo County	$2,399,000	East Palo Alto Overcrossing at University Ave; expenditures shown primarily for 2012 in MTC TIP
Bay Rd Improvement Phases II and III	East Palo Alto/San Mateo County	$11,897,000	Resurface, streetscape, bike lanes, and other improvements; expenditures shown for 2010-2011 in MTC TIP
El Camino Real Grand Boulevard Initiative	San Mateo County Transit District (SAMTRANS)	$3,994,000	Over $3 million shown in FY 2010-2011 in MTC TIP