Appendix 3.1 Planning and Policy Context

Alignment with Existing Planning Documents

The Santa Clara Countywide Bicycle Plan is consistent with prior planning and policy efforts at the local, regional, and national level. The Countywide Bicycle Plan was developed with input from the local jurisdictions, the Metropolitan Transportation Commission, and Caltrans and supports practices from these agencies. This appendix provides an annotated list of relevant policy and planning documents, and indicates how the Countywide Bicycle Plan relates to these documents.

National Plans and Policies

US DOT Policy Statement on Bicycle and Pedestrian Accommodation Regulations and Recommendations

In 2010, the United States Department of Transportation (US DOT) issued a policy in support of walking and bicycling. The policy encourages transportation agencies to fully integrate active transportation into projects. The US DOT encourages agencies to adopt similar policies in support of walking and bicycling such as:

- Treating walking and bicycling on par with other transportation modes
- Ensuring availability of transportation choices for people of all ages and abilities
- Exceeding minimum design standards
- Accommodating bicyclists and pedestrians on bridges
- Setting mode share goals for walking and bicycling, and tracking them over time
- Establishing maintenance procedures for removing snow from sidewalks and paths
- Improving active transportation facilities during maintenance projects
- Collecting data on walking and bicycling trips

VTA integrates active transportation into its plans, funding programs, and capital projects. The Countywide Bicycle Plan is one example of this.

Americans with Disabilities Act

The Americans with Disabilities Act, enacted in 1990, provides protections to individuals with disabilities with regard to access to public accommodation and transportation. In the context of the Countywide Bicycle Plan, ADA is critical to the planning and design of innovative and enhanced bikeways. The needs of people with visual, hearing, or mobility impairments must be accommodated when designing bikeways. This is particularly true for areas where pedestrians and bicyclists share the facility, such as cycle tracks adjacent to transit stops and bicycle paths.

Statewide Plans and Policies

Complete Streets Act of 2008

California's Complete Streets Act of 2008 (Assembly bill 1358) requires California cities to "plan for a balanced, multimodal transportation network that meets the needs of all users." In effect, the Complete Streets Act requires cities to consider bicyclists, pedestrians, and transit customers when planning their transportation network. The Complete Streets Act makes it more likely that projects identified in the Countywide

Bicycle Plan will be integrated into larger transportation projects.

Senate Bill 375/Assembly Bill 32

California Assembly Bill 32 sets statewide goals for reducing greenhouse (GHG) gases in response to climate change. The bill requires GHG emissions to be reduced by 28 percent from 1990 levels by 2020 and by 50 percent by 2050. Senate Bill 375 provides the implementation mechanisms for AB 32. It requires planning organizations agencies to develop Sustainable Community Strategies, which are regional guides for housing, land uses, and transportation. Sustainable Community Strategies identify ways a region can reduce GHG emissions by increasing biking, walking, and transit use, and decreasing the amount people drive.

The Countywide Bicycle Plan supports these goals by planning for functional Cross County Bicycle Corridors that will enable people to leave their cars at home and bicycle for some trips.

Regional Plans and Policies

MTC Policy on Routine Accommodation and Complete Streets Resolutions

The Metropolitan Transportation Commission (MTC) is the regional transportation planning agency for the Bay Area. In 2006, MTC adopted a policy on “Routine Accommodation,” (Resolution 3765). The policy states that pedestrian and bicyclist accommodations must be considered during the planning, design, and construction of transportation projects funded through MTC’s programs and fund sources. The policy requires city or county agencies to complete the MTC Complete Street Checklist to document how a project accommodates bicyclists and pedestrians. The Countywide Bicycle Plan encourages Member Agencies to reference this policy when developing bicycle projects.

MTC Regional Bicycle Plan for the San Francisco Bay Area

MTC’s Regional Bicycle Plan for the San Francisco Bay Area (2009) identifies a set of regional bicycle corridors. Regional bicycle corridors are a subset of local bicycle networks. The Santa Clara Countywide Bicycle Plan incorporates the regional bicycle network into its Cross County Bicycle Corridors.

Plan Bay Area 2040

Plan Bay Area 2040 is an updated long-range Regional Transportation Plan and Sustainable Communities Strategy for the nine-county San Francisco Bay Area. It is developed by MTC, and integrates land use and transportation planning. The plan describes where and how the region can accommodate 820,000 new households and 1.3 million jobs by 2040. It also describes $303 billion in transportation investments, and outlines how land use and transportation decisions can reduce greenhouse gas emissions.

The Countywide Bicycle Plan supports Plan Bay Area 2040 by planning for improved bicycle connections to transit. Interchange improvements included in Plan Bay Area 2040 are opportunities for implementing the Countywide Bicycle Plan.

San Francisco Bay Trail Gap Analysis

The San Francisco Bay Trail is a planned 500 mile walking and biking path around the San Francisco Bay. ABAG’s Bay Trail Gap Analysis identifies gaps and costs needed to build out the San Francisco Bay Trail. In 2005, there were 15.5 miles of gap closure remaining in Santa Clara County. The document estimates it will cost approximately $19 million (in 2005 dollars) to complete the Bay Trail in the county. The Santa Clara Countywide Bicycle Plan incorporates the Bay Trail into its Cross County Bicycle Corridors.

Countywide Plans and Policies

VTA Valley Transportation Plan

VTP 2040 is the countywide long-range transportation plan for Santa Clara County. The plan establishes a list of transportation projects that could be delivered over the next approximately 30 years given anticipated funding sources. It includes bicycle and pedestrian projects, in addition to transit, highway, local road and intelligent transportation system projects. VTA updates the VTP every four years. Future updates will incorporate some of the projects and programs identified in the updated Countywide Bicycle Plan.

VTA Complete Streets Policy

In January 2018, VTA's Board of Directors adopted a Complete Streets Policy. The policy incorporates best practices from other agencies, and supports MTC's Complete Streets policies. Among other things, VTA's Complete Streets Policy requires VTA to seek opportunities to incorporate projects in the Countywide Bicycle Plan into larger transportation projects managed by the agency. Exceptions are signed off by management.

VTA Complete Streets Requirements for 2016 Measure B

In November 2016, Santa Clara County voters approved Measure B—a half-cent, 30-year sales tax to fund multimodal transportation improvements. 2016 The VTA Board of Directors requires that all capital projects funded through the sales tax follow complete streets best practices to provide for pedestrians, bicyclists, and transit riders. Among other things, this means that, with some exceptions, major transportation projects funded by 2016 Measure B must look for opportunities to implement the Countywide Bicycle Plan within the project footprint.

VTA Strategic Plan

The VTA Strategic Plan, adopted in 2017, aims to further establish VTA as an industry leader, innovator, and a transportation organization worthy of moving Silicon Valley. The plan provides the framework to tie everyday work into the overall direction and priorities for the agency. It is a high-level plan meant to provide direction and actively foster creativity, collaboration, and leadership.

The Countywide Bicycle Plan was developed with the action values of the Strategic Plan in mind: create, collaborate, lead.

Pedestrian Access to Transit Plan

In September 2017, the VTA Board of Directors adopted the agency's first Pedestrian Access to Transit Plan. The plan identifies 12 Focus Areas that have high transit ridership and poor pedestrian environment. It makes recommendations for improvements in these Focus Areas. The projects identified in this document are evaluated for their potential to improve pedestrian conditions. The Countywide Bicycle Plan complements the improvements proposed in the Pedestrian Access to Transit Plan.

Bicycle Technical Guidelines (BTG)

The VTA BTG present standards and guidance for planning, designing, operating, retrofitting and maintaining roadways and bikeways. They are intended to improve the quality of bicycle accommodation and to ensure countywide consistency in the design and construction of not only bicycle projects but all roadways. The BTG are intended to aid Member Agencies in providing a high quality and seamless bicycle network and to facilitate and encourage the use of bicycles as a transportation mode in the county. VTA funding sources often require that bicycle projects meet BTG designs in order to be eligible for funding.

The design expectations for CCBCs and Bicycle Superhighways described in the Countywide Bicycle Plan either meet or exceed the recommendations of the BTG.

Countywide Trails Prioritization and Gaps Analysis

In 2015, Santa Clara County Parks and Recreation developed the Countywide Trails Prioritization and Gaps Analysis Report, summarizing the status of trail corridors throughout Santa Clara County. The Countywide Bicycle Plan incorporates the regional and sub-regional trails identified in the Gaps Analysis.

Local Planning Documents

In addition to the Federal, State, Regional, and Countywide planning documents reviewed here, there are numerous local bicycle planning documents, ranging from citywide master plans, to corridor studies, to trail master plans. The Santa Clara Countywide Bicycle Plan aims to support and complement these documents.

Appendix 4.1 Public and Stakeholder Input

Outreach was crucial for development of the Countywide Bicycle Plan. Outreach helped:

- Define and share the vision, goals, and purpose of the Santa Clara County Bicycle Plan.
- Educate the public and stakeholders about existing conditions, progress made to-date on countywide bicycle facilities, innovative bicycle treatments, and ways to get involved in developing the plan.
- Gather information from the public and stakeholders regarding desired bikeway locations, infrastructure designs, bicycle amenities, and current barriers to bicycle commuting.
- Build excitement and momentum for the Countywide Bicycle Plan by engaging as many people as possible.
- Gather input from people who do not typically participate in the public outreach process, to understand the barriers that may inhibit wide swaths of the population from choosing to commute by bicycle.
- Reach consensus on needs and bikeway design preferences with Member Agencies.

VTA used a variety of tools, venues, and platforms to conduct education and information sharing, gather input, and publicize the planning effort. VTA reached out to three primary groups for input on the development of the Countywide Bicycle Plan: the public, Member Agencies and other stakeholders, and VTA committees.

Public Outreach Snapshot

- Common themes:
  - The biggest barriers to bicycling are freeway interchanges and gaps in bikeways
  - Participants preferred separated bike paths to on-street facilities.
  - Participants emphasized the need for better access to bike paths.
- 700 active participants
- 11 events throughout Santa Clara County
- Over 800 web map comments
- Regular/experienced bicycle riders were majority of participants

This appendix briefly describes the methods used to reach the public and other stakeholders, and the key findings from that effort.

Outreach to the Public

Public outreach and participation was an integral element in developing the Countywide Bicycle Plan. As part of the planning process, VTA conducted a series of community workshops, hosted an interactive web map, communicated via social media, and held non-traditional public outreach events. Public input was used to update the Cross County Bicycle Corridors and Across Barrier Connections, factored into prioritizing infrastructure, and used to help update policies, and education/encouragement programs. A large number of location-specific comments regarding bicycle infrastructure were collected. These helped shape the plan and were shared with Member Agency staff for inclusion in their work plans.

VTA hosted three family-friendly, bilingual community workshops across Santa Clara County in March 2016. In addition to these workshops, VTA hosted an interactive web map to reach people unable or reluctant to attend outreach events. VTA advertised the interactive map extensively to reach a broader and more representative cross-section of the community. A text-based phone survey was also used ti gather input.

VTA also connected with the public through other activities such as placing a "Roving Bicycle Exhibit" with information about the plan at libraries and government centers, and visiting outreach booths at various community events. Although the activities and information at these community event booths varied, common activities included asking participants to share their vision for bicycling, locations where they bicycle, and barriers to bicycling.

Key Findings

The workshops, web map, text survey, and other events provided interactive opportunities for the public to weigh in on key issues or bicycling preferences. Common themes across outreach platforms include:

Safety concerns were identified as the biggest barrier to bicycling. The most commonly reported barriers in the workshops were unsafe freeway interchanges and gaps in the bicycle network. Respondents consistently stated they were unlikely to bicycle at locations where it does not feel safe or where there is a dangerous or difficult crossing. Other outreach platforms confirmed gaps in bicycle facilities and freeway crossings as top challenges, particularly bicycle facilities on high-speed roadways, lack of separated bicycle facilities, and large intersections.

VTA Facebook Post Highlighting Participation at the East San Jose Workshop
Source: Facebook

Individual at Booth at Community Event
Source: Fehr & Peers

Survey respondents replied that many of the barriers to bicycling included freeway interchanges and gaps in facilities. Respondents indicated a need for improving infrastructure at intersections, interchanges, and railway crossings or helping bikes and pedestrians avoid them altogether by building bicycle/pedestrian bridges.

As part of this process, VTA collected information about routes with missing infrastructure, infrastructure gaps, or infrastructure in poor condition (e.g., no bike lanes, narrow bike lanes, the need for better signal timing, improving sight lines, wayfinding, potholes, and lighting).

Network connections are essential to a high-functioning bicycle system. Respondents highlighted the need for improved network connections such as connections to trails, transit hubs, major employment centers, schools, public buildings, and parks. They also emphasized the importance of completing or extending existing trails to grow the network.

Bicyclists prefer bike paths or side streets when possible. When asked their preference between bike paths, bike lanes, or signed bike routes, workshop participants preferred bike paths. For on-street travel, many participants commented that they prefer to use side streets over major arterials, as they are less busy and noisy. Participants noted that even on side streets, drivers still speed, and this should be addressed.

Several key bicycle infrastructure improvements were frequently requested. Participants requested more trail lighting, better accommodations at signalized intersections (such as bicycle detection), better access/signage to shared use paths, and more frequent maintenance (such as street or trail sweeping). During the workshops, participants identified their bicycle facility preferences:

- **Most Popular Bike Path Treatments:** bike bridges, under crossings and separating bikes and pedestrians.
- **Most Popular Bike Lane Treatments:** buffered bike lanes and green paint.
- **Most Popular Bike Route Treatments:** traffic calming treatments, specifically closing the street for bicycles only.
- Workshop participants preferred a one-way cycle track to a two-way cycle track.

Participants desire improved accommodation for bicycles on transit. Participants noted concern about bicycle theft, the difficulty of using bicycle storage on buses and light rail vehicles (people have a hard time lifting their bikes into the racks), and unpredictable availability of space on transit.

Community members are wary of letting their children bicycle. Several parents noted that they do not allow their children to ride on streets because they are concerned for safety. Children mostly ride on sidewalks and trails.

Secure bicycle parking is critical for encouraging bicycling. Secure bicycle parking is critical, particularly at transit stations. Some participants identified light rail stations as not having enough bicycle parking.

Low stress bicycle facilities are desired. Participants preferred low-stress bicycle facilities that avoid arterial streets, such as bicycle boulevards, separated paths, and buffered bicycle lanes. Specific locations were identified for needed improvements/connectivity:

- Bicycle access to the Berryessa BART Station
- Better connections to East San Jose
- Completion of the Coyote Creek Trail
- Connection between Coyote Creek Trail and Guadalupe River Trail north of Highway 237
- More north/south bicycle connections in eastern county and central county.

Where Would You Like to Bike Map Station at Community Workshop. Source: Fehr & Peers

About the Participants

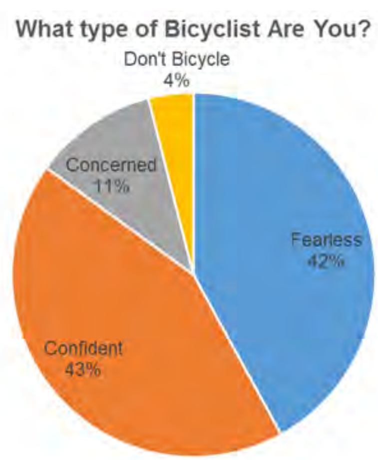
Over 700 people provided input for the Countywide Bicycle Plan through workshops, the web map, Textizen (a tool that collects survey responses using texts), and in-person events throughout the County.

VTA strived to engage people of all bicycling levels to get a good understanding of bicycling challenges across the population. To this end, participants were asked to categorize themselves into four bicycling types, shown in **Figure 4.1-1**:

The vast majority of participants answered that they feel very comfortable on a bicycle:

- 42% classified themselves as fearless
- 43% classified themselves as confident.
- 11% were concerned riders
- Four percent stated that they do not ride a bicycle.

This breakdown contrasts sharply with the distribution of bicyclists in the general population.[1] Less than one percent of the general population are "fearless bicyclists," seven percent are confident. Over half (60%) are concerned and one third do not bicycle at all. Public comments may reflect the opinions of experienced bicyclists as opposed to more casual/infrequent bicyclists. However, the benefit to having good representation by experienced and frequent bicyclists is their insight to barriers and needed improvements.



[1] Geller, R. "Four Types of Cyclists," Portland Bureau of Transportation, Portland, OR, 2006. http://www.portlandoregon.gov/transportation/article/264746

Figure 4.1-1: Type of Bicyclist, Self-Identified by Outreach Participants

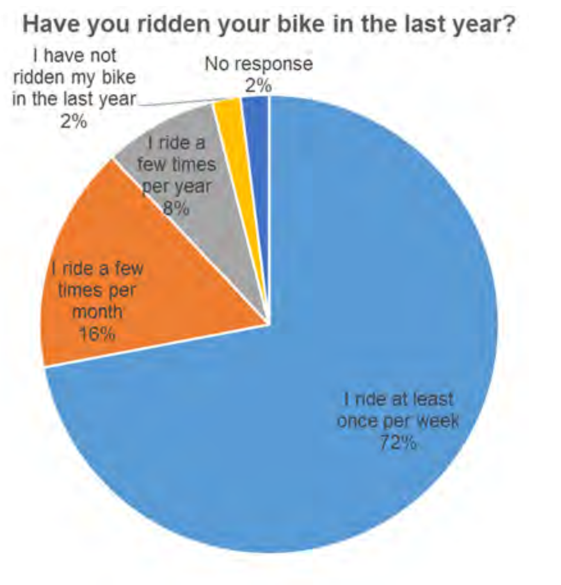


Figure 4.1-2: Web Map Survey: Riding Frequency

VTA also asked participants how frequently they bike and the primary reasons why they bike. As shown in **Figure 4.1-2**, nearly three-quarters of participants ride their bike at least once a week. An additional 16 percent ride their bike a few times per month. The top three reasons people in the workshops gave for biking were riding for fun, commuting to work, and to go shopping. Similarly, on the web survey, the top three responses were commuting (55%), fun (21%), exercise (12%), and errands (10%).

VTA also collected demographic information as part of the interactive web map. Participants in the web map were disproportionately white (71%) and male (72%). Other races and ethnicities and women were under-represented. This is likely due to self-selection for participation in the web map. To reach under-represented groups, VTA hosted booths at several community events.

How can VTA help member agencies deliver bikeway projects?

Key Roles for VTA

- Interagency coordination within the County
- Stakeholder engagement
- Outreach and marketing support
- Strengthening bike connections to transit
- Providing planning support, policy and program ideas, data and best practices to Member Agencies
- Additional funding (maintenance and construction)
- Helping identify and apply for funding on behalf of Member Agencies

Barriers to Delivering Bikeways

- Coordination challenges between and within jurisdictions and Member Agencies
- The need for more stakeholder engagement and education
- Staff knowledge and experience
- Implementation challenges
- Issues related to policies, planning and permits
- Lack of funding

Member Agency and Stakeholder Outreach

In addition to general public outreach efforts, VTA conducted significant outreach to staff from VTA's 16 Member Agencies and other agencies/stakeholders during plan development. The following four mechanisms were used:

- Member Agency Interviews

- Stakeholder Charrettes
- Member Agency Working Meetings
- Stakeholder Bicycle Ride Audits

Member Agency Interviews

One-on-one interviews with Member Agency and VTA representatives were conducted to understand how closely agency programs and policies follow national best practices for bicycle planning and infrastructure implementation. This information was used to understand ways in which VTA can assist Member Agencies in delivering projects. The interviews addressed:

- Transportation planning and programming
- Land-use and transportation integration
- Local ordinances and guidelines
- Design and construction of bicycle facilities
- Complementary policies which encourage bicycling

Key Findings

All Member Agencies support safe bicycling within their jurisdictions, through both infrastructure projects and non-infrastructure programming, such as education, encouragement, enforcement, and engagement activities. Six Member Agencies have been recognized by the League of American Bicyclists as Bicycle Friendly Communities. **Chapter 4, Current Bicycling Conditions and Setting**, summarizes information collected as part of the interviews.

Stakeholder Charrettes

VTA hosted two stakeholder charrettes at VTA's offices in March 2016. Staff presented existing conditions information, information on innovative bicycle ideas from around the world. Additionally, staff asked for input on preferred design standards for bikeways, and requested input on the Cross County Bicycle Corridor network.

Thirty-five individuals participated in the first charrette and ten individuals participated in the second charrette. Participants included a mix of staff from VTA, Member Agencies, private sector, and community groups.

Key Findings

Some of the key issues identified through this exercise include:

- A desire to be context-sensitive and as realistic as possible when developing the design expectations for Cross County Bicycle Corridors.
- Legal issues related to having lights along trails.
- A preference for buffered bike lanes.
- A desire for consistent signage along off-street cross county bikeways.
- Increased amenities and signage along off-street paths in comparison to on-street bikeways.

Stakeholders provided feedback about how VTA could help their organizations implement bicycle facilities and their biggest barriers to implementation.

Member Agency Working Meetings

VTA collaborated with Member Agencies to discuss changes to the Cross County Bicycle Corridors and Across Barrier Connections identified in VTA's 2008 Countywide Bicycle Plan.

Four meetings were held in August 2016:

- Meeting 1: Included agency staff from VTA, Santa Clara County, Morgan Hill, and Gilroy
- Meeting 2: Included agency staff from VTA, City of Santa Clara, San Jose, and Campbell
- Meeting 3: Included agency staff from VTA, Saratoga, and Los Gatos
- Meeting 4: Included agency staff from VTA, Mountain View, Los Altos Hills, Palo Alto, and Sunnyvale

At each meeting, participants reviewed large scale maps that showed the Cross County Bicycle Corridors identified in the 2008 Plan and draft additions/changes based on input received through public outreach.

Key Findings

Member Agencies reviewed VTA's proposed CCBC network and requested a variety of modifications, including:

- Modifying CCBC alignments to reflect locally preferred alignments
- Adding new CCBCs to support local priorities
- Requesting that planned bicycle bridges or undercrossings be included in the Countywide Bicycle Plan
- Confirming that proposed deletions were appropriate

VTA revised the CCBCs and list of ABCs to reflect Member Agency comments.

Stakeholder Bicycle Audits

VTA held three bicycle audits for Member Agency staff and stakeholders in October 2016:

- Audit 1: Middlefield Road/ Maude Avenue/Steven's Creek Trail Audit (Mountain View and Sunnyvale)
- Audit 2: McLaughlin/ San Antonio/King/Story Audit (East San Jose)
- Audit 3: Lincoln Road/Los Gatos Creek Trail/Diridon Station Audit (San Jose)

The bicycle audits allowed stakeholders to identify bicycle needs along representative corridors and learn about bicycle infrastructure and enhanced bicycle treatment options.

Stakeholder Charrette at VTA Offices.
Source: Local Government Commission

Key Findings

The following themes were consistent across all of the bicycle audits:

- To have a truly integrated and continuous regional bikeway network, facilities must be consistent across jurisdictional boundaries.
- The off-street trail network is an important asset in Santa Clara County's bikeway system.
- Large, busy intersections are challenging because frequently the bike lane does not continue through the intersection, and left turns are difficult due to traffic volumes and speeds.

VTA Committee Outreach

Various VTA Committees and associated working groups were kept updated and reviewed key interim deliverables during development of the Countywide Bicycle Plan. Meetings are summarized in on the next page.

In addition to receiving formal presentations at meetings, VTA Bicycle and Pedestrian Advisory Committee (BPAC) members were invited to attend the various outreach activities for the public and Member Agency staff. VTA's staff liaison to the BPAC also provided periodic updates on plan progress at several BPAC meetings.

The VTA Committees include:

Technical Advisory Committee (TAC): Consists of one senior staff member (usually the public works or planning director) from each of the county's 15 cities and the County of Santa Clara. Non-voting representatives from Caltrans and the Metropolitan Transportation Commission also participate in meetings. The TAC advises the Board on technical aspects of transportation-related policy issues and initiatives.

Bicycle and Pedestrian Advisory Committee (BPAC): Consists of 16 members representing each of the 15 cities and the County, plus a non-voting representative of the Silicon Valley Bicycle Coalition. The BPAC advises the Board on funding and planning issues for bicycle and pedestrian projects. It also serves as the countywide bicycle and pedestrian advisory committee for Santa Clara County.

Policy Advisory Committee (PAC): Consists of one City Council member from each of the 15 cities and one member from the Santa Clara County Board of Supervisors. The PAC allows all jurisdictions within the county to comment directly on the development of VTA's policies.

Citizens Advisory Committee (CAC): Consists of 17 appointed members: six citizens-at-large from the City and County groupings, six citizens representing certain specified community interests, and five citizens representing certain specified business and labor groups. The Committee advises the Board on policy issues referred to the Committee by either the Board or the General Manager in consultation with the Chairperson.

Congestion Management Program & Planning Committee (CMPP): This standing committee consists of six members (four members and two alternates) from VTA's Board of Directors. The committee reviews policy recommendations pertaining to the Congestion Management Program and the development of the countywide transportation plan for Santa Clara County.

Key Findings

Committee members reviewed interim deliverables and provided input at important milestones. Input was incorporated into the plan

Table 4.1-1: Presentations to VTA Committees

Discussion Item	Dates	Committees Involved*
Goals for update of Countywide Bicycle Plan	February 2015	BPAC, TAC
Scope of work and schedule for Countywide Bicycle Plan Update	November 2015	BPAC, TAC
Outreach plan	January 2016	CAC, BPAC, TAC, PAC, CMPP
Potential projects, education and encouragement programs, policies to include in plan	June 2016	BPAC
Prioritization criteria for Cross County Bicycle Corridors	October 2016	BPAC, TAC, PAC, CMPP,
Draft Cross County Bicycle Corridors and prioritization results	July 2017 August 2017	BPAC TAC
Public Review Draft Plan	March 2018	BPAC, TAC, PAC, CMPP
Final Plan – Adoption	May 2018	BPAC, TAC, PAC, CMPP

BPAC – Bicycle and Pedestrian Advisory Committee
CAC – Citizen's Advisory Committee
CMPP – Congestion Management Program and Planning Committee
PAC – Policy Advisory Committee
TAC – Technical Advisory Committee

Appendix 4.2 Level of Traffic Stress Methodology

Many factors contribute to a bicyclist's comfort and perceived safety when bicycling. Riding on a low-speed residential road with no bike lanes and very little traffic is a very different experience than bicycling in a bicycle lane with cars traveling past at 40 mph. This qualitative difference in bicycling experience can be measured using Bicycle Level of Traffic Stress (LTS).

LTS measures various street characteristics to determine how stressful a street is for bicyclists. LTS methodology classifies roadway segments into one of four comfort categories, which are termed LTS 1 through LTS 4. These categories reflect the amount of stress that different types of bicyclist will tolerate.

- LTS1: Most children feel comfortable bicycling.
- LTS2: The mainstream adult population feels comfortable bicycling.
- LTS3: Bicyclists who are considered "enthused and confident" but still prefer having their own dedicated space feel comfortable while bicycling.
- LTS4: Only "strong and fearless" bicyclists feel comfortable while bicycling. These routes have high speed limits, multiple travel lanes, limited or non-existent bicycle lanes and signage, and large distances to cross at intersections.

Data Source

The LTS analysis for Santa Clara County used TomTom map data.

Criteria and Assumptions

General LTS Criteria

LTS analysis considers several factors that influence the stress of bicycling, including:

- **Presence of On-Street Parking**: Bicycle facilities next to parking lanes have higher levels of traffic stress than those not alongside a parking lane.
- **Speed**: Higher speeds are associated with higher levels of stress for bicyclists.
- **Number of Directional Lanes**: The more through lanes in one direction on a street, the higher the level of traffic stress.
- **Bicycle Lane Width**: A wider bicycle lane is associated with a lower level of traffic stress

- **Blockage**: LTS evaluates whether a bicycle lane is blocked by parked cars, commercial vehicles, or off-loading cars, and assigns a higher stress scores in cases where blockage is frequent.

VTA referred to the criteria listed in **Tables 4.2.1 and 4.2.2** as a starting point to calculate LTS designations on Santa Clara County's roadway system.

Table 4.2.1 LTS Criteria for Bicycle Lanes Adjacent to a Parking Lane

	LTS >= 1	LTS >= 2	LTS >= 3	LTS >= 4
Street width (thru lanes per direction)	1	NA	2 or more	NA
Sum of bicycle lane and parking lane width	15 ft or more	14 or 14.5 ft	15.5 ft or less	NA
Speed limit or prevailing speed	25 mph or less	30 mph	35 mph	40 mph or more
Bicycle lane blockage	rare	NA	Frequent	NA

Source: Mekuria, Furth and Nixon (2012)

Table 4.2.2 LTS Criteria for Bicycle Lanes Not Adjacent to a Parking Lane

	LTS >= 1	LTS >= 2	LTS >= 3	LTS >= 4
Street width (thru lanes per direction)	1	2 if directions are separated by a raised median	more than 2, or 2 without a separating median	NA
Bicycle lane width	6 ft or more	5.5 ft or less	NA	NA
Speed limit or prevailing speed	30 mph or less	NA	35 mph	40 mph or more
Bicycle lane blockage	rare	NA	Frequent	NA

Source: Mekuria, Furth and Nixon (2012)

Criteria and Assumptions Used for Santa Clara County's LTS Analysis

For some criteria, consistent countywide data were not available. Where data were unavailable, the analysis uses assumptions where possible, and omits criteria where there is not enough information to support an assumption. The LTS for Santa Clara County analysis utilized the following data and assumptions:

- **Speed:** Posted speeds were converted from kilometers per hour to miles per hour (MPH). If speed limits were less than 20 MPH they were assigned 25 MPH if their functional class is >/=6 (local streets). If not, they were assigned 30 MPH. Posted speed was not available for all segments. Most assumptions defer to functional classification when data was not available.

- **Lanes:** TomTom data comes with total number of lanes on most high order segments in the street network. Where data was not available for lanes, the analysis used functional classification to assume number of lanes. Where lanes are not indicated, two lanes are assumed if the functional classification is a local street. For streets with a higher order than a local street, four lanes were assumed. This was done to make sure there were no gaps in the LTS network and realistic LTS results where data was missing. Where we could not capture the nuance of existing streets, a conservative approach was taken. This is primarily seen on residential streets that where actual conditions would indicate LTS 1, however, they are shown as LTS 2.
- **Cycle Track Coding for LTS:** All cycle tracks and bicycle paths are assumed to rate LTS 1.
- **Bicycle Lane Width:** The LTS analysis assigns bicycle lane infrastructure the benefit of the doubt and assumes all bicycle lanes are 6 feet measured from curb to bicycle lane edge, and widths of 7 feet for other high quality infrastructure. Cycle tracks override this, as described above. Shared lane markings and bicycle boulevards are given widths of 0 and assumed to be mixed flow facilities.
- **Parking:** The lack of countywide on-street parking data was dealt with by assuming that streets do not have on-street parking. While this does not directly impact mixed flow LTS calculations, it can create the potential for streets with bicycle lanes to have a lower LTS than actual conditions would indicate. This is largely because the criteria for bicycle lanes evaluations where there is on-street parking is more conservative.
- **Blockage:** LTS evaluates whether a bicycle lane is blocked by parked cars, commercial vehicles, or off-loading cars, and ranks more high stress scores in cases where blockage is frequent. Since there is no information on this directly, rather than use proxy variables this information was not included in the analysis. This potentially results in high-density commercial corridors and urban areas having a lower stress LTS score than they should.
- **One-Way Streets:** In many places, the TomTom network divides two-way arterials into one-way streets. For the purposes of a fair analysis, the LTS analysis treats one directional travel with more scrutiny than a total lane approach of conventional mixed flow LTS by conducting a directional LTS. While segments with bicycle lanes are already directionally evaluated, mixed flow evaluation was made directional by dividing the number of lanes in half for two-directional roads and not dividing for one directional roads. This makes the LTS methodology more consistent by treating the

entire methodology directionally, and addresses one-way streets with the understanding that bicyclist and vehicle behavior and speeds are perceived differently on one-way streets. This can result in assigning a higher stress LTS score to mixed flow one-way streets than actual conditions would indicate. However, this methodology is more consistent and helps evaluate split arterials more accurately.

- **Centerlines/Residential Streets:** Some LTS analyses use presence or absence of centerlines in scoring. Due to lack of data, the LTS analysis for Santa Clara County did not include this criterion. However, most segments in these locations were already LTS 2 or better. This results in a conservative analysis in residential locations that likely have unmarked centerlines.
- **Outside Santa Clara County:** The LTS analysis scored TomTom segments up to three miles outside the border of Santa Clara County. This reduced the impact of spatial edge effects for the Santa Clara County analysis. However, due to lack of bicycle lane data outside of the county, the analysis assumed all roadways were marked as mixed flow.

Appendix 4.3 Bicycle Collision Analysis

Bicycle collisions were analyzed to assess bicycle safety conditions and recent trends across the County. The most recent five years of available data (2009-2013) were obtained from the California Highway Patrol (CHP) Statewide Integrated Traffic Record System (SWITRS) database, which compiles collision reports from the local police departments. The SWITRS database is the most comprehensive inventory of roadways collisions in the County, but it is known that SWITRS underreports collisions, as not all bicycle collisions are reported to the local police. This is shown through hospital emergency room records, which contain more injury collisions than the number in police databases.[1]

Though the study dataset does not capture all bicycle collisions in Santa Clara County during the five-year timeframe, it helps the County and local jurisdictions make more informed decisions about future bicycle improvements.

The collision analysis focuses on the following four areas:

a. Countywide five-year trends

b. Collisions by jurisdiction

c. High collision locations

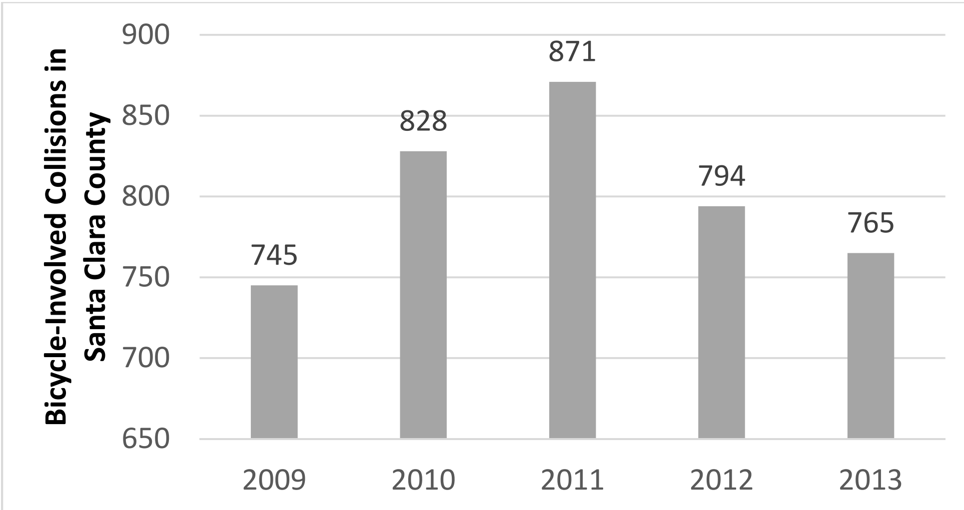
d. Primary collision factors

Collisions occur most frequently in the more urban, built out areas of the County, in downtowns and along key travel corridors where more people bicycle and drive.

Countywide Five-Year Trends

Santa Clara County saw approximately 800 bicycle collisions per year between 2009 and 2013, ranging from as low as 745 in 2009 to as high as 871 in 2011. As shown in **Figure 4.3.1**, the most recent two years of data show a steady decline in bicycle collisions, despite an increase in bicycling during that period.

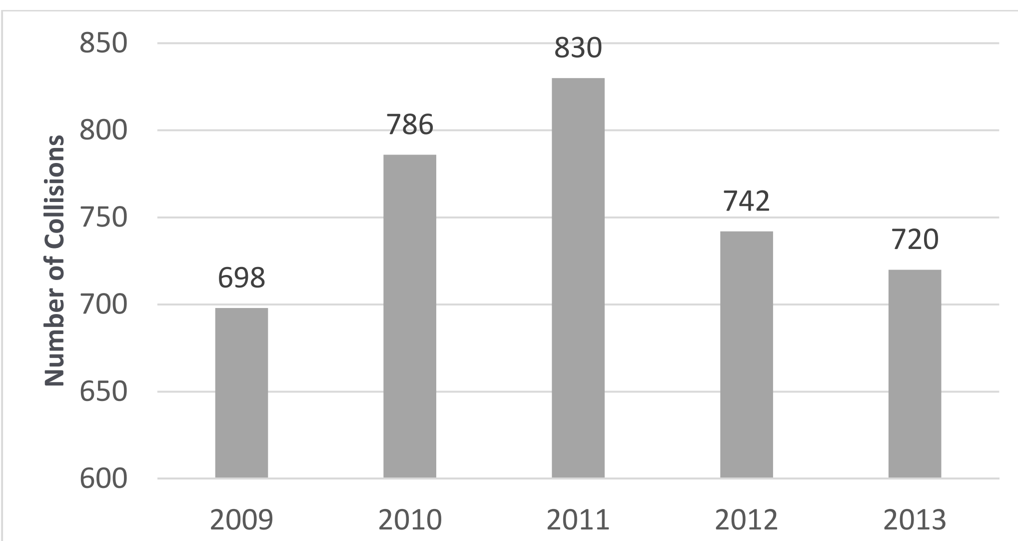
[1] In Santa Clara County from 2010 to 2014, between 35 and 50 percent of the bicycle crash emergency room visits involved a collision with a motor vehicle, while 88 percent of bicycle crashes in SWITRS do. This suggests that many bicycle crashes, particularly those that do not involve a motor vehicle, are not reported to the police, and therefore are not in the SWITRS database. “Bicycle Transportation & Safety in Santa Clara County” by the Transportation Safety Communities Network, Santa Clara County Public Health Department (2015)



Source: SWITRS, 2009-2013.

Figure 4.3.1 Bicycle-Involved Collisions in Santa Clara County by Year

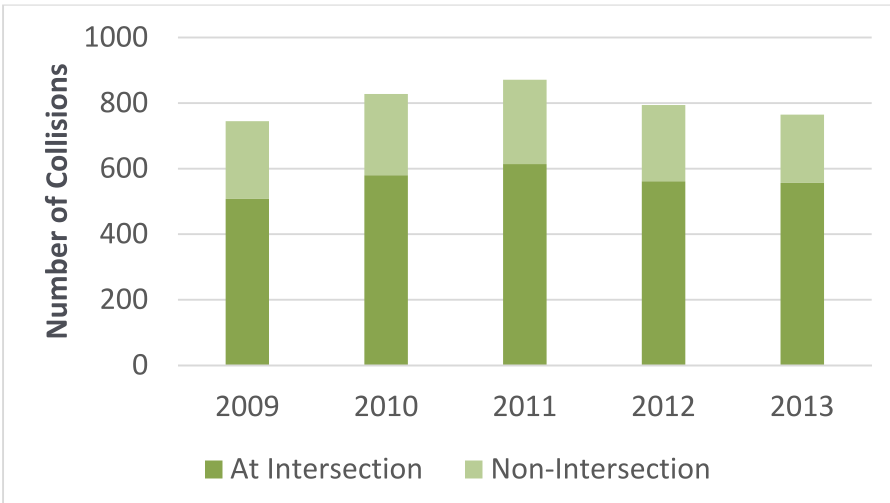
Bicycle injuries per year followed a similar pattern between 2009 and 2013, ranging from a low of 698 in 2009 to a high of 830 in 2011 (as shown in **Figure 4.3.2**). Approximately six collisions per year resulted in a bicyclist fatality in the County during this period. It is unclear why bicyclist injuries grew from 2009 to 2013, but a potential cause is an increase in the number people bicycling and driving throughout the County, leading to greater exposure for bicyclists on the roadway system. The decline between 2011 and 2013 could be due to the 'safety in numbers' effect, whereby more people riding bicycles leads to fewer collisions as drivers become more aware of these roadway users. Another potential cause for the decline could be the implementation of more bicycle infrastructure across the County, providing designated space for bicyclists on the roadways.



Source: SWITRS, 2009-2013.

Figure 4.3.2 Bicycle-Involved Injury Collisions in Santa Clara County by Year

Bicycle collisions in the County occurred at intersections more frequently than at non-intersection locations (where intersection collisions are defined as collisions within 50 feet of an intersection), as shown in **Figure 4.3.3**. Over the five-year time period, approximately two-thirds of all reported bicycle collisions in Santa Clara County occurred at an intersection.



Source: SWITRS, 2009-2013.

Figure 4.3.3 Bicycle-Involved Collisions in Santa Clara County by Year and Location Type

Collisions by Jurisdiction

Total bicycle collisions by jurisdiction between 2009 and 2013 are shown in **Table 4.3.1**. San Jose experienced the most collisions during the time period (with 1,773 collisions, or 40 percent of the countywide total). This is expected for the County jurisdiction with the largest population. Palo Alto and the City of Santa Clara had the next highest bicycle collision counts with 495 and 227, respectively.

Another useful measure of collision occurrence is the collision rate, which accounts for bicyclist exposure*.* Collision rates were determined for the 16 Member Agencies based on three metrics: population, vehicle-miles of travel (VMT), and bicycle-miles of travel (BMT).[2] Total bicycle collisions and bicycle collision rates by Member Agency are summarized in **Table 4.3.1**.

[2] Data on bicycle-miles traveled and vehicle-miles traveled were obtained from VTA's travel demand model. VMT data excludes freeways/ramps.

Table 4.3.1 Bicycle Collisions and Collision Rates by Member Agency (2009-2013)

Member Agency	Number of Bicycle Collisions	Collision Rate per year per 1000 population	Collision Rate per 100 Bicycle-Miles of Travel (BMT)	Collision Rate per 10,000 Vehicles-Miles of Travel (VMT)
County (unincorporated)	196	0.44	1.35	0.85
Campbell	118	0.60	0.19	0.58
Cupertino	209	0.72	0.45	1.29
Gilroy	92	0.38	0.42	0.24
Los Altos	77	0.53	0.15	0.62
Los Altos Hills	50	1.25	0.37	1.20
Los Gatos	104	0.71	0.28	0.90
Milpitas	120	0.36	0.26	0.41
Monte Sereno	7	0.41	0.28	0.44
Morgan Hill	42	0.22	0.22	0.36
Mountain View	208	0.56	0.27	0.76
Palo Alto	495	1.54	0.23	0.95
San Jose	1773	0.37	0.23	0.58
Santa Clara	227	0.39	0.14	0.39
Saratoga	87	0.58	0.31	0.50
Sunnyvale	198	0.28	0.18	0.43
Total	**4,003**	_	-	-

Notes:
VMT data excludes miles traveled on freeways and ramps. Expressway miles traveled are included in the jurisdiction in which the expressway is located.
BMT includes all facilities: undesignated, bike lanes and bike paths.
Source: SWITRS, 2009-2013.

Palo Alto had the highest collision rate per population (1.54 bicycle collisions per 1,000 population), which aligns with its high bicycling mode share.[3] The second and third highest collision rates per population were Los Altos Hills (1.25) and Cupertino (0.72).

The Member Agencies with the highest collision rates per VMT were Cupertino (1.29 bicycle collisions per 10,000 VMT), Los Altos Hills (1.20) and Palo Alto (0.95). Some of the variance in collision rates per VMT may be due to a high level of bicycling relative to driving in some communities. For example, Los Altos Hills sees a lot of recreational riding, but its low density of land uses results in lower VMT, leading to a high collision rate. Similarly, the high bicycle mode split for residents in Palo Alto, and the subsequent increased exposure of bicyclists, is paired with a relatively low VMT to result in a high collision rate.

The Member Agency with the highest collision rate per BMT was Unincorporated Santa Clara County, with 1.35 bicycle collisions per 100 BMT. This is three times the rate of the next-highest Member Agencies, Cupertino (0.45) and Gilroy (0.42). The BMT estimate focuses on commute riders and therefore may fail to capture the high number of recreational riders that use the County's rural roads. This may lead to an artificially low BMT for the Unincorporated Santa Clara County and artificially inflate the collision rate based on this metric. The Member Agencies with the lowest collision rates per BMT were Santa Clara (0.14 bicycle collisions per 100 BMT), Los Altos (0.15), Sunnyvale (0.18) and Campbell (0.19). BMT estimation is generally not as accurate as VMT estimation, given limited existing bicycle count data. However, BMT estimates are a useful measure of relative bicyclist exposure among Member Agencies, and potentially reflect variations in infrastructure quality, education efforts or bicyclist comfort.

High Collision Locations

As previously noted, intersections represent a larger proportion of bicycle collisions than non-intersection locations. Intersections and roadways with the highest numbers of bicycle collisions in Santa Clara County between 2009 and 2013 are listed in **Table 4.3.2** and **Table 4.3.3**, respectively. Roadway lengths and collisions per mile are also provided to standardize the roadway results. Of note, four of the listed collision locations are freeway interchanges.

[3] Palo Alto had a 7.3% bicycle commute mode split in 2014 (approximately 67,000 bicyclists), one of the highest nationwide according to the League of American Bicyclists' *Where We Ride report* (2014).

Table 4.3.2: Santa Clara County Intersections with the Highest Number of Bicycle Collisions (2009-2013)

Intersection	Jurisdiction	Number of Collisions (2009-2013)
SR 9/Austin Way	County	10
Prospect Rd/Scully Av	Saratoga	5
McClellan Rd/ Club House Ln	Cupertino	4
Shoreline Blvd/Villa St	Mountain View	4
South King Rd/I-680	San Jose	4
McLaughlin Av/I-280	San Jose	4
Tully Rd/Senter Rd	San Jose	4
Mary Av/Evelyn Av	Sunnyvale	4
Story Rd/US 101	San Jose	4
Oregon Expwy/Louis Rd	Palo Alto	4
Story Rd/McLaughlin Av	San Jose	4
University Av/High St	Palo Alto	4
McClellan Rd/Rose Blossom Dr	Cupertino	4
Story Rd/King Rd	San Jose	4
Senter Rd/Tully Rd	San Jose	4

Note: Includes collisions within 50 feet of the intersection.
Source: SWITRS, 2009-2013.

Table 4.3.3: Santa Clara County Roadways with the Highest Number of Collisions Per Mile (2009-2013)

Roadway	Length of Roadway (approximate miles)	Number of Collisions (2009-2013)	Collisions per Mile
El Camino Real/Route 82	26	150	5.77
Stevens Creek Boulevard	8	59	7.38
Story Road	5	52	10.40
Blossom Hill Road	10	50	5.00
Homestead Road	7	50	7.14
Route 9	11	50	4.55
Middlefield Road	8	44	5.50
Monterey Road	20	40	2.00
Tully Road	5	37	7.40
Senter Road	5	36	7.20

Source: SWITRS, 2009-2013.

Primary Collision Factors – Countywide

Of the 4,003 bicycle collisions that occurred in the County between 2009 and 2013, the investigating police officer determined that the driver was the party at fault in 35 percent of the collisions and the bicyclist was the party at fault in 46 percent of the collisions. In 17 percent of the collisions the party at fault was not determined by the responding police officer, and in the remaining collisions the party at fault was determined to be either a pedestrian or a parked car.

Eighty-eight percent of the bicycle collisions in the County between 2009 and 2013 involved a motor vehicle, while the remaining twelve percent were recorded as bike-bike or bike-ped crashes. When party-at-fault percentages are recalculated to account for motorist involvement, the driver was recorded as the party at fault in 42 percent of vehicle-bicycle collisions. Party-at-fault information is summarized in **Table 4.3.4**.

Table 4.3.4: Party at Fault in Bicycle Collisions in Santa Clara County (2009-2013)

Party at Fault	All Bicycle-Involved Collisions		All Vehicle-Bicycle Collisions with Stated Party at Fault	
	Number of Collisions	Percent of Total	Number of Collisions	Percent of Total
Driver	1411	35%	1411	42%
Adult Cyclist	1447	36%	1392	42%
Child Cyclist (<16)	418	10%	418	13%
Unstated/Fault not assigned	684	17%	-	-
Pedestrian	8	0.2%	8	0.2%
Parked Car	24	0.6%	24	0.7%
Other	8	0.2%	10	0.2%
Total	4003	100	3321	100

Source: SWITRS, 2009-2013.

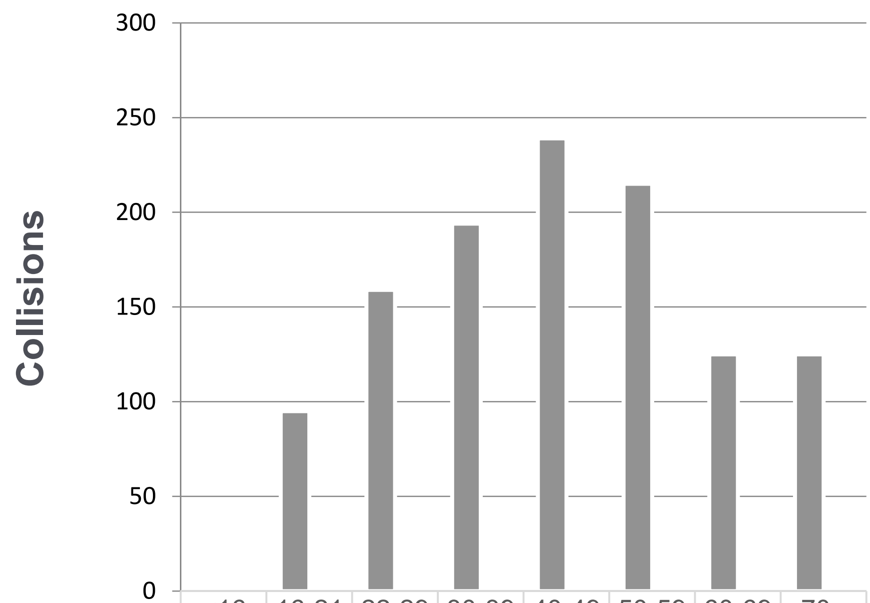
The Primary Collision Factor (PCF) available in SWITRS data provides information on the collision causes. The PCF was investigated for three categories of collisions: motor vehicle driver at-fault, adult bicyclist at-fault, and child bicyclist at-fault. Since motorists make different errors than bicyclists, this analysis helps determine the education as well as physical improvements that could help prevent future collisions. Similarly, child bicyclists make different errors than adult bicyclists, and there are different strategies employed to educate children. Thus, it is important to distinguish between the PCF of adult vs. child bicyclists. Since drivers can be as young as 16, age 16 was chosen as the age for adult bicyclists so that the same age assumptions are made for drivers as for bicyclists.

Collisions were analyzed to determine the primary behavior that led to the collision, as described by the California Vehicle Code (CVC) section that was violated that caused the collision.

Driver at-fault collisions

The age bracket for motorists involved in the highest number of collisions was 40-49, followed by 50-59 (as shown in **Figure X**). Collisions involving drivers over age 70 also made up a relatively large proportion (11%) compared to the number of drivers in that age bracket.

Table 4.3.5: Bicycle Collisions in Santa Clara County by Age of Motorist At-Fault

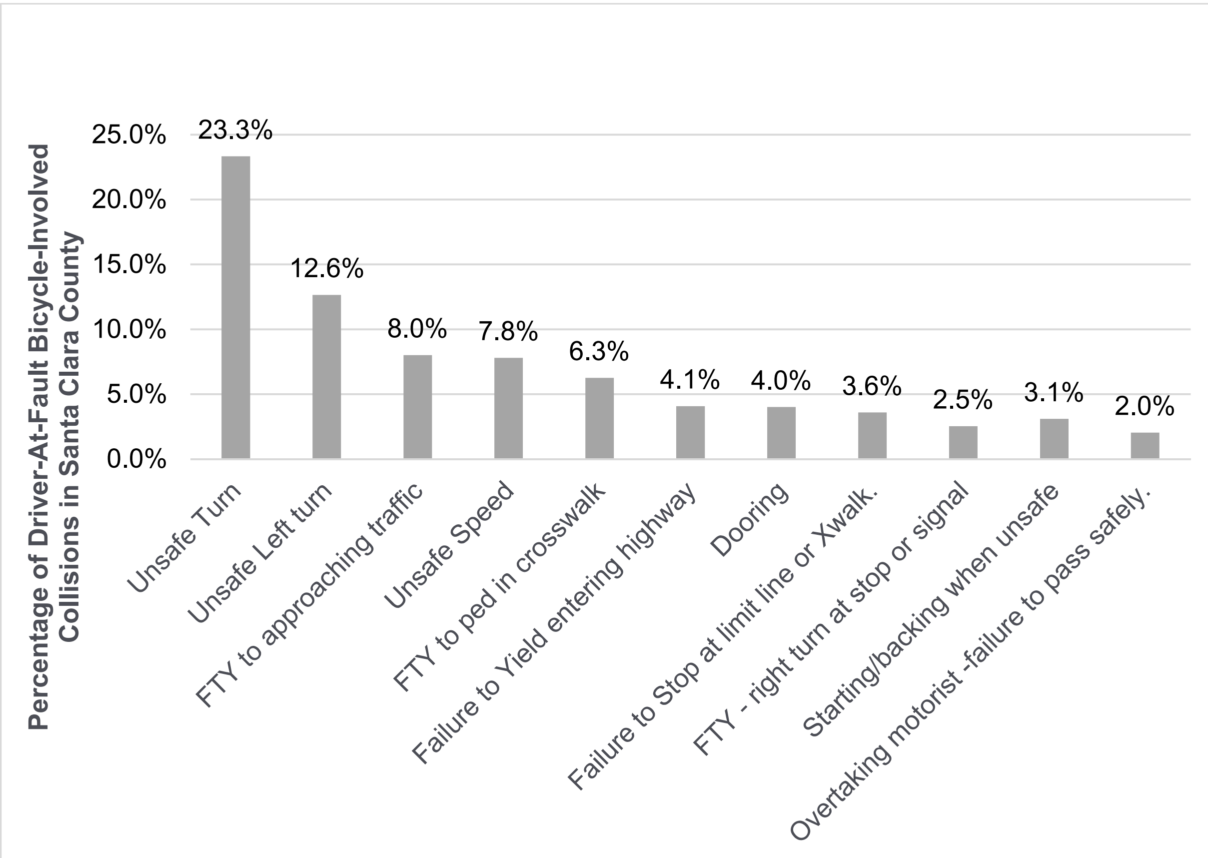


	<16	16-21	22-29	30-39	40-49	50-59	60-69	70+
No. of Motorists At Fault	1	95	159	194	239	215	125	125
%	0%	8%	14%	17%	21%	19%	11%	11%

Source: SWITRS, 2009-2013.

Of the collisions where the driver was recorded to be at fault, the most common PCFs involved a turning movement (40 percent), most often noted as “Unsafe turn and/or without signaling” or “Left or U-turns.” The next most common driver behaviors were failing to yield to approaching traffic (eight percent), speeding (eight percent), not yielding to a bicyclist in the crosswalk (six percent), dooring[4](four percent), failing to yield at STOP sign (four percent), and starting/backing when unsafe (four percent). A summary of the top recorded PCFs is included in **Table 4.3.6**.

Table 4.3.6: Primary Collision Factors for Driver-At-Fault Bicycle Collisions in Santa Clara County



Source: SWITRS, 2009-2013.

Adult bicyclist at-fault collisions

The PCF information provided in SWITRS is not very specific, making it difficult to determine the true cause of a bicycle collision. The most common PCFs for bicycle collisions where the bicyclist was recorded to be at fault were “failure to use right edge of the road” and “unsafe speed.” While it is intuitive how a motorist can cause a collision by traveling too fast, it is not intuitive how a bicyclist, under his/her own power, can travel too fast for roadway conditions and be the primary cause of a collision with a car.

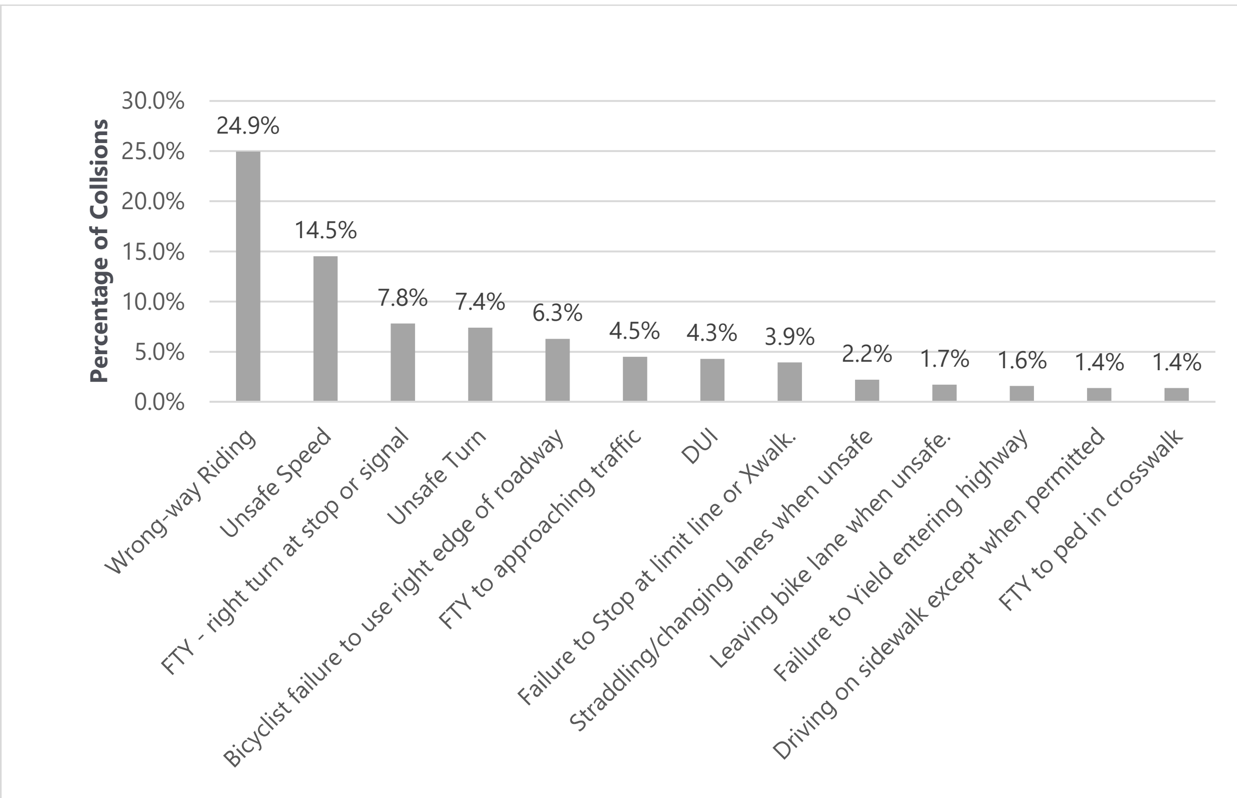
[4] Dooring is a violation of California Vehicle Code 22517: “Vehicle doors, opening to traffic when unsafe” i.e. a collision between the bicyclist and an opening car door which causes an injury to bicyclist and/or causes the bicyclist to fall. The fault is always the motorist as he/she can legally only open a car door when it is safe to do so. There can be a secondary collision whereby the now fallen bicyclist is struck by a vehicle in the adjacent lane.

Some jurisdictions discover that after educating police officers of bicyclists' rights and responsibilities, collisions attributed to “unsafe speed” decrease because the investigating officer chooses a more appropriate PCF.

The five most common factors of adult bicyclist at-fault collisions were wrong way riding (25 percent), unsafe speed (15 percent), failure to yield at right turn (eight percent), unsafe turn (seven percent) and failure to use the right edge of the roadway (six percent). A summary of top recorded PCFs is included in

Table 4.3.7.

Table 4.3.7: Primary Collision Factors for Adult Bicyclist-At-Fault Bicycle Collisions in Santa Clara County



Source: SWITRS, 2009-2013.

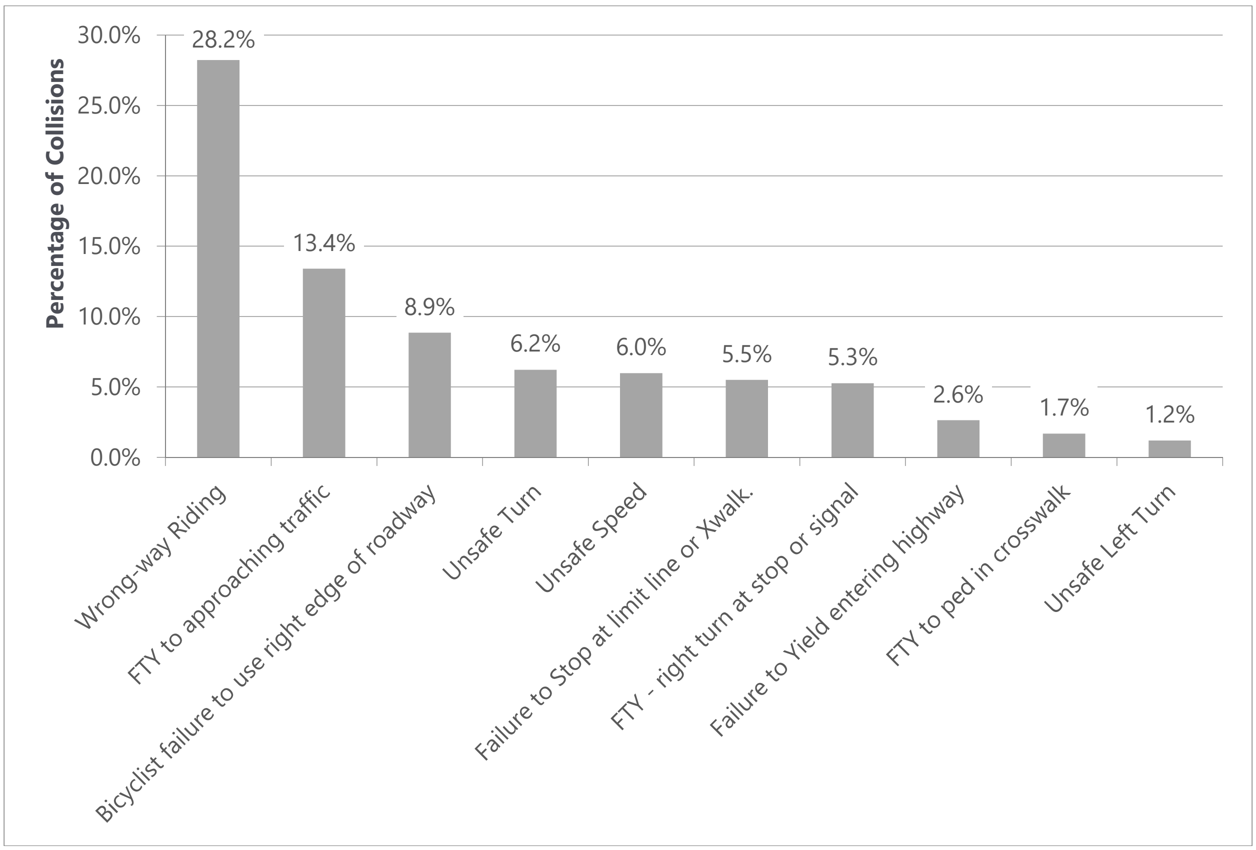
Child bicyclist at-fault collisions

Three PCFs constituted approximately half of all child bicyclist at-fault collisions. Similar to adult bicyclist at-fault collisions, the most common factor was wrong-way riding (28 percent). The next most common factor was failure to yield to approaching traffic (13 percent), followed by failure to use the right edge of the roadway (nine percent).

Table 4.3.8 summarizes the top recorded PCFs.

Bicycle-specific facilities such as bicycle lanes, wrong-way riding signs, and shared lane markings have been shown to reduce the incidence of wrong way riding. Additional investigation would be needed to determine why child bicyclists fail to yield to approaching traffic and do not use the right edge of the roadway. However, education programs for child bicyclists are effective at teaching bicycling rules.

Table 4.3.8: Primary Collision Factors for Child Bicyclist-At-Fault Bicycle Collisions in Santa Clara County



Source: SWITRS, 2009-2013.

VTA has long promoted the idea of Cross County Bicycle Corridors (CCBCs) – a subset of on-street bikeways and off-street bike paths that provide high-quality, cross-jurisdictional routes. CCBCs connect Santa Clara County communities and adjacent counties and serve major destinations and transit. CCBCs are a planning concept, and they consist of both built and unbuilt sections. The Countywide Bicycle Plan includes 57 named CCBCs, and numerous connectors, totaling approximately 950 miles. Of these:

- Approximately 260 miles are existing, planned, or proposed[1] off-street bicycle paths
- Approximately 690 miles are existing, planned or proposed on-street bikeways

CCBC No.	Name	Description *Refers to ultimate conditions, not existing conditions.*		Jurisdictions
CAMP=Campbell, CU=Cupertino, GIL=Gilroy, LA=Los Altos, LAH=Los Altos Hills, LG=Los Gatos, MIL=Milpitas, MSO=Monte Sereno, MH=Morgan Hill, MV=Mountain View, PA=Palo Alto, SAR=Saratoga, SC=Santa Clara, SCC=Santa Clara County, SJ=San Jose, SV=Sunnyvale				
1	**US 101 Corridor**	On-street and off-street bikeways roughly paralleling U.S. 101 between Palo Alto and Gilroy. Key routes: Middlefield Rd, Maude Ave, Arques Ave, Scott Blvd, De La Cruz Blvd, Coleman Ave, Guadalupe River Trail, Monterey Road		PA, MV, SV, SC, SJ, MH, , SCC, GIL
2	**Alma Street/Caltrain Corridor**	On-street bikeway roughly paralleling Caltrain between Palo Alto and Santa Clara. Key routes: Alma St, Park Blvd, California St, Dana St, Evelyn Ave, Monroe St, Agate Dr		PA, MV, SV, SC
3	**Dumbarton East-West Connector**	On-street bikeway that connects north Palo Alto to Los Altos Hills. Key routes: Oregon Expwy, California Ave, Hanover St, Page Mill Rd, Old Page Mill Rd		PA, LAH

[1] Existing bike paths and on-street bikeways (striped bike lanes, cycle tracks, or signed bike routes, including bicycle boulevards) as of February 2016. Planned bikeways are in locally adopted plans. Proposed bikeways are identified as a CCBC in VTA's Countywide Bicycle Plan, but they are not identified as a bikeway in a local plan.

CCBC No.	Name	Description *Refers to ultimate conditions, not existing conditions.*		Jurisdictions
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4	**El Camino Real/Grand Boulevard Corridor**	On-street bikeway along SR 82, connecting cities along El Camino Real corridor to Diridon station. Key routes: El Camino Real, The Alameda, Santa Clara St, Montgomery St, San Carlos St		PA, MV, LA, SV, SC, SJ
5	**Shoreline/Miramonte/ San Antonio/El Monte Corridor**	On-street and off-street bikeways connecting north Mountain View to Los Altos and Los Altos Hills. Key routes: Amphitheater Pkwy, Garcia Ave, Shoreline Blvd, Miramonte Ave, Permanente Creek Trail, Farley St, Escuela St, El Monte Ave, San Antonio Rd		MV, PA, LA, LAH
6	**Tasman/Alum Rock Light Rail Corridor/River Oaks Spur**	On-street bikeway roughly parallel to north county light rail corridor. Key routes: Manila Ave, Moffett Park Dr, Persian Dr, Elko Dr, Tasman Dr, Capitol Ave, River Oaks Pkwy, Agnew Rd		MV, SV, SC, SJ, MIL
7	**Mary/Old Highway 9 Corridor**	On-street bikeway connecting north Sunnyvale to Cupertino, Saratoga and Los Gatos. Key routes: Mary Ave, Stelling Rd, DeAnza Blvd, Saratoga Los Gatos Rd		SV, CU, SAR, MSO, LG
8	**Winchester/Hedding /Berryessa/Penitencia Creek Corridor**	On-street and off-street bikeways connecting downtown Campbell to Santa Clara Caltrain Station, Berryessa BART Station and east San Jose. Key routes: Winchester Blvd, Hedding Ave, Park Ave, Brokaw Rd, Coleman Ave, Guadalupe River Trail, Brokaw Rd, Hostetter Rd, Berryessa Rd, Penitencia Creek Trail, Empire St, Mabury Rd		CAMP, SC, SJ

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9	**Wolfe/Sunnyvale-Saratoga/Borregas Corridor**	On-street bikeway connecting Bay Trail and Moffett Park area in Sunnyvale to Cupertino and west San Jose. Key routes: Borregas Ave, Sunnyvale Ave, Maude Ave, Wolfe Rd, Miller Ave,		SV, CU, SJ, SAR
10	**North I-280/Stevens Creek-San Carlos Street Corridor**	On-street bikeway connecting Los Altos Hills and Foothill College to Cupertino, Santa Clara and central San Jose. Key routes: Purissima Rd, El Monte Rd, Granger Ave, Foothill Blvd, Stevens Canyon Rd, Junipero Serra Trail, Pruneridge Ave, Hedding St, Park Ave, San Fernando Ave, San Antonio St, Stevens Creek Blvd, San Carlos Ave, San Salvador St		LAH, SCC, LA, CU, SAR, SC, SJ
11	**Calabazas Creek/ Winchester/Los Gatos Boulevard Corridor**	On-street and off-street bikeways connecting north Santa Clara to Valley Fair Mall, Downtown Campbell and Los Gatos. Key routes: Calabazas Creek Trail, Mission College Blvd, Scott Blvd, Cabrillo Ave, Monroe St, Winchester Blvd, Main St, Los Gatos Blvd		SC, SJ, CAMP, LG
12	**South of I-280/Williams/ Moorpark/Alma Corridor**	On-street bikeway connecting Cupertino and DeAnza College to central and east San Jose. Key routes: McClellan Rd, Moorpark Ave, Bollinger Rd, Williams Rd, Leigh Ave, Minnesota Ave, Alma Ave, Ocala Ave		CU, SJ

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13	**Bowers/Kiely/Saratoga Avenue Corridor**	On-street bikeway connection central Santa Clara to west San Jose and Saratoga. Key routes: Kiely Blvd, Bellomy St, Saratoga Ave, Big Basin Way, Fruitvale Ave		SC, SJ, SAR
14	**Prospect/Campbell/ Curtner/Tully Corridor**	On-street bikeway connecting Saratoga to downtown Campbell and east San Jose. Key routes: Cox Ave, Prospect Rd, Campbell Ave, Bucknall Rd, Union Ave, Curtner Ave, Tully Rd		SAR, CAMP, SJ
15	**Gilroy to Valley Fair/Santa Teresa Corridor**	On-street bikeway connecting areas around Valley Fair Mall and San Carlos Avenue to south San Jose, Morgan Hill and Gilroy. Key routes: Meridian Ave, Leigh Ave, Blossom Hill Rd, Santa Teresa Blvd, Masten Ave, Bloomfield Ave, Bolsa Rd, Hale Ave		SJ, SCC, MH, GIL
16	**Blossom Hill/Branham to Saratoga Corridor**	On-street and off-street bikeways connecting Saratoga to Los Gatos, neighborhoods south of Campbell and south San Jose. Key routes: Herriman Ave, Pollard Rd, Knowles Dr, Los Gatos Creek Trail, Charmeran Ave, Ross Ave, Branham Ln, Blossom Hill Rd, National Ave, Los Gatos Almaden Rd, Lean Ave		SAR, CAMP, LG, SJ
17	**Oakland Road/Abel/ Milpitas Boulevard Corridor**	On-street bikeway connecting north Milpitas to neighborhoods north of downtown San Jose. Key routes: Milpitas Blvd, Able St, Oakland Rd		MIL, SJ

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18	**San Martin East-West Corridor**	On-street bikeways connecting west Morgan Hill to San Martin, Anderson Lake and Coyote Creek Trail. Key routes: Oak Glen Ave, Dewitt Ave, Dunne Ave, Watsonville Rd, Butterfield Blvd, San Martin Ave.		MH, SCC
19	**Dixon Landing/Zanker/ Monterey Road Corridor**	On-street bikeway connecting north Milpitas to North San Jose, downtown and south San Jose. Key routes: Dixon Landing Rd, McCarthy Blvd, Alviso Milpitas Rd, Zanker Rd, Old Bayshore Hwy, N 4th St, N 10th St, S 3rd St, S 1st St, Monterey Rd, Monterey Hwy		MIL, SJ
20	**Coyote Valley/Uvas Road Corridor**	On-street bikeway connecting southwest San Jose to San Martin and Coyote Lake. Key routes: Camden Ave, Redmond Ave, McKean Rd, Uvas Rd, Watsonville Rd, Day Rd, Buena Vista Ave, New Ave, Roop Rd		SJ, SCC
21	**I-680/ Silver Creek Corridor**	On-street bikeway connecting northeast Milpitas to Alum Rock area and southeast San Jose. Key routes: N Park Victoria Dr, Evans Rd, Piedmont Rd, White Rd, San Felipe Rd, Farnsworth Dr, Silver Creek Valley Rd		MIL, SJ
22	**Hwy 152 Corridor**	On-street bikeway crossing Gilroy east to west and connecting Unincorporated County. Key routes: Hacker Pass Hwy, Santa Teresa Blvd, 10th St, Bloomfield Ave, Miller Ave, Thomas Rd		GIL, SCC

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23	**Eastern South Valley Corridor**	On-street bikeway connecting areas north of Morgan Hill to east San Martin and SR152. Key routes: Tilton Ave, Burnett Ave, Cochrane Rd, Hill Rd, Foothill Ave, New Ave, Ferguson Rd		MH, SCC
24	**Blaney/Sunnyvale East Channel Corridor**	On-street and off-street bikeways connecting Bay Trail in north Sunnyvale to Cupertino and Prospect Road in west San Jose. Key routes: East Channel Trail, Blaney Ave		SV, CU, SJ
25	**South County Caltrain to Coyote Creek Corridor**	On-street bikeway connection downtown Gilroy to downtown and west Morgan Hill. Key routes: Cochrane Rd, Caltrain corridor		MH, SCC, GIL
26	**Race/Lincoln/Cherry Corridor**	On-street bikeway connecting areas around Diridon Station to Cherry Avenue bridge over SR 85 and Blossom Hill Road. Key routes: Lincoln Ave, Minnesota Ave, Cherry Ave, Sanchez Dr.		SJ
27	**McLaughlin/24th Street Corridor**	On-street bikeway parallel to US 101 connecting southeast San Jose to San Antonio Road. Key routes: McLaughlin Ave, 24th St		SJ
28	**Milpitas Boulevard/Lundy/ King/ Silver Creek Road Corridor**	On-street bikeway connecting north Milpitas and Milpitas BART Station to Evergreen neighborhood in San Jose. Key routes: Milpitas Blvd, Lundy Ave, King Rd, Yerba Buena Rd		MIL, SJ

CCBC No.	Name	Description *Refers to ultimate conditions, not existing conditions.*		Jurisdictions
CAMP=Campbell, CU=Cupertino, GIL=Gilroy, LA=Los Altos, LAH=Los Altos Hills, LG=Los Gatos, MIL=Milpitas, MSO=Monte Sereno, MH=Morgan Hill, MV=Mountain View, PA=Palo Alto, SAR=Saratoga, SC=Santa Clara, SCC=Santa Clara County, SJ=San Jose, SV=Sunnyvale				
29	**Julian/McKee Corridor**	On-street bikeway connecting Burbank neighborhood to SAP center and White Road in east San Jose. Key routes: Shasta Ave, Julian St, St John St, 17th St, McKee Rd		SJ
30	**N 1st Street Corridor**	On-street bikeway connecting Alviso to Hedding Avenue. Key route: N 1st St		SJ
31	**Calderon/Phyllis/Grant Corridor**	On-street bikeway connecting Evelyn Avenue to El Camino Real and Foothill Expressway. Key routes: Calderon Ave, Phyllis Ave, Grant Rd		MV, LA
32	**Channing/Homer Corridor**	On-street bikeway connecting north Palo Alto to downtown Palo Alto.		PA
33	**Fremont/Benton/Homestead Corridor**	On-street bikeway connecting Foothill Expressway and southeast Los Altos to Santa Clara close to Santa Clara University. Key routes: Fremont Ave, Homestead Rd, Ramon Dr, Dunford Way, Benton St, Monroe St		LA, SV, SC
34	**Story/Ruby/Aborn Corridor**	On-street bikeway connecting areas around Tamien Station to southeast San Jose and Evergreen neighborhood. Key routes: Goodyear St, Keyes St, Story Rd, Clayton Rd, Mt Pleasant Rd, Ruby Ave, Aborn Rd		SJ

CCBC No.	Name	Description *Refers to ultimate conditions, not existing conditions.*		Jurisdictions
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35	**Loma Verde Avenue/Charleston/ Arastradero Corridor**	On-street bikeway connecting Shoreline Park in Mountain View and Adobe Creek Trail to Los Altos Hills. Key routes: Charleston Rd, Arastradero Rd, Loma Verde Ave, Matadero Ave, Hansen Way, Roble Ridge Rd		PA, MV, LAH
36	**Trade Zone/Cropley Corridor**	On-street bikeway connecting Great Mall and Milpitas BART Station to Piedmont Road. Key routes: McCandless Dr, Trade Zone Blvd, Cropley Ave		MIL, SJ
401	**SR 237 Bike Path**	Paved bike path parallel to Highway 237 between Santa Clara and Milpitas.		SC, SJ, MIL
402	**San Tomas Aquino Creek Trail-Saratoga Creek Trail**	Paved bike path parallel to San Tomas Aquino Creek and Saratoga Creek. Some segments are enhanced on-street bikeways.		SC, SJ, SCC, CAM
403	**SR 87 Bike Path**	Paved bike path parallel to SR 87.		SJ
404	**Uvas Creek Trail**	Paved bike path parallel to Uvas Creek.		GIL
405	**Thompson Creek Trail-Silver Creek Trail**	Paved bike path connecting Coyote Creek Trail around Berryessa BART Station to Lake Cunningham, Evergreen Community College and southeast San Jose.		SJ, SCC
406	**Three Creeks Trail/Five Wounds Trail**	Paved bike path connecting Los Gatos Creek Trail south of Diridon Station to SR 87 bike path, Kelly Park, Coyote Creek Trail, East Santa Clara Street, Five Wounds neighborhood, Five Wounds Trail and Alum Rock BART.		SJ
407	**Llagas Trail-Little Llagas Trail to Coyote Lake**	Paved bike path connecting north and central Morgan Hill to San Martin, Gilroy and Coyote Lake.		MH, SCC, GIL
408	**Hetch-Hetchy Trail**	Paved bike path along Hetch-Hetchy right-of-way. The alignment in Santa Clara County is not continuous.		MIL, SC, SV

CCBC No.	Name	Description *Refers to ultimate conditions, not existing conditions.*		Jurisdictions
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409	**San Francisco Bay Trail**	Bike path (paved and unpaved) parallel to the San Francisco Bay. Planned by Association of Bay Area Governments/Bay Trail Project.		PA, MV, SV, SC, SJ, MIL
410	**UPRR Trail**	Paved bike path parallel to the Union Pacific Railroad/ SR 85 from Permanente Quarry to Vasona Junction/ Winchester Boulevard.		SCC, CU, SAR, CAMP, LG
411	**Coyote Creek Trail**	Paved bike path parallel to Coyote Creek from Morgan Hill to San Francisco Bay.		MH, SCC, SJ, MIL
412	**Stevens Creek Trail**	Paved bike path with some on-street segments, parallel to Stevens Creek from Stevens Creek County Park to San Francisco Bay.		SCC, CU, LA, SV, MV
413	**Guadalupe River/Creek Trail-Los Alamitos Trail**	Paved bike path parallel to Los Alamitos Creek, Guadalupe Creek, and Guadalupe River from Almaden neighborhood in San Jose to San Francisco Bay.		SJ
414	**Los Gatos Creek Trail**	Bike path (paved and unpaved, with some on-street segments) parallel to Los Gatos Creek from Lexington Reservoir to Diridon Station/Guadalupe River Trail.		SCC, LG, CAM, SJ
500	**Expressway Connector**	The following local streets extend expressway CCBCs: • Junipero Serra Blvd from San Hill Rd to Page Mill Rd • Landess Ave from I-680 to Piedmont Rd • Trimble Rd-De La Cruz Blvd from Orchard Pkwy to Central Expy • Quito Rd from Saratoga Ave to Allendale Ave • Hillsdale Ave from Camden Ave to Almaden Rd.		SCC, MH, SJ, SAR
501	**Capitol Expressway**	Wide shoulders on Capitol Expressway.		SCC
502	**Lawrence Expressway**	Wide shoulders on Lawrence Expressway, with plans for bike path with Lawrence Expressway Grade Separation project by County Roads and Airports.		SCC

CCBC No.	Name	Description *Refers to ultimate conditions, not existing conditions.*		Jurisdictions
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503	**Page Mill-Oregon Expressway**	Wide shoulders and bicycle lanes on Oregon and Page Mill Expressway, with plans for bicycle path parallel to Page Mill Expressway.		SCC
504	**San Tomas/Montague Expressway**	Wide shoulders on San Tomas and Montague Expressways.		SCC
505	**Foothill Expressway**	Wide shoulders on Foothill Expressway.		SCC
506	**Central Expressway**	Wide shoulders on Central Expressway.		SCC
507	**Almaden Expressway**	Wide shoulders on Almaden Expressway		SCC
600	**Local Connector**	Local streets mapped, but not included as numbered CCBCs. Typically, connectors are short and provide access between numbered CCBCs. They are included as part of the entire CCBC network.		various

Appendix 5.2 Prioritization Methodology

FEHR & PEERS

MEMORANDUM

To: Lauren Ledbetter, VTA

From: David Wasserman and Dana Weissman, Fehr & Peers

Subject: CCBC Prioritization Analysis Overview

SJ15_1631

The Cross County Bicycle Corridor (CCBC) Prioritization Analysis can be summarized as a three-step process:

1. Associate prioritization criteria data from disparate sources with the CCBC network by assigning a unique value for every network segment.
2. Create normalized scores for each prioritization criterion with values 1-10 using percentile scoring, linear normalization, or expert based weight assignment.
3. Compute a weighted sum of the eight prioritization criteria sub-scores to create a combined prioritization score for every network segment, weighted based on designated sub-score percentages.

The eight prioritization criteria layers that inform the combined prioritization score were developed to best reflect the intentions outlined in Attachment B of the Countywide Bike Plan Prioritization Criteria memorandum approved by VTA's Board of Directors.

Detailed Methodology

The process for developing each prioritization criterion is outlined below.

1. Collision History - Bicycle collision density, with fatal and severe injury collisions weighted higher than other types of collisions. Data from Statewide Integrated Traffic Records System, most recent five years of data.
    - **Data Sources:** Bicycle Collisions over 5 Years from TIMS/SWITRS.
    - **Methodology:**
        - To weight the collisions to facilities/severe injuries a collision weight field was developed. The weight field was developed so that it would be sensitive to changes in collision severity, but would not have collision severity be weighted so high it masked out global collision patterns.
            - The Weights developed for each collision were assigned so that:
                - A fatal collision had a weight of 5
                - A severe injury had a weight of 3
                - All other collisions had a weight of 1
        - A kernel density raster using a bandwidth of 500 ft. using the collision weight was developed then sampled by the centroids of the CCBCs, then joined back to the network.

      - Percentile scores were computed on the variable values excluding NULL and 0 values. All excluded values are assigned a final percentile score of 0. Percentile scores were then normalized to a 1-10 score.

2. Level of Traffic Stress - Current LTS as calculated based on roadway factors such as posted speeds, vehicle lanes, and existing bicycle infrastructure.
   - **Data Sources:** TomTom, VTA Bike Infrastructure Data
   - **Methodology:**
      - The TomTom based LTS analysis was spatially joined to the CCBC network. It was a multistep spatial join in which search radius could be adjusted base on facility type, with off-street facilities receiving a more liberal search radius relative to on-street. Any segment that did not get an LTS score at the end of the association process was assumed to not have supporting infrastructure, so assigned an LTS of 4.
      - The scores developed for LTS as 1-10 scores were developed so that low and high stress corridors diverged so that high stress corridors are clearly scored for needing improvement.
      - LTS Scores and their corresponding score were:
         - LTS 1 – Scored 1
         - LTS 2 – Scored 3
         - LTS 3 – Scored 8
         - LTS 4 – Scored 10

3. Projected bicycle ridership numbers - Projected ridership in 2026, calculated by the VTA travel demand model, assuming the entire Cross County Bicycle Corridor (CCBC) network is built out.
   - **Data Sources:** VTA Model Volumes
   - **Methodology:**
      - VTA Model data was joined to the CCBC network based on the shared segment ID. Data and its corresponding patterns were reviewed as a quality check.
      - Percentile scores were computed on the variable values excluding NULL and 0 values. Many segments had values of zero that would have biased the percentile statistics in the case of model volumes. All excluded values are assigned a final percentile score of 0. Percentile scores were then normalized to a 1-10 score.

4. Transit access - Projected number of bicyclists traveling from major transit stops in 2026, calculated by the VTA travel demand model, assuming the entire CCBC network is built out.
   - **Data Sources:** VTA Model Volumes
   - **Methodology:**
      - VTA Model data was joined to the CCBC network based on the shared segment ID. Data and its corresponding patterns were reviewed as a quality check.

      - Percentile scores were computed on the variable values excluding NULL and 0 values. Many segments had values of zero that would have biased the percentile statistics in the case of model volumes. All excluded values are assigned a final percentile score of 0. Percentile scores were then normalized to a 1-10 score.

5. Employment and school access - Projected number of work and school commuter bicyclists in 2026, calculated by the VTA travel demand model, assuming the entire CCBC network is built out.
    - **Data Sources:** VTA Model Volumes
    - **Methodology:**
        - VTA Model data was joined to the CCBC network based on the shared segment ID. Data and its corresponding patterns were reviewed as a quality check.
        - Percentile scores were computed on the variable values excluding NULL and 0 values. Many segments had values of zero that would have biased the percentile statistics in the case of model volumes. All excluded values are assigned a final percentile score of 0. Percentile scores were then normalized to a 1-10 score.

6. Equity - Projected number of bicyclists traveling from COC's in 2026, calculated by the VTA travel demand model, assuming the entire CCBC network is built out.
    - **Data Sources:** VTA Model Volumes
    - **Methodology:**
        - VTA Model data was joined to the CCBC network based on the shared segment ID. Data and its corresponding patterns were reviewed as a quality check.
        - Percentile scores were computed on the variable values excluding NULL and 0 values. Many segments had values of zero that would have biased the percentile statistics in the case of model volumes. All excluded values are assigned a final percentile score of 0. Percentile scores were then normalized to a 1-10 score.

7. Destinations - Average density per mile of schools, parks, and shopping areas within 1/4 mile of corridor. Additional weight for services, employment, or high-density housing that serve disadvantaged populations.
    - **Data Sources:** Open Street Map, VTA Provided Datasets
    - **Methodology:**
        - The process of evaluating destinations involved the creation of 4 kernel density rasters. All kernel density rasters used a search radius of 1.5 miles to create a smooth regional gradient and to use a bandwidth that is comparable to a 10 minute bike ride.
            - **HD Housing Raster:** All of the rasters were unweighted, except for high density housing parcels which were weighted by area (in

acres). When this was initially not weighted, the output raster created a high preference for Sunnyvale that was not justified by a global review of the data. This artifact was a result of Sunnyvale having main small parcels in close proximity while other areas including San Jose including parcels that just had much larger areas. While this was imperfect, the housing data came with no other field to weight the data.

- The rasters then were reclassified to scores between 1 and 10 based on the Natural Breaks classification algorithm. This process found natural high and low clusters within the raster data and allowed each criterion to be weighted equally. These rasters valued 1-10 were then sampled by the CCBC centroids.
- The resulting values were then combined in a weighted sum that weighted schools, parks, shopping, and HD housing with weights of 20%, 20%, 20%, and 40% respectively to create a final score.
- The final values did not have a maximum value of 10, so they were linearly normalized to a 1-10 scale.

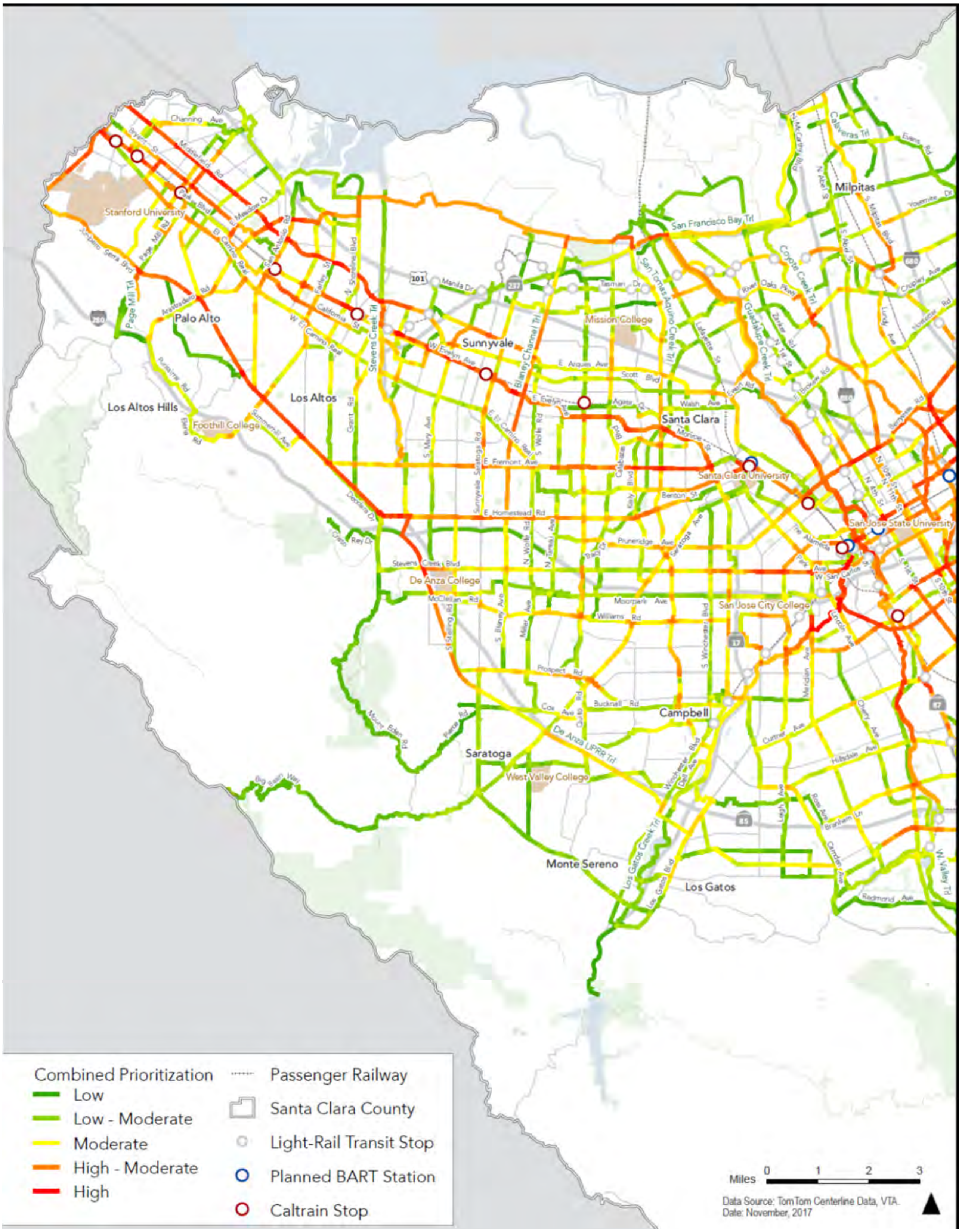
8. Community support - Corridor desirability based on input from members of the public. (Comments received during public outreach for bicycle plan at in person events, or on web map survey in spring 2016.)
    - **Data Sources:** Public Outreach Files (Web and In Person)
    - **Methodology:**
        - The data sets treatments used were treated differently based on whether they were from web or in person charrettes.
            - The web outreach files was provided in the form of a line and point file.
                - The final output score was based on two kernel densities that were weighted based on the number of "Likes" that facility received (ignoring dislikes). These two rasters were then added together to make a final "Like" density map.
                - The density rasters were sampled by the CCBC centroids and then joined back to the network. Percentile scores were then calculated on the density values. The Percentile scores were then normalized to be between 0 and 6.
            - The charrette determined barriers and corridors were used to develop scores based on proximity.
                - If a barrier or corridor shape was found to be within 300 ft. it received a score of 4 and zero otherwise.
        - The final outreach score was calculated by adding the charrette and web based outreach scores, with a minimum score of 1, so that the values were normalized scores between 1 and 10.

Combined Weighted Prioritization Score: The final prioritization score was derived by computing a weighted sum based on the "Percent of Total Score" values shown in Attachment A.

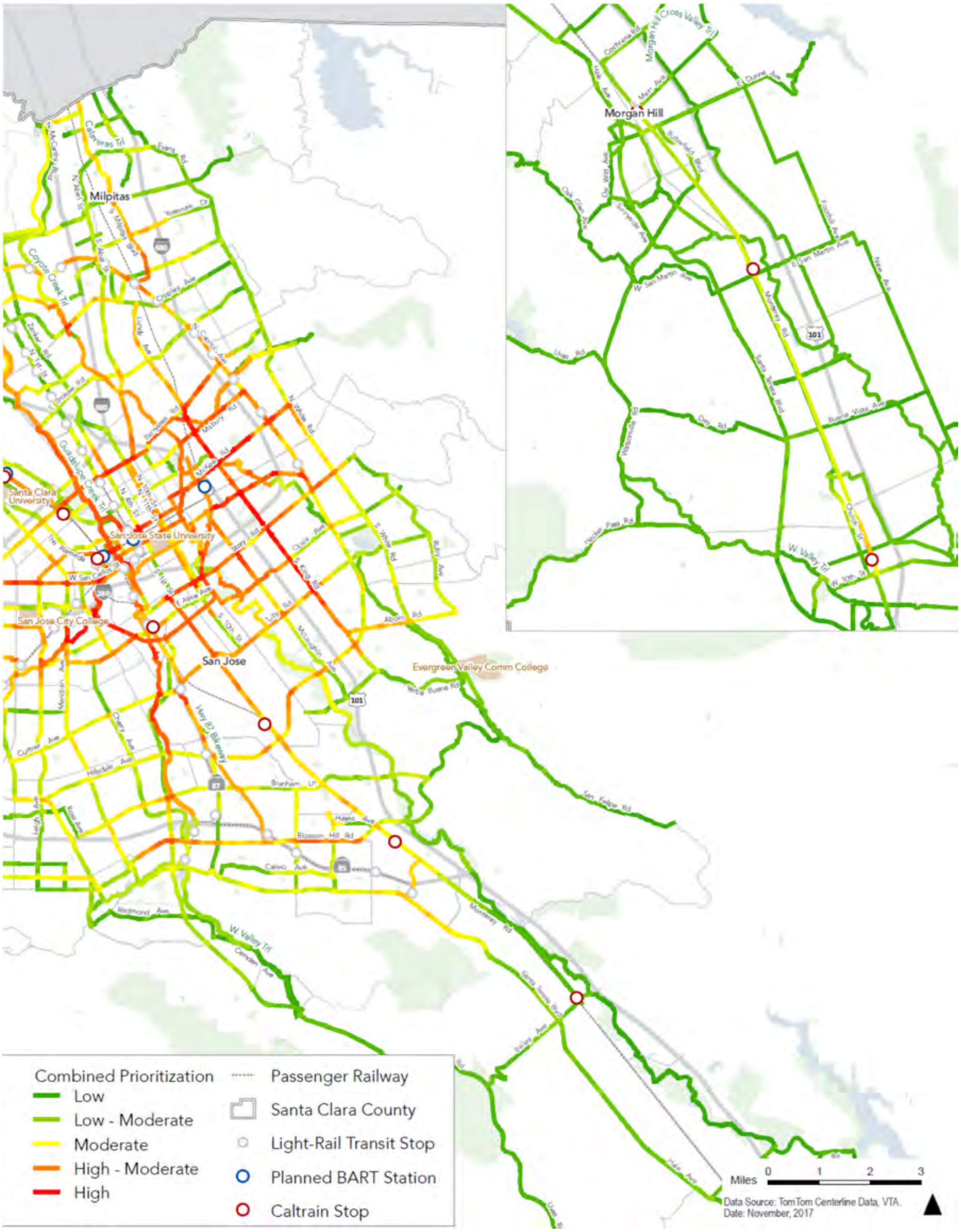
ATTACHMENT A: PROPOSED PRIORITIZATION CRITERIA FOR THE COUNTYWIDE BICYCLE PLAN

Criterion		Assessment	Percent of Total Score*
Safety			
1	Provides opportunity to improve safety in a corridor with high number of collisions.	Bicycle collision density, with fatal and severe injury collisions weighted higher than other types of collisions. Data from Statewide Integrated Traffic Records System, most recent five years of data.	10%
2	Provides opportunity to improve a corridor with high Bicycle Level of Traffic Stress (LTS).	Current LTS as calculated based on roadway factors such as posted speeds, vehicle lanes, and existing bicycle infrastructure.	10%
Projected Bicycle Ridership Numbers			
3	Has potential to serve many bicyclists.	Projected ridership in 2026, calculated by the VTA travel demand model, assuming the entire Cross County Bicycle Corridor (CCBC) network is built out.	20%
Transit Access			
4	Serves first mile/ last mile transit access.	Projected number of bicyclists traveling from major transit stops in 2026, calculated by the VTA travel demand model, assuming the entire CCBC network is	15%
Employment and School Access			
5	Serves work and school commutes.	Projected number of work and school commuter bicyclists in 2026, calculated by the VTA travel demand model, assuming the entire CCBC network is	15%
Equity			
6	Serves Communities of Concern (COC)**	Projected number of bicyclists traveling from COC's in 2026, calculated by the VTA travel demand model, assuming the entire CCBC	10%
Destinations			
7	Serves all trip purposes.	Average density per mile of schools, parks, and shopping areas within 1/4 mile of corridor. Additional weight for services, employment, or high-density housing that serve disadvantaged	15%
Community Support			
8	Has support from the community.	Corridor desirability based on input from members of the public. (Comments received during public outreach for bicycle plan at in person events, or on web map survey in spring 2016.)	5%

* Scores will be calculated on a sliding scale, with the weight representing the maximum percent that each criterion can contribute to the total score.
** Metropolitan Transportation Commission has established Communities of Concern (COC) for the Bay Area. COCs are defined as Census tracts with high concentrations of both minority and low-income households or Census tracts with a high concentration of low-income households and three of the following criteria: limited English proficiency, zero-vehicle households, seniors 75 years or older, people with disabilities, single parent families, or rent-burdened households.



Palo Alto
Los Altos Hills
Los Altos
Sunnyvale
Santa Clara
Milpitas
Campbell
Saratoga
Monte Sereno
Los Gatos
Stanford University
Foothill College
Mission College
Santa Clara University
San Jose State University
De Anza College
San Jose City College
West Valley College
Combined Prioritization
Low
Low - Moderate
Moderate
High - Moderate
High
Passenger Railway
Santa Clara County
Light-Rail Transit Stop
Planned BART Station
Caltrain Stop
Miles 0 1 2 3
Data Source: TomTom Centerline Data, VTA.
Date: November, 2017



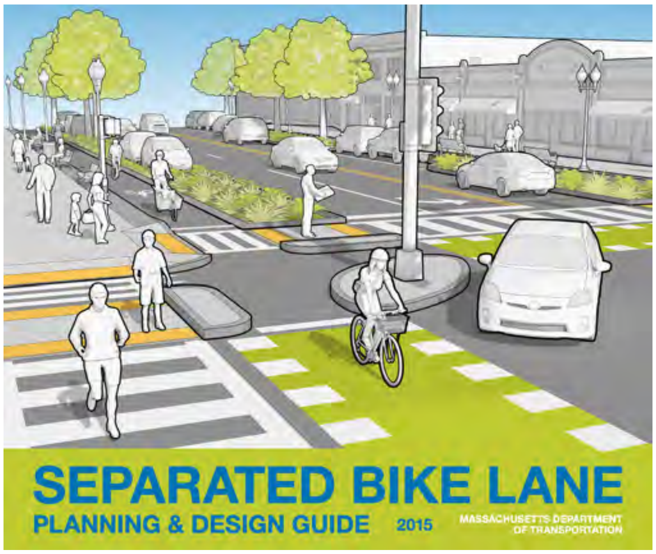
Milpitas
San Jose
Morgan Hill
Santa Clara University
San Jose State University
San Jose City College
Evergreen Valley Comm College
Combined Prioritization
Low
Low - Moderate
Moderate
High - Moderate
High
Passenger Railway
Santa Clara County
Light-Rail Transit Stop
Planned BART Station
Caltrain Stop
Miles
0
1
2
3
Data Source: TomTom Centerline Data, VTA.
Date: November, 2017

Appendix 5.3 Visual Toolbox

This appendix contains an illustrated toolkit of bikeway treatments. It is useful for visualizing the treatments recommended in the Countywide Bicycle Plan. It includes examples of how a treatment looks on the street, design considerations and details, and design guideline references.

It should be used in conjunction with the Bicycle Technical Guidelines and other sources published by VTA, Caltrans, American Association of State Highway Transportation Officials, North American City Transportation Officials, and Federal Highway Administration.

NATIONAL STANDARDS AND RESOURCES



Massachusetts Department of Transportation (MassDOT)

Separated Bike Lane Planning & Design Guide, 2016

Federal Highway Administration (FHWA)

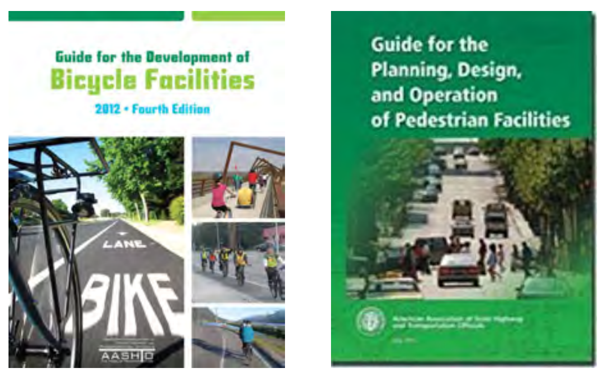
Separated Bike Lane Planning and Design Guide, 2015

National Association of City Transportation Officials (NACTO)

Urban Street Design Guide

Transit Street Design Guide

Urban Bikeway Design Guide



American Association of State Highway and Transportation Officials (AASHTO)

Guide for the Development of Bicycle Facilities, 2012

Guide for the Planning, Design, and Operation of Pedestrian Facilities, 2004

Facility Types by Traffic Stress

Class III

Level of Traffic Stress Concept

Research shows that many people feel safer and more comfortable riding on low traffic streets or on facilities that provide protection from fast-moving traffic. Level of Traffic Stress is a way to measure routes that are comfortable for different groups.

Level of Traffic Stress 1

Users from 8 (children) to 80 (seniors)

Level of Traffic Stress 2

The mainstream adult population ('interested but concerned')

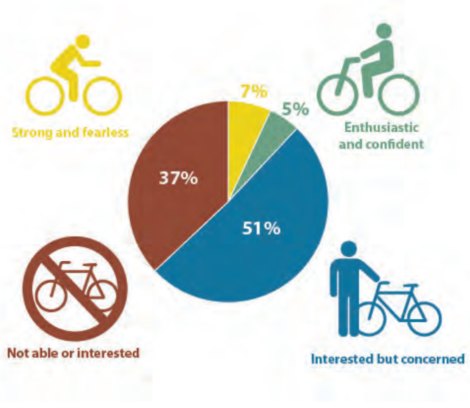
Level of Traffic Stress 3

Adults that are comfortable in shared traffic but may prefer some separation ('enthused and confident')

Level of Traffic Stress 4

Adults that are comfortable in shared traffic with no separation ('strong and fearless')

ADT = Annual Daily Traffic
MPH = Miles per Hour for Motor Vehicles



Dill, J. McNeil, N. "Revisiting the Four Types of Cyclists: Findings from a National Survey" Transportation Research Board 95th Annual Meeting, 2016.

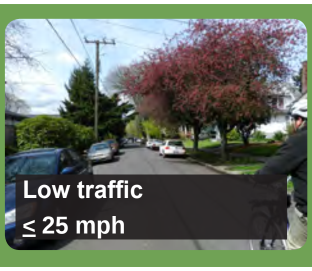
low

traffic stress

high

Level of Traffic Stress

1



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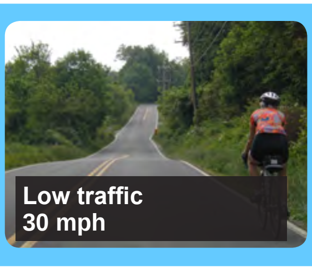

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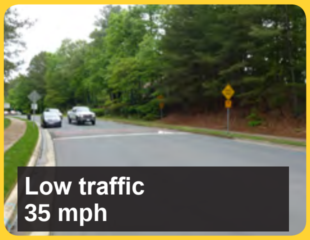

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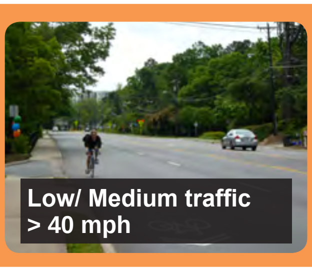
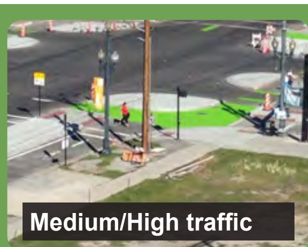
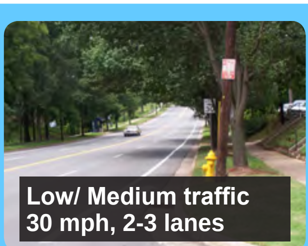
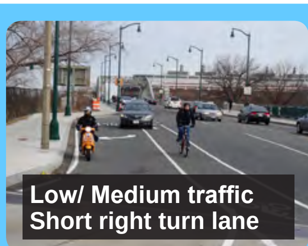
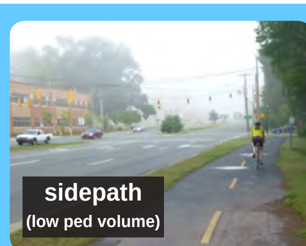
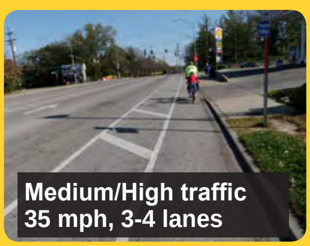
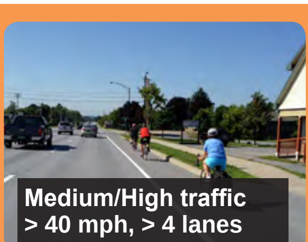


Santa Clara
Countywide Bicycle Plan

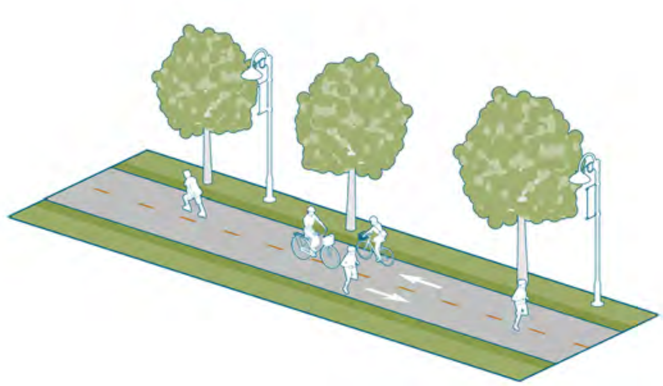
Class II	intersections	Class I	Class IV
 Medium/High traffic ≤ 25 mph, 2-3 lanes	 Medium/High traffic	 multi-use trail	 Separated Bikeway
 Low/ Medium traffic 30 mph, 2-3 lanes	 Low/ Medium traffic Short right turn lane	 sidepath (low ped volume)	
 Medium/High traffic 35 mph, 3-4 lanes	 Medium/High traffic Long right turn lane	 sidepath (high ped volume)	
 Medium/High traffic > 40 mph, > 4 lanes	 Medium/High traffic Bike Lane		

SIDEPATHS (CLASS I) $$$

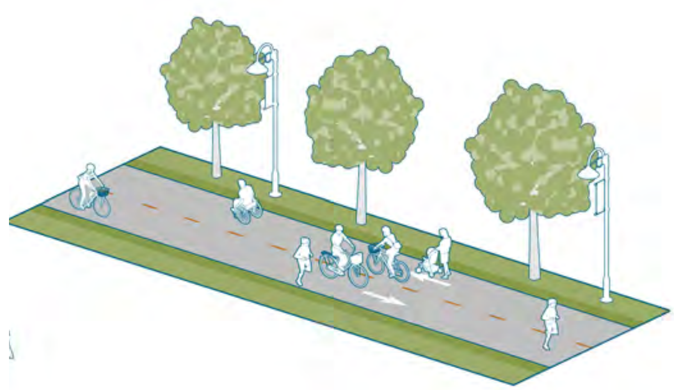
A shared use path, also known as a Class I path, is a two-way facility physically separated from motor vehicle traffic and used by bicyclists, pedestrians, and other non-motorized users. Shared use paths, also referred to as trails, are often located in an independent alignment, such as a greenbelt or abandoned railroad. However, they are also regularly constructed along roadways; often bicyclists and pedestrians will have increased interactions with motor vehicles at driveways and intersections on these "sidepaths."

CONSIDERATIONS

+ According to the AASHTO, "Shared use paths should not be used to preclude on-road bicycle facilities, but rather to supplement a network of on-road bike lanes, shared roadways, bicycle boulevards, and paved shoulders." In other words, in some situations it may be appropriate to provide an on-road bikeway in addition to a sidepath along the same roadway.
+ Many people express a strong preference for the separation between bicycle and motor vehicle traffic provided by paths when compared to on-street bikeways. Sidepaths may be desirable along high-volume or high-speed roadways, where accommodating the targeted type of bicyclist within the roadway in a safe and comfortable way is impractical. However, sidepaths may present increased conflicts between path users and motor vehicles at intersections and driveway crossings. Conflicts can be reduced by minimizing the number of driveway and street crossings present along a path and otherwise providing high-visibility crossing treatments.
+ Paths typically have a lower design speed for bicyclists than on-street facilities and may not provide appropriate accommodation for more confident bicyclists who desire to travel at greater speeds. In addition, greater numbers of driveways or intersections along a sidepath corridor can decrease bicycle travel speeds and traffic signals can increase delay for bicyclists on off-street paths compared to cyclists using in-street bicycle facilities such as bike lanes. Therefore, paths should not be considered a substitute to accommodating more confident bicyclists within the roadway.



Path Width for One-way Passing



Path Width for Two-way Passing

REFERENCES

AASHTO Guide for the Development of Bicycle Facilities (2012)

FHWA Shared-Use Path Level of Service Calculator (2006)

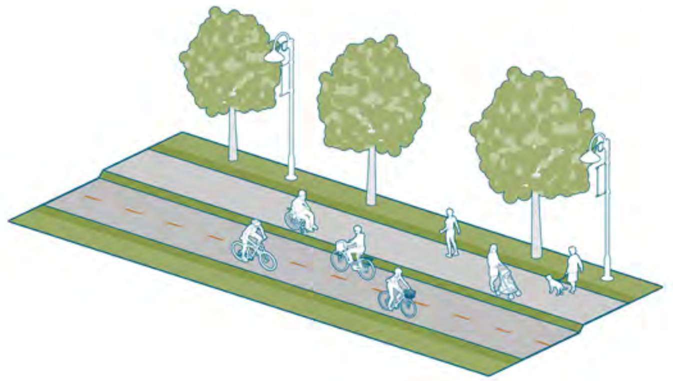
Manual on Uniform Traffic Control Devices (2009)

PATH WIDTH CONSIDERATIONS

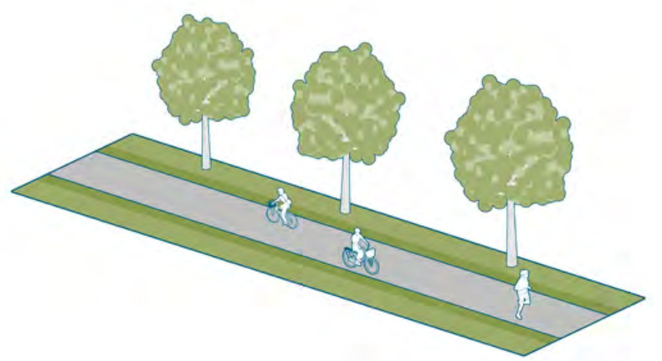
Path width should be determined based on three main characteristics: the number of users, the types of users, and the differences in their speeds. For example, a path that is used by higher-speed bicyclists and children walking to school may experience conflicts due to their difference in speeds. By widening the path to provide space to accommodate passing movements, conflicts can be reduced.

CONSIDERATIONS

+ Widths as narrow as 8 feet are acceptable for short distances under physical constraint. Warning signs should be considered at these locations.
+ In locations with heavy volumes or a high proportion of pedestrians, widths exceeding 10 feet are recommended. A minimum of 11 feet is required for users to pass with a user traveling in the other direction. It may be beneficial to separate bicyclists from pedestrians by constructing parallel paths for each mode.
+ Paths must be designed according to state and national standards. This includes establishing a design speed (typically 18 mph) and designing path geometry accordingly. Consult the AASHTO Guide for the Development of Bicycle Facilities for guidance on geometry, clearances, traffic control, railings, drainage, and pavement design.
+ On hard surfaces it can be useful to include soft surface parallel paths which are preferred by some users, such as runners.
+ Path clearances are an important element in path design and reducing user conflicts. Vertical objects close to the path edge can endanger users and reduce the comfortable usable width of the path. Along the path, vertical objects should be set back at least two feet from the edge of the path. Path shoulders may also reduce conflicts by providing space for users who step off the path to rest, allowing users to pass one another, or providing space for viewpoints.



Shared Use Path Physical Separation



Minimum Path Width Limits Passing

REFERENCES

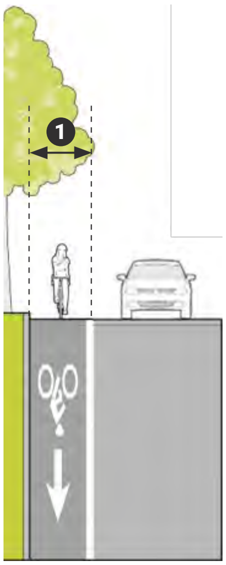
AASHTO Guide for the Development of Bicycle Facilities (2012)

FHWA Shared-Use Path Level of Service Calculator (2006)

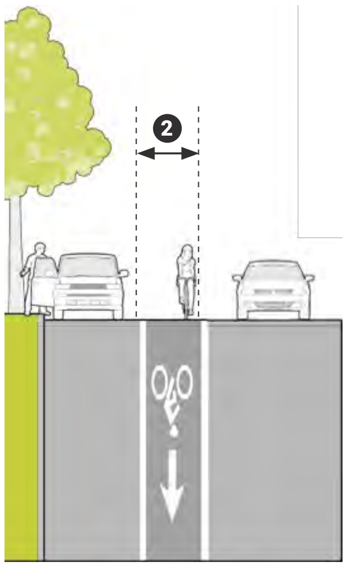
Manual on Uniform Traffic Control Devices (2009)

BIKE LANES (CLASS II) $

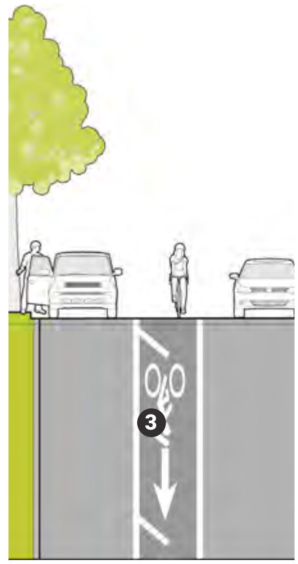
Bicycle lanes, also known as Class II lanes, provide an exclusive space for bicyclists in the roadway. Bicycle lanes are established through the use of lines and symbols on the roadway surface. Bicycle lanes are for one-way travel and are normally provided in both directions on two-way streets and/or on one side of a one-way street. Bicyclists are not required to remain in a bicycle lane when traveling on a street and may leave the bicycle lane as necessary to make turns, pass other bicyclists, or to properly position themselves for other necessary movements. Bicycle lanes may only be used temporarily by vehicles accessing parking spaces and entering and exiting driveways and alleys.



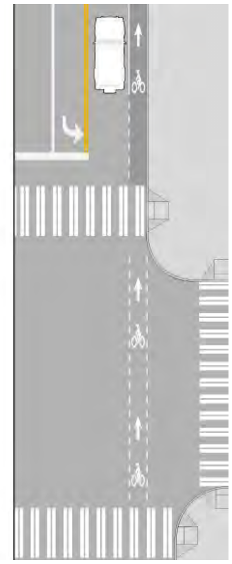
Bike Lane Adjacent to a Curb



Bike Lane Adjacent to Parking



Bike Lane with Door Zone Marking



Extended Bike Lanes through Intersection

CONSIDERATIONS

+ Typically installed by reallocating existing street space. Parking removal, lane narrowing, and lane removal are common strategies used to reallocate space.
+ Can be used on one-way or two-way streets.
+ Contra-flow bicycle lanes may be used to allow two-way bicycle travel on streets designated for one-way travel for motorists to improve bicycle network connectivity.
+ Stopping, standing and parking in bike lanes may be problematic in areas of high parking demand and deliveries, especially in commercial areas.
+ Wider bike lanes or buffered bike lanes are preferable at locations with high parking turnover.
+ Colored pavement can be used to increase the overall visibility of the facility. Consistent application of color is important to promote clear understanding for all users.

GUIDANCE

1. The minimum width of a bike lane adjacent to a curb is 5 feet exclusive of a gutter, a desirable width is 6 feet.
2. The minimum width of a bike lane adjacent to parking is 5 feet, a desirable width is 6 feet.
3. Parking T's or hatch marks can highlight the door zone on constrained corridors with high parking turnover to guide bicyclists away from doors.

REFERENCES

AASHTO. Guide for the Development of Bicycle Facilities. 2012.

NACTO. Urban Bikeway Design Guide. 2nd Edition.

LEFT SIDE BIKE LANE

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In some locations, one one-way streets, bicycle lanes placed on the left-side of the roadway can result in fewer conflicts between bicyclists and motor vehicles, particularly on streets with heavy right-turn volumes or frequent bus service and stops where buses operate in the right-side curb lane. Other occasions may be where parking is provided only on the right side of the street or where loading predominantly occurs on the right. Left-side bike lanes can increase visibility between motorists and bicyclists at intersections due to the location of the rider on the left-side of the vehicle. However, left-side bike lanes are often an unfamiliar orientation for both bicyclists and drivers and may be less intuitive.

CONSIDERATIONS

+ On one-way streets with parking on both sides, bicyclists will typically encounter fewer conflicts with car doors opening on the passenger side.
+ Colored pavement should be considered in curbside locations to increase awareness of the restriction against parking or stopping in the bicycle lane.
+ Left-side placement may not be appropriate in locations where the street switches from one-way to two-way operation.
+ Left-side bicycle lanes may not be appropriate near the center or left-side of free flow ramps or along medians with streetcar operations, unless appropriate physical separation and signal protection can be provided.
+ Consider dominant bicycle routes. Where a large proportion of bicyclists make right hand turns, conventional bike lanes may be preferable.

GUIDANCE

+ Left-side bicycle lanes generally may only be used on one-way streets or on median divided streets.
+ Left-side bicycle lanes have the same design requirements as right-side bicycle lanes.

REFERENCES

AASHTO. Guide for the Development of Bicycle Facilities. 2012..

BUFFERED BIKE LANES

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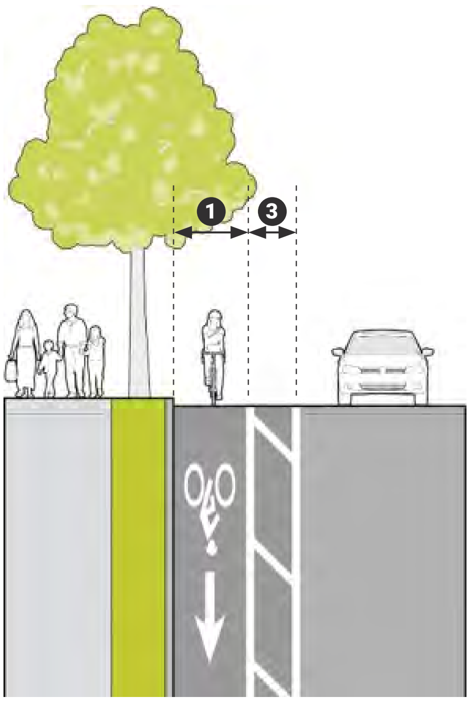
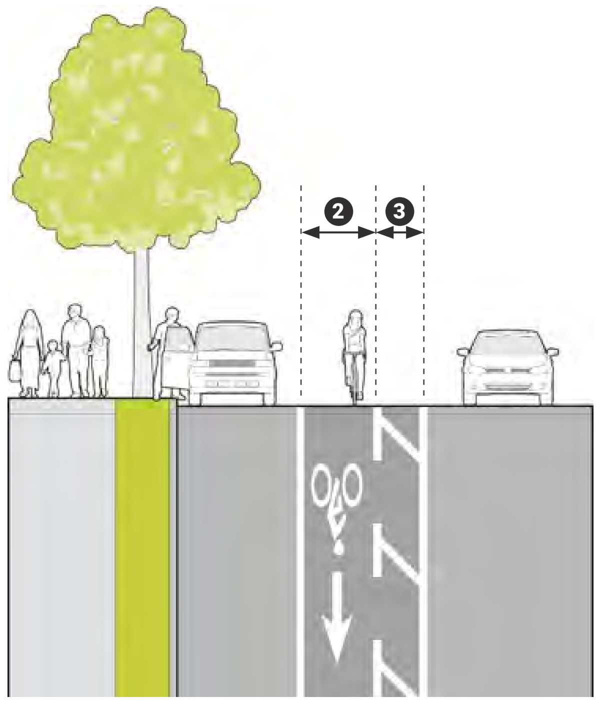
Buffered bicycle lanes are created by painting or otherwise creating a flush buffer zone between a bicycle lane and the adjacent travel lane. While buffers are typically used between bicycle lanes and motor vehicle travel lanes to increase bicyclists' comfort, they can also be provided between bicycle lanes and parking lanes in locations with high parking turnover to discourage bicyclists from riding too close to parked vehicles.



Buffered Bike Lane Adjacent to a Curb



Buffered Bike Lane Adjacent to Parking

CONSIDERATIONS

+ Preferable to a conventional bicycle lanes when used as a contra-flow bike lane on one-way streets.
+ Typically installed by reallocating existing street space by removing parking or narrowing or removing travel lanes.
+ Can be used on one-way or two-way streets.
+ Consider placing buffer next to parking lane where there is commercial or metered parking.
+ Consider placing buffer next to travel lane where speeds are 30 mph or greater or when traffic volume exceeds 6,000 vehicles per day.
+ Where there is 7 feet of roadway width available for a bicycle lane, a buffered bike lane should be installed instead of a conventional bike lane
+ Buffered bike lanes allow bicyclists to ride side by side or to pass slower moving bicyclists.
+ Research has documented buffered bicycle lanes increase the perception of safety.

GUIDANCE

1. The minimum width of a buffered bike lane adjacent to parking is 4 feet, a desirable width is 6 feet.
2. Buffers are to be broken where curbside parking is present to allow cars to cross the bike lane.
3. The minimum buffer width is 18 inches. There is no maximum. Diagonal cross hatching should be used for buffers <3 feet in width. Chevron cross hatching should be used for buffers >3 feet in width.

REFERENCES

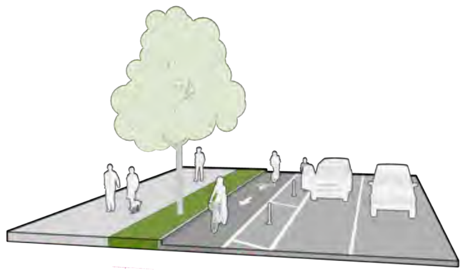
AASHTO. Guide for the Development of Bicycle Facilities. 2012.

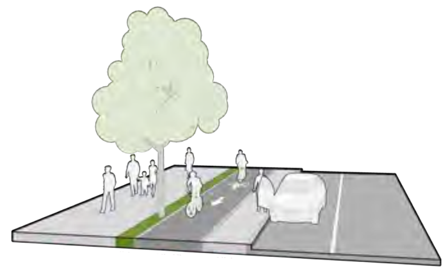
NACTO. *Urban Bikeway Design Guide.* 2nd Edition.

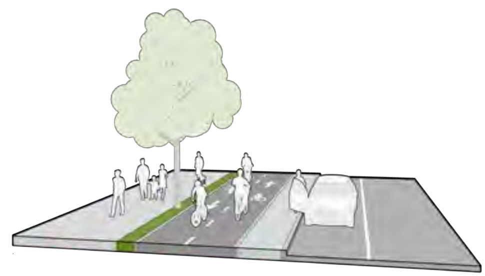
Portland State University, Center for Transportation Studies. *Evaluation of Innovative Bicycle Facilities: SW Broadway Cycle Track & SW Stark/Oak Street Buffered Bike Lanes FINAL REPORT.* 2011.

SEPARATED BIKE LANES (CLASS IV) $$-$$$

Separated Bike Lanes, also known as Class IV lanes, are an exclusive bikeway facility type that combines the user experience of a sidepath with the on-street infrastructure of a conventional bike lane. They are physically separated from motor vehicle traffic and distinct from the sidewalk.







CONSIDERATIONS

Separated bike lanes are more attractive to a wider range of bicyclists than striped bikeways on higher volume and higher speed roads. They eliminate the risk of a bicyclist being hit by an opening car door and prevent motor vehicles from driving, stopping or waiting in the bikeway. They also provide greater comfort to pedestrians by separating them from bicyclists operating at higher speeds.

Separated bike lanes can provide different levels of separation:

+ Separated bike lanes with flexible delineator posts ("flex posts") alone offer the least separation from traffic and are appropriate as interim solution.

+ Separated bike lanes that are raised with a wider buffer from traffic provide the greatest level of separation from traffic, but will often require road reconstruction.

+ Separated bike lanes that are protected from traffic by a row of on-street parking offer a high-degree of separation.

GUIDANCE

Separated bike lanes can generally be considered on any road with one or more of the following characteristics:

+ Traffic lanes: 3 lanes or more.

+ Posted speed limit: 30 mph or more.

+ Traffic: 9,000 vehicles per day or more.

+ On-Street parking turnover: frequent.

+ Bike lane obstruction: likely to be frequent.

+ Streets that are designated as truck or bus routes.

Separated bike lanes are preferred over sidepaths in higher density areas, commercial and mixed-use development, and near major transit stations or locations where pedestrian volumes are anticipated to exceed 200 people per hour on a shared use path.

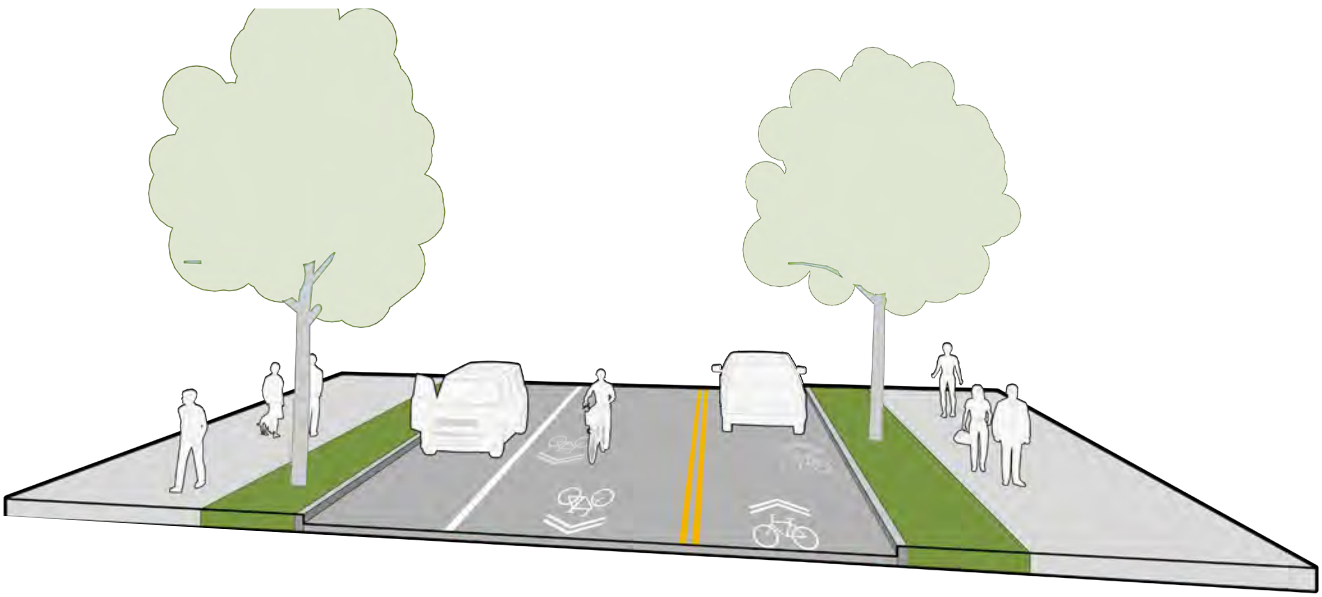
REFERENCES

NACTO. Urban Bikeway Design Guide. 2nd Edition.

MassDOT. Separated Bike Lane Planning and Design Guide. 2015

SHARED LANE MARKINGS (CLASS III) $

Shared lane markings (or "sharrows") are pavement markings that denote shared bicycle and motor vehicle travel lanes. This type of treatment is considered a Class III facility. The markers are two chevrons positioned above a bicycle symbol, placed where the bicyclist should be anticipated to operate. In general, this is a design solution that should only be used in locations with low traffic speeds and volumes as part of a signed route, bicycle boulevard, or as a temporary solution on constrained, higher-traffic streets until additional right-of-way can be acquired.



CONSIDERATIONS

+ Typically used on local, collector, or minor arterial streets with low traffic volumes. Commonly used on bicycle boulevards to reinforce the priority for bicyclists.
+ Typically feasible within existing right-of-way and pavement width even in constrained situations that preclude dedicated facilities.
+ May be used as interim treatments to fill gaps between bike lanes or other dedicated facilities for short segments where there are space constraints.
+ May be used for downhill bicycle travel in conjunction with climbing lanes intended for uphill travel.
+ Typically supplemented by signs, especially Bikes May Use Full Lane (R4-11).

GUIDANCE

+ Intended for use only on streets with posted speed limits of up to 25 mph and traffic volumes of less than 4,000 vehicles per day. Maximum posted speed of street: 35 mph
+ The marking's centerline must be at least 4' from curb where parking is prohibited.
+ The marking's centerline must be at least 11' from curb where parking is permitted, so that it is outside the door zone of parked vehicles.
+ For narrow lanes, it may be desirable to center shared lane markings along the centerline of the outside travel lane.

REFERENCES

AASHTO Guide for the Development of Bicycle Facilities (2012)

NACTO Urban Bikeway Design Guide (2012)

Manual on Uniform Traffic Control Devices (2009)

BICYCLE BOULEVARDS $-$$$

Bicycle boulevard treatments are applied on quiet streets, often through residential neighborhoods. These treatments are designed to prioritize bicycle through-travel, while discouraging motor vehicle traffic and maintaining relatively low motor vehicle speeds. Treatments vary depending on context, but often include elements of traffic calming, including traffic diverters, speed attenuators such as speed humps or chicanes, pavement markings, and signs. Bicycle boulevards are also known as neighborhood greenways, and neighborhood bikeways, among other locally-preferred terms.

CONSIDERATIONS

Many cities already have signed bike routes along neighborhood streets that provide an alternative to traveling on high-volume, high-speed arterials. Applying bicycle boulevard treatments to these routes makes them more suitable for bicyclists of all abilities and can reduce crashes as well.

Stop signs or traffic signals should be placed along the bicycle boulevard in a way that prioritizes the bicycle movement, minimizing stops for bicyclists whenever possible.

Bicycle boulevard treatments include traffic calming measures such as street trees, traffic circles, chicanes, and speed humps. Traffic management devices such as diverters or semi-diverters can redirect cut-through vehicle traffic and reduce traffic volume while still enabling local access to the street.

Communities should begin by implementing bicycle boulevard treatments on one pilot corridor to measure the impacts and gain community support. The pilot program should include before-and-after crash studies, motor vehicle counts, and bicyclist counts on both the bicycle boulevard and parallel streets. Findings from the pilot program can be used to justify bicycle boulevard treatments on other neighborhood streets.

Additional treatments for major street crossings may be needed, such as median refuge islands, rapid flash beacons, bicycle signals, and HAWK or half signals.

GUIDANCE

+ Maximum Average Daily Traffic (ADT): 3,000
+ Preferred ADT: up to 1,000
+ Target speeds for motor vehicle traffic are typically around 20 mph; there should be a maximum < 15 mph speed differential between bicyclists and vehicles.

REFERENCES

AASHTO Guide for the Development of Bicycle Facilities (2012)

NACTO Urban Bikeway Design Guide (2012)

Manual on Uniform Traffic Control Devices (2009)

Fundamentals of Bicycle Boulevard Planning & Design (2009)

BICYCLE BOULEVARD TREATMENTS: TRAFFIC CALMING

Bicycle Boulevards are intended to be low-speed streets. Traffic calming is often needed to slow the speeds of motorists to a "desired speed". The greatest benefit of traffic calming is increased safety and comfort for all users on and crossing the street. Compared with conventionally-designed streets, traffic calmed streets typically have fewer collisions and far fewer injuries and fatalities. These safety benefits are the result of slower speeds for motorists that result in greater driver awareness, shorter stopping distances, and less kinetic energy during a collision.



Horizontal deflection: includes chicanes, neckdowns, and traffic circles



Vertical deflection: includes raised crosswalks, speed cushions, and speed humps

CONSIDERATIONS

+ Speed humps and raised crosswalks impact bicyclist comfort. The approach profile should preferably be sinusoidal or flat.
+ Where traffic calming must not slow an emergency vehicle, speed cushions or raised tables (crosswalks) should be considered. Speed cushions provide gaps spaced for an emergency vehicle's wheelbase to pass through without slowing.
+ Horizontal traffic calming treatments must be designed to deflect motor vehicle traffic without forcing the bicycle path of travel to be directed into a merging motorist.

GUIDANCE

Vertical traffic calming will not be necessary on all neighborhood greenways but should be considered on any road with the following characteristic:

+ Locations with measured or observed speeding issues, with 50th percentile of traffic exceeding 25mph.

Continuous devices, such as speed humps and raised crosswalks, are more effective to achieve slower speeds than speed cushions.

Horizontal traffic calming treatments can be appropriate along street segments or at intersections where width contributes to higher motor vehicle speeds. It can be particularly effective at locations where:

+ On-street parking is low-occupancy during most times of day.
+ There is desire to remove or decrease stop control at a minor intersection.

REFERENCES

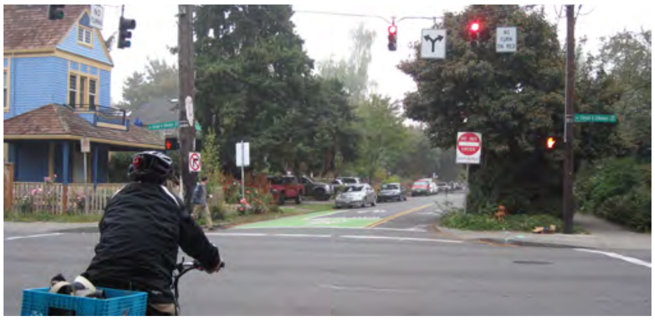
IPBI, Alta Planning + Design, Portland State University. Bicycle Boulevard Planning and Design Guidebook. 2009.

NACTO. Urban Bikeway Design Guide. 2nd Edition.

Portland Bureau of Transportation. Neighborhood Greenway Assessment Report. 2015.

BICYCLE BOULEVARD TREATMENTS: TRAFFIC DIVERSION

Traffic diversion strategies are used to reroute traffic from a neighborhood greenway onto other adjacent streets by installing design treatments that restrict motorized traffic from passing through.



Partial closure - permanent, signalized

Diagonal diverter

Partial closure - interim, stop-control

Full closure

CONSIDERATIONS

+ Diversion necessarily moves trips from the neighborhood greenway onto adjacent streets. This change in traffic volume on other local streets must be identified and addressed during the planning, design and evaluation process.
+ Other traffic calming tools should be explored for their effectiveness before implementing traffic diversion measures. In communities where the street network is not a traditional grid, the impacts of diversion to the larger street network will be greater, due to the inability of traffic to easily disperse and find alternate routes.
+ Temporary materials may be used to test diversion impacts before permanent, curbed diverters are installed.
+ Consultation with emergency services will be necessary to understand their routing needs.

GUIDANCE

+ Preferred motor vehicle volumes are in the range of 1,000 to 1,500 per day, while up to 3,000 automobiles is acceptable.
+ Diversion devices must be designed to provide a minimum clear width of 6 feet for a bicyclist to pass through.
+ Some treatments may require a separate pedestrian accommodation.

REFERENCES

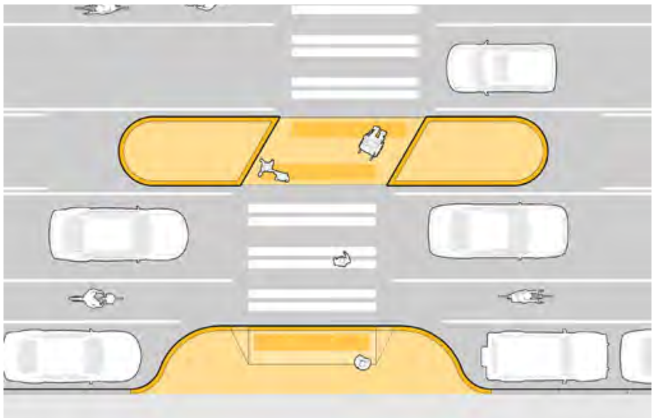
IPBI, Alta Planning + Design, Portland State University. Bicycle Boulevard Planning and Design Guidebook. 2009.

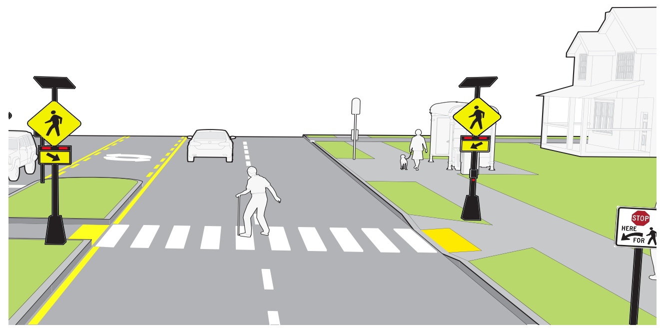
NACTO. Urban Bikeway Design Guide. 2nd Edition.

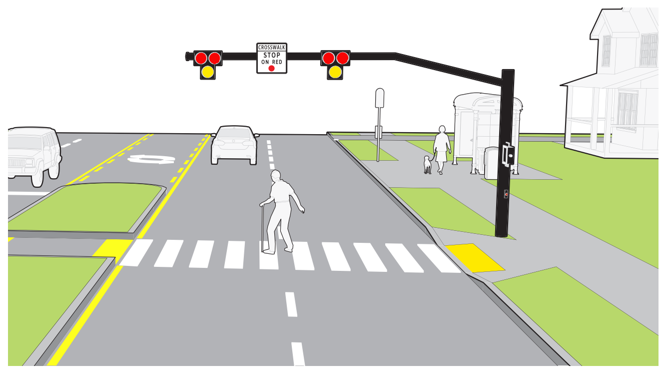
Portland Bureau of Transportation. Neighborhood Greenway Assessment Report. 2015.

BICYCLE BOULEVARD TREATMENTS: CROSSINGS

Bicycle Boulevards often utilize low-traffic, neighborhood streets. These streets may not have signalized arterial crossings. To increase safety and comfort when crossing arterials, several treatments may be used.







Crossing treatments include (clockwise from above): Median crossing islands, Rectangular Rapid Flashing Beacons (RRFBs), and High Intensity Activated Crosswalk Beacons (HAWKs).

CONSIDERATIONS

Crossing treatments are an important component of bicycle boulevards. Engineering judgment, along with the MUTCD and FHWA guides, should be used when selecting an appropriate treatment.

Crossing islands should be considered where crossing distances are greater than 50 feet. For long distances, islands can allow multi-stage crossings, which in turn allow shorter signal phases.

Rectangular Rapid Flashing Beacons (RRFBs) are considerably less expensive to install than mast-arm mounted signals. They can also be installed with solar-power panels to eliminate the need for a power source.

RRFBs should be limited to locations with critical safety concerns, and should not be installed in locations with sight distance constraints that limit the driver's ability to view pedestrians on the approach to the crosswalk.

GUIDANCE

+ Preferred Width of median islands: 10 feet (to accommodate bicyclists with trailers and wheelchair users)
+ Curb ramps with truncated dome detectable warnings and 5'x5' landing areas are required on a median island.
+ The design of RRFBs should be in accordance with FHWA's Interim Approval 11 (IA-11) for Optional Use of Rectangular Rapid Flashing Beacons issued July 16, 2008 and the Interpretation Letter 4(09)-41 (I) - Additional Flash Pattern for RRFBs issued July 25, 2014.
+ RRFBs can be used when a signal is not warranted at an unsignalized crossing. They are not appropriate at intersections with signals or STOP signs.
+ For HAWKS, the MUTCD provides suggested minimum volumes of 20 pedestrians or cyclists an hour for major arterial crossings (excess of 2,000 vehicles/hour). Pushbuttons should be "hot" (respond immediately), be placed in convenient locations for bicyclists, and abide by other ADA standards. Passive signal activation, such as video or infrared may also be considered.

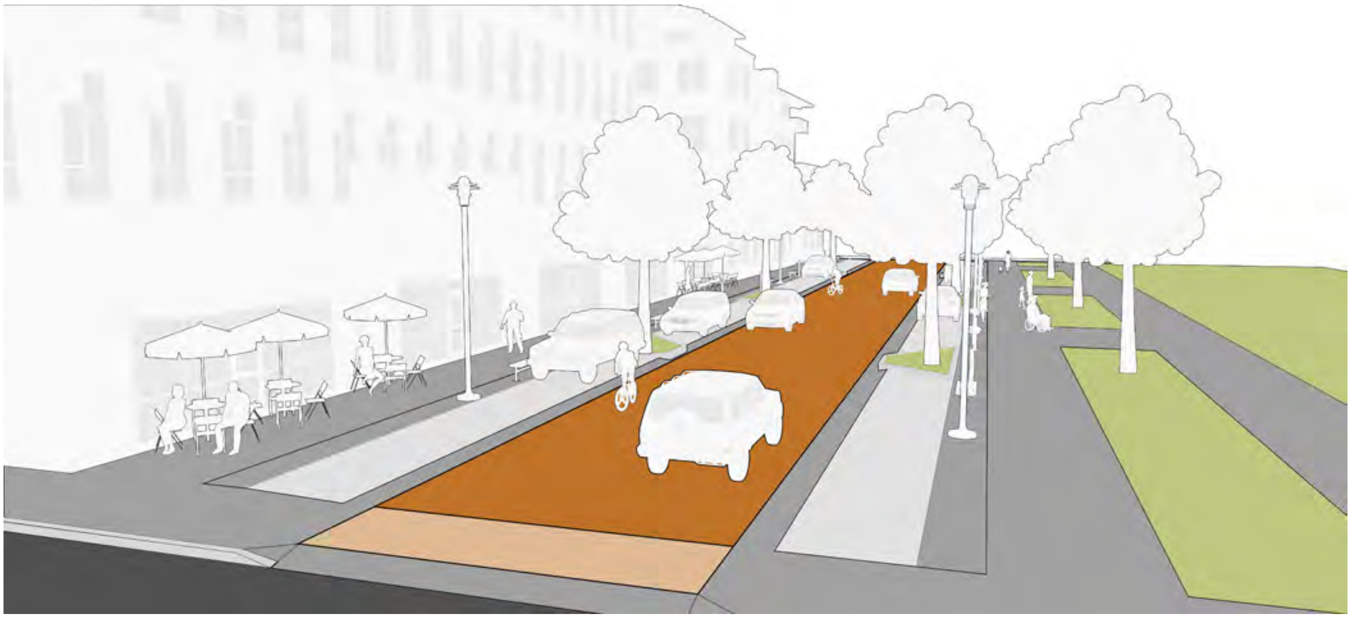
REFERENCES

NACTO Urban Street Design Guide (2013)

Manual on Uniform Traffic Control Devices (2009)

SHARED STREET $-$$$

Shared streets, also called flush streets or woonerfs, prioritize pedestrian and bicycle movement by slowing vehicular speeds and communicating clearly through design features that motorists must yield to all other users. Shared streets use various design elements to blur the boundary between pedestrian and motor vehicle space. The design should create conditions where pedestrians and bicyclists can walk or ride on the street and cross at any location, as opposed to at designated locations. This encourages cautious behavior on the part of all users, which in turn reinforces slower speeds and comfortable walking and bicycling conditions.



CONSIDERATIONS

+ Streets which serve primarily for local access and have high volumes of pedestrians may be well suited to shared street design implementation; alleys may unofficially provide these characteristics and make for good candidates.
+ Desiging shared streets without vertical curb allows for the street use to be flexible by time of day/year; a shared street may be closed to motor vehicles for festivals or other special events.
+ On streets without vertical curbing, special attention should be paid to stormwater design, to ensure that succifient slope is present to avoid ponding. Valley gutters may be used to convey surface water to collection points.
+ Material selection is important, as different materials can signal to pedestrians and motorists where conflicts may occur.

GUIDANCE

+ Shared streets should have less than 100 vehicles during the peak hour; in cases where this limit is exceeded, access restrictions should be considered
+ Intersections should be treated in the traditional manner, to highlight the change in environment to both pedestrians and motorists. Warning signs should be used, in addition to gateway treatments at the intersections.

REFERENCES

BICYCLE ROUTING / DESTINATION WAYFINDING $-$$

Wayfinding is a highly visible way to improve bicycling in an area because it helps identify the best routes to destinations, helps people overcome a barrier of not knowing where to ride, and reminds motorists to anticipate the presence of bicyclists. A wayfinding system typically combines signage and pavement markings to guide bicyclists along preferred routes to destinations across the community, county, or region. The routes may or may not be numbered, named, or color-coded. Signs may also indicate distances or travel time to destinations. Similar wayfinding systems can be devised for pedestrian travel.

D1-3c

D11-1

CONSIDERATIONS

A bicycle wayfinding protocol should coordinate with bicycle route maps and provide three general forms of guidance:

+ Decision assemblies, which consist of Bike Route identification and optional destination fingerboards, placed at decision points where routes intersect or on the approaches to a designated bike route.
+ Turn assemblies, which consist of Bike Route panels and arrow plaques, placed where a designated bike route turns from one street to another.
+ Confirmation assemblies, which consist of Bike Route panels and optional destination fingerboards, placed on the far side of intersections to confirm route choice and the distance (and optionally, time) to destinations.

Sign design can be customized to add distinct community branding, but the clarity and accuracy of the information must be the top priority.

GUIDANCE

+ Basic bicycle route signs consist of a MUTCD-style "Bike Route" sign (D11-1 shown above) placed every half mile on a major bike route and on the approach to major bike routes at decision points. Unique numbered routes can be designated and can incorporate a route name or agency logos.
+ Bike route signs can be supplemented with "fingerboard" panels showing destinations, directions, and distances (MUTCD D1 series).
+ Place directional signs on the near side of intersections and confirmation signs on the far side of intersections.

REFERENCES

NACTO Urban Bikeway Design Guide (2012)

Manual on Uniform Traffic Control Devices (2009)

CONFLICT AREA MARKING

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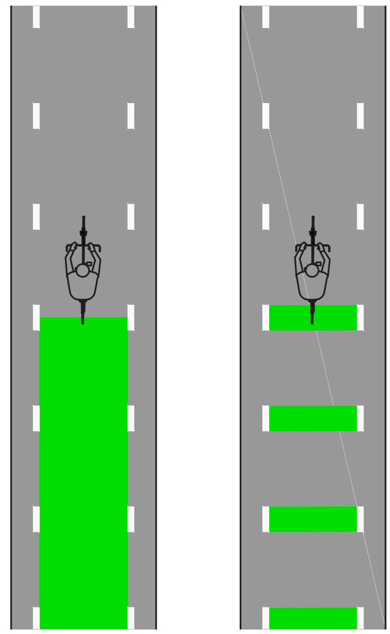
Intersection pavement markings designed to improve visibility, alert all roadway users of expected behaviors, and to reduce conflicts with turning vehicles.



Colored Conflict Area

Dotted Colored Conflict Area

CONSIDERATIONS

+ The level of emphasis and visibility: dashed lane lines may be sufficient for guiding bicyclists through intersections; however, consider providing enhanced markings with green pavement and/or symbols at complex intersections or at intersections with documented conflicts and safety concerns.
+ Symbol placement within intersections should consider vehicle wheel paths for maintenance.
+ Driveways with higher volumes may require additional pavement markings and signage.
+ Consideration should be given to using intersection pavement markings as spot treatments or standard intersection treatments. A corridor wide treatment can maintain consistency; however, spot treatments can be used to highlight conflict locations.

GUIDANCE

+ Dashed white lane lanes should conform to the latest edition of the MUTCD. These can be used through different types of intersections based on engineering judgment.
+ A variety of pavement marking symbols can enhance intersection treatments to guide bicyclists and warn of potential conflicts.
+ Green pavement markings can be used along the length of a corridor or in select conflict locations.

REFERENCES

AASHTO Guide for the Development of Bicycle Facilities (2012)

NACTO Urban Bikeway Design Guide (2012)

Manual on Uniform Traffic Control Devices (2009)

MIXING ZONES

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A mixing zone requires turning motorists to merge across a separated bike lane at a defined location in advance of an intersection. Unlike a standard bike lane, where a motorist can merge across at any point, a mixing zone design limits bicyclists' exposure to motor vehicles by defining a limited merge area for the turning motorist. Mixing zones are compatible only with one-way separated bike lanes.

CONSIDERATIONS

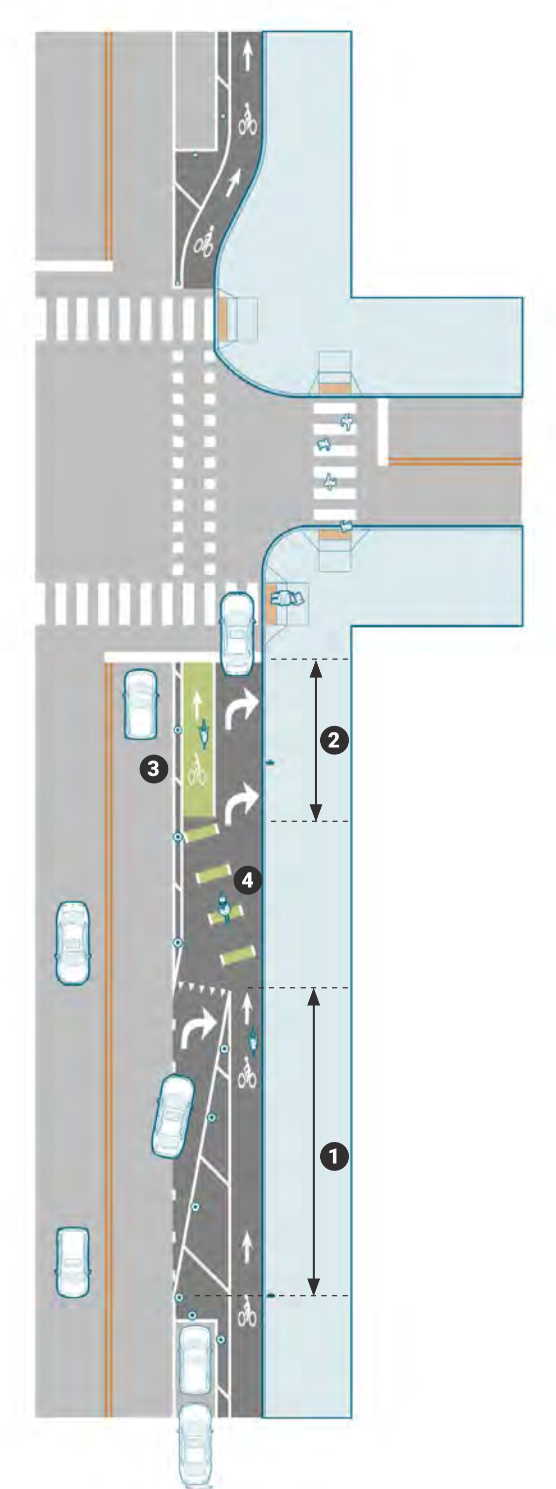
Protected intersections are preferable to mixing zones. Mixing zones are generally appropriate as an interim solution or in situations where severe right-of-way constraints make it infeasible to provide a protected intersection.

Mixing zones are only appropriate on street segments with one-way separated bike lanes. They are not appropriate for two-way separated bike lanes due to the contra-flow bicycle movement.

GUIDANCE

1. Locate merge points where the entering speeds of motor vehicles will be 20 mph or less by (a) minimizing the length of the merge area and (b) locating the merge point as close as practical to the intersection.
2. Minimize the lenth of the storage portion of the turn lane
3. Provide a buffer and physical separation (e.g. flexible delineator posts) from the adjacent through lane after the merge area, if feasible.
4. Highlight the conflict area with green surface coloring and dashed bike lane markings, as necessary, or shared lane markings placed on a green box.

+ Provide a BEGIN RIGHT (or LEFT) TURN LANE YIELD TO BIKES sign (R4-4) at the beginning of the merge area.
+ Restrict parking within the merge area
+ At locations where raised separated bike lanes approach the intersection, the bike lane should transition to street elevation at the point where parking terminates.
+ Where posted speeds are 35 mph or higher, or at locations where it is necessary to provide storage for queued vehicles, it may be necessary to provide a deceleration/storage lane in advance of the merge point.



REFERENCES

NACTO. *Urban Bikeway Design Guide. 2nd Edition.*

MassDOT. Separated Bike Lane Planning and Design Guide. 2015.

FHWA. Separated Bike Lane Planning and Design Guide. 2015.

SHARED BIKE/TURN LANES

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A shared bike/turn lane is similar to a mixing zone, but is used where a standard bike lane is present. This treatment mintains bicyclist priority in a situation where a bike lane may otherwise not exist and reduces motor vehicle turning speed and risk of "right hook" collisions at intersections.

CONSIDERATIONS

+ May not be appropriate at intersections with very high peak automobile turn demand.
+ Some form of bicycle marking should be used to clarify bicyclist positioning to the left of turning cars.

GUIDANCE

+ Width of the combined lane should be 9 feet minimum, 13 fet maximum.
+ Include BEGIN RIGHT TURN LANE YEILD TO BIKES (MUTCD R4-4) at the end of parking restrictions.

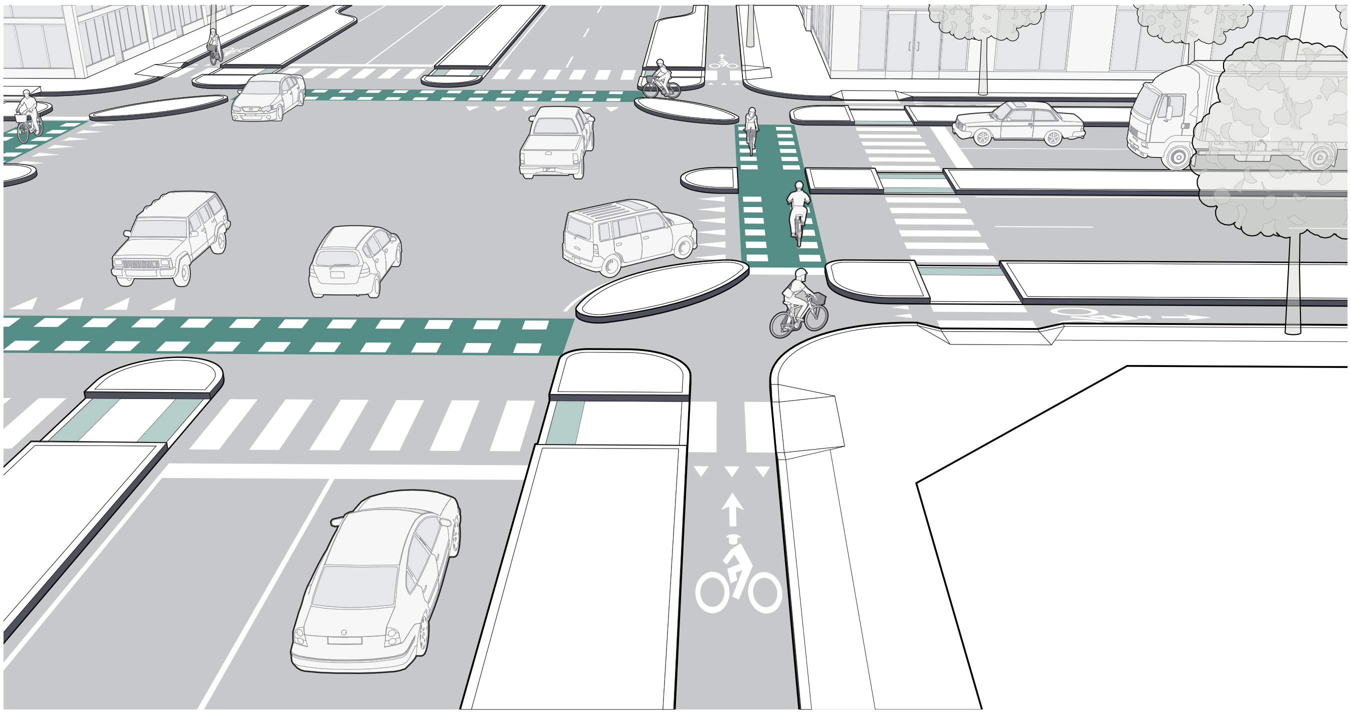
REFERENCES

NACTO Urban Bikeway Design Guide

FHWA Separated Bike Lane Planning and Design Guide (2015)

SEPARATED BIKE LANES AT INTERSECTIONS $$

Separated bicycle lanes provide an exclusive travel way for bicyclists alongside roadways that is separate from motor vehicle travel lanes, parking lanes, and sidewalks. Separated bike lane designs at intersections should manage conflicts with turning vehicles and increase visibility for all users.



CONSIDERATIONS

Separated bicycle lane designs at intersections should give consideration to signal operation and phasing in order to manage conflicts between turning vehicles and bicyclists. Bicycle signal heads should be considered to separate conflicts.

Shared lane markings and/or colored pavement can supplement short dashed lines to demark the protected bike lane through intersections, where engineering judgment deems appropriate.

At non-signalized intersections, design treatments to increase visibility and safety include:

+ Warning signs
+ Raised intersections
+ Special pavement markings (including colored surface treatment)
+ Removal of parking prior to the intersection

GUIDANCE

+ It is preferable to maintain the separation of the bike lane through the intersection rather than introduce the bicyclist into the street with a merge lane. Where this is not possible, see guidance on Mixing Zones.
+ Increasing visibility and awareness are two key design goals for separated bike lanes at intersections. In some cases, parking restrictions between 20' to 40' are needed to ensure the visibility of bicyclists at intersections.
+ Separated bike lanes should typically be routed behind transit stops (i.e., the transit stop should be between the bike lane and motor vehicle travel lanes). If this is not feasible, the seperated bike lane should be designed to include treatments such as signage and pavement markings to alert the bicyclist to stop for buses and pedestrians accessing transit stops.
+ Markings and signage should be used at intersections to give priority to separated bicycle lanes.

REFERENCES

Bicycle Facilities and the Manual on Uniform Traffic Control Devices

NACTO Urban Bikeway Design Guide

FHWA Separated Bike Lane Planning and Design Guide (2015)

BIKE BOXES

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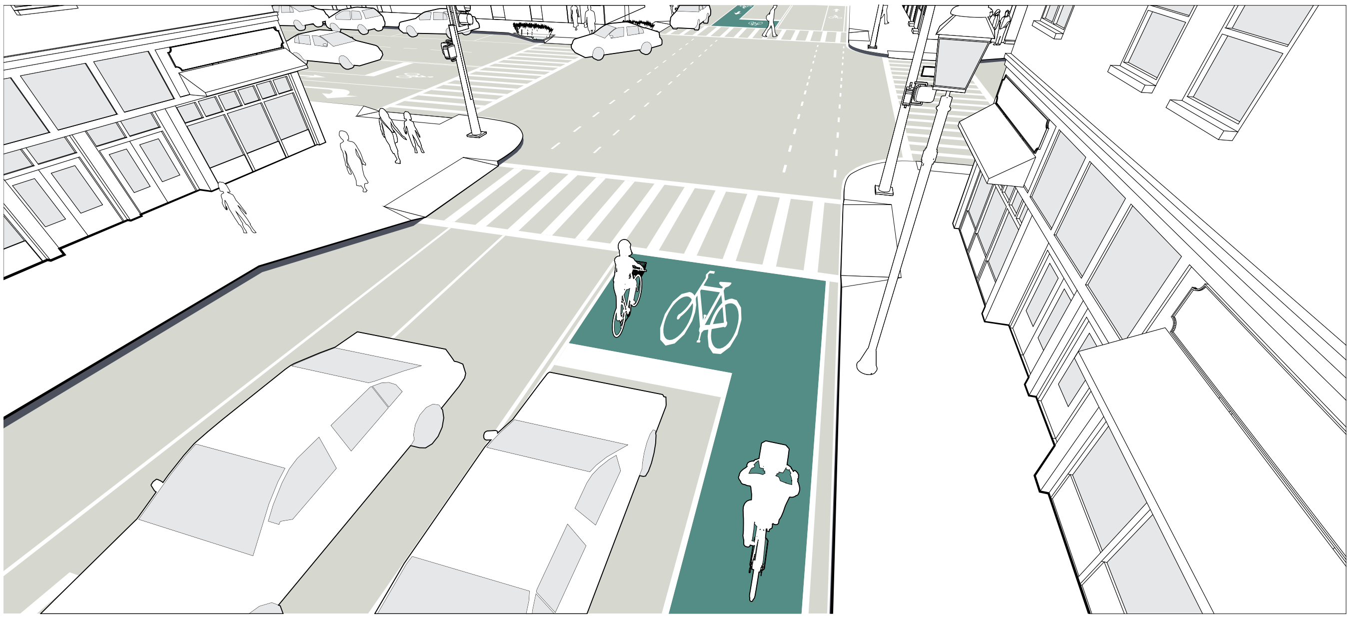
A bicycle box provides dedicated space between the crosswalk and vehicle stop line where bicyclists can wait during the red light at signalized intersections. The bicycle box allows a bicyclist to take a position in front of motor vehicles at the intersection, which improves visibility and motorist awareness, and allows bicyclists to "claim the lane" if desired. Bike boxes aid bicyclists in making turning maneuvers at the intersection, and provide more queuing space for multiple bicyclists than that provided by a typical bicycle lane.



CONSIDERATIONS

+ Bicycle boxes are typically painted green and are a minimum of 10 feet in depth.
+ Bicycle box design should be supplemented with appropriate signage according to latest version of the MUTCD.
+ Bicycle box design should include appropriate adjustement in determining the minimum green time.
+ Where right turn lanes for motor vehicles exist, bicycle lanes should be designed to the left of the turn lane. If right turns on red are permitted, consider ending the bicycle box at the edge of the bicycle lane to allow motor vehicles to make this turning movement.

GUIDANCE

+ In locations with high volumes of turning movements by bicyclists, a bicycle box should be used to allow bicyclists to shift towards the desired side of the travel way. Depending on the position of the bicycle lane, bicyclists can shift sides of the street to align themselves with vehicles making the same movement through the intersection.
+ In locations where motor vehicles can continue straight or cross through a right-side bicycle lane while turning right, the bicycle box allows bicyclists to move to the front of the traffic queue and make their movement first, minimizing conflicts with the turning. When a bicycle box is implemented in front of a vehicle lane that previously allowed right turns on red, the right turn on red movement must be restricted using signage and enforcement following installation of the bike box.

REFERENCES

NACTO Urban Bikeway Design Guide - Bike Boxes

FHWA Separated Bike Lane Planning and Design Guide (2015)

MassDOT Separated Bike Lane Planning & Design Guide (2016)

TWO-STAGE TURN QUEUE BOX

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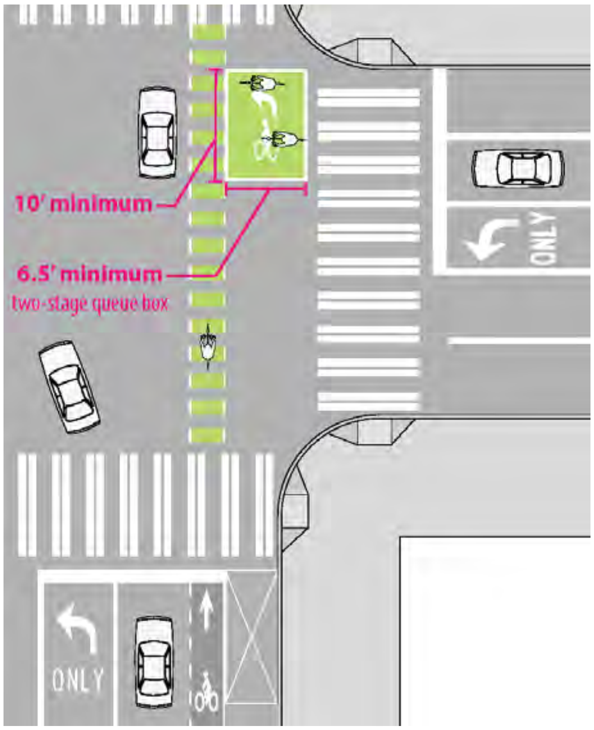
A two-stage turn queue box should be considered where separated bike lanes are continued up to an intersection and a protected intersection is not provided. The two-stage turn queue box designates a space for bicyclists to wait while performing a two-stage turn across a street at a location outside the path of traffic.



CONSIDERATIONS

The use of a two-stage turn queue box requires FHWA permission to experiment.

+ Two-stage turn queue box dimensions will vary based on the street operating conditions, the presence or absence of a parking lane, traffic volumes and speeds, and available street space. The turn box may be placed in a variety of locations including in front of the pedestrian crossing (the crosswalk location may need to be adjusted), in a 'jug-handle' configuration within a sidewalk, or at the tail end of a parking lane or a median island.
+ Dashed bike lane extension markings may be used to indicate the path of travel across the intersection.

GUIDANCE

+ A minimum width of 10 feet is recommended.
+ A minimum depth of 6.5 feet is recommended.
+ NO TURN ON RED (R10-11) restrictions should be used to prevent vehicles from entering the queuing area.
+ The use of a supplemental sign instructing bicyclists how to use the box is (above) optional and requires an experiment request in CA.
+ The box should consist of a green box outlined with solid white lines supplemented with a bicycle symbol and a turn arrow to emphasize the crossing direction.

REFERENCES

NACTO. *Urban Bikeway Design Guide. 2nd Edition.*

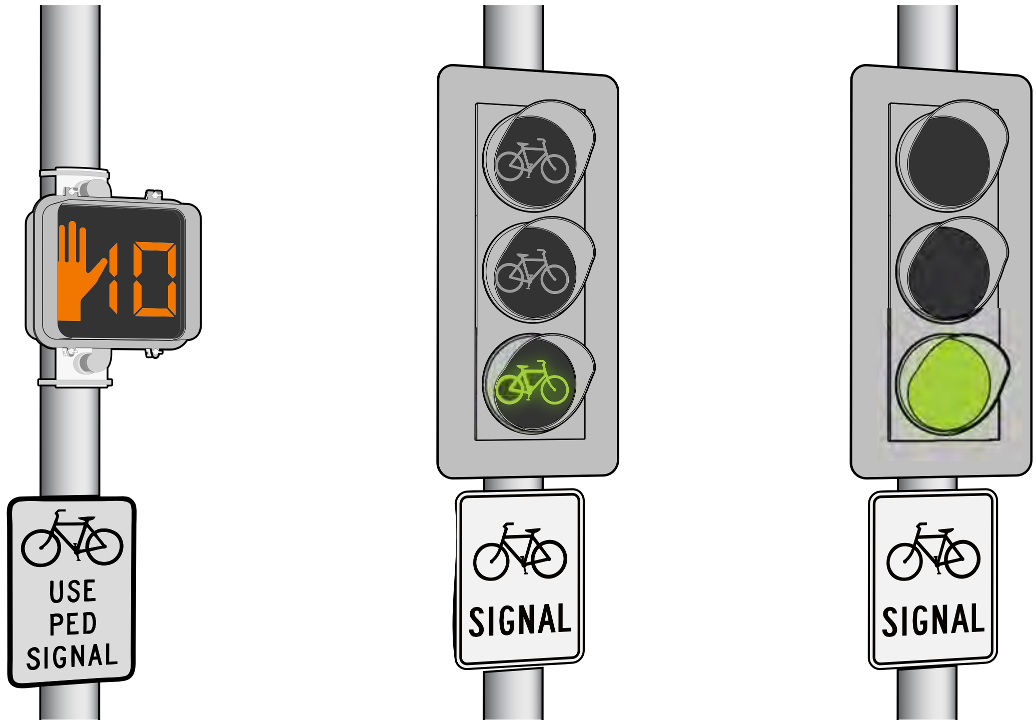
MassDOT. Separated Bike Lane Planning and Design Guide. 2015.

FHWA. Separated Bike Lane Planning and Design Guide. 2015.

FHWA. Bicycle Facilities and the Manual on Uniform Traffic Control Devices - Two-Stage Turn Box. 2015.

BICYCLE SIGNALS, DETECTION, ACTUATION $$

Bicyclists have unique needs at signalized intersections. Bicycle movements may be controlled by the same indications that control motor vehicle movements, by pedestrian signals, or by bicycle-specific traffic signals. The introduction of separated bike lanes creates situations that may require leading or protected phases for bicycle traffic, or place bicyclists outside the cone of vision of existing signal equipment. In these situations, provision of signals for bicycle traffic will be required.



CONSIDERATIONS

+ Bicycle-specific signals may be appropriate to provide additional guidance or separate phasing for bicyclists per the 2012 AASHTO Guide for the Development of Bicycle Facilities.
+ It may be desirable to install advanced bicycle detection on the intersection approach to extend the phase, or to prompt the phase and allow for continuous bicycle through movements.
+ Video detection, microwave and infrared detection can be an alternate to loop detectors.
+ Another strategy in signal timing is coordinating signals to provide a "green wave", such that bicycles will receive a green indication and not be required to stop. Several cities including Portland, OR and San Francisco, CA have implemented "green waves" for bicycles.

GUIDANCE

+ A stationary, or "standing", cyclist entering the intersection at the beginning of the green indication can typically be accommodated by increasing the minimum green time on an approach per the 2012 AASHTO Guide for the Development of Bicycle Facilities.
+ A moving, or "rolling", bicyclist approaching the intersection towards the end of the phase can typically be accommodated by increases to the red times (change and clearance intervals) per the 2012 AASHTO Guide for the Development of Bicycle Facilities.
+ Set loop detectors to the highest sensitivity level possible without detecting vehicles in adjacent lanes and field check. Type D and type Q loops are preferred.
+ Install bicycle detector pavement markings and signs per the MUTCD, 2012 AASHTO Guide for the Development of Bicycle Facilities, and the NACTO Urban Bikeway Design Guide.

REFERENCES

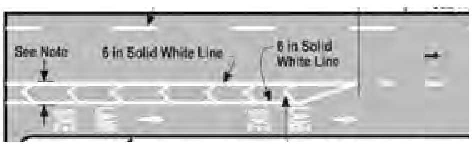
AASHTO Guide for the Development of Bicycle Facilities (2012)

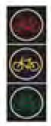
NACTO Urban Bikeway Design Guide (2012)

Manual on Uniform Traffic Control Devices (2009)

MUTCD STATUS

Several common traffic control devices that are used with protected bike lanes are under experimentation or not explicitly covered in the MUTCD. The following chart shows the current status of these devices.

ITEM	FHWA MUTCD	Approved by NCUTCD	CA MUTCD	Interim Approval Granted	Under Current Experiment with FHWA/ CA	Requires Experiment Request in CA
Extended Bicycle Lanes through Intersections 	✓		✓			
Buffer-Separated Bicycle Lanes 	✓		✓			
Bicycle Lanes on the Left-Hand Side of One-Way Streets 	✓		✓			
Shared-lane markings in exclusive turn lanes 	✓					
EXCEPT Bicycle Plaque (R118(CA)) 		✓	✓			
Green Colored Bike Lanes 			✓	✓		
Solid Green Colored Bike Lanes Through Intersections and Conflict Areas 			✓	✓		

ITEM	FHWA MUTCD	Approved by NCUTCD	CA MUTCD	Interim Approval Granted	Under Current Experiment with FHWA/ CA	Requires Experiment Request in CA
Dotted Green Colored Bike Lanes Through 			✓	✓		
Bike Signal Faces for Protected Phases 		✓	✓	✓		
Shared-lane with green pavement background 		✓		✓	✓	
Bicycle Box 		✓		✓	✓	✓ (This may change as FHWA granted approval (IA-18) on 10/12/2016
Two-Stage Turn Box 		✓			✓	✓
Left Turn Queue Box Sign 						✓
Flashing Yellow Arrow for Permissive Bike Signal Conflicts 					✓	✓
Merging Vehicles Yield to Bikes Sign 						✓
Actuated Turning Traffic Yield to Bike Sign  *Photo Credit: bikeportland.org*						✓
Turning Vehicles Yield to Bikes Sign R10-15a and R10-15b 						✓

Appendix 6.1 Across Barrier Connections

Major barriers to bicycling are found throughout Santa Clara County. “Across Barrier Connections” or ABCs can be thought of as “problem spots” where improvements are needed to close gaps where the bicycle network crosses barriers. The Countywide Bicycle Plan inventories ABCs at three major barriers: freeways, waterways, and railroad tracks.

ABCs are sorted into three categories:

- Category 1: Inadequate Roadway Crossings
- Category 2: Unfriendly Freeway Interchanges
- Category 3: Large Distance between Existing Crossings of Major Barriers

ABCs are described and listed below.

Category 1 ABCs: Inadequate Roadway Crossings

Category 1 ABCs are locations where a road already crosses a barrier, but there is no bicycle lane and the shoulder is less than four feet wide.

Category 1 ABCs: Inadequate Roadway Crossings - By Jurisdiction

Includes ABCs that have been addressed since 2008. These are noted as “Completed.”

#	Jurisdiction	Barrier	Crossing	Status	Planning Cost ($ M)	Priority Status
BP9	Campbell	Los Gatos Creek	Creekside Way	Unplanned	10	
BP2	Campbell	SR 17	Campbell Ave	Completed		
BP5	Campbell	UPRR	Civic Center Dr	Unplanned	0.5	
BP6	Campbell	UPRR	Orchard City Dr	Unplanned	0.5	
BP3	Campbell	UPRR	Kennedy Ave	Planned (no funding)	0.5	
BP7	Campbell	UPRR	Camden Ave	Unplanned	0.5	

Category 1 ABCs: Inadequate Roadway Crossings - By Jurisdiction

Includes ABCs that have been addressed since 2008. These are noted as "Completed."

#	Jurisdiction	Barrier	Crossing	Status	Planning Cost ($ M)	Priority Status
BP8	Campbell	UPRR	Hacienda Ave	Unplanned	0.5	
BP17	County	Llagas Creek	Masten	Unplanned	10	
BP15	County	Uvas Creek	Uvas Road	Unplanned	10	
BP11	County	Uvas Creek	Watsonville Rd	Completed		
BP12	County	Uvas Creek	Hecker Pass Hwy	Completed		
BP18	County	Uvas Creek	Luchessa	Planned (no funding)	10	
BP16	County	Uvas Creek	Bloomfield	Planned (no funding)	10	
BP21	County/ Santa Clara	San Tomas Aquino Creek	San Tomas Expressway	Completed		
BP26	Cupertino	UPRR	Seven Springs	Unplanned	0.5	
BP31	Gilroy	Caltrain	Buena Vista Ave	Planned (no funding)	0.5	
BP32	Gilroy	Caltrain	Cohansey	Planned (no funding)	0.5	
BP28	Gilroy	Caltrain	Las Animas Ave	Planned (no funding)	0.5	
BP33	Gilroy	Caltrain	Luchessa Ave	Planned (no funding)	0.5	
BP34	Gilroy	US 101	Monterey Rd	Planned (no funding)	10	
BP37	Los Altos	Hale Creek	Rosita	Unplanned	10	
BP36	Los Altos	Hale Creek	Fremont Ave	Unplanned	10	
BP35	Los Altos	Permanente Creek	Fremont Ave	Completed		
BP41	Los Gatos	Los Gatos Creek	Lark	Completed		
BP261	Los Gatos	Los Gatos Creek	Los Gatos/Saratoga Rd	Completed		

Category 1 ABCs: Inadequate Roadway Crossings - By Jurisdiction

Includes ABCs that have been addressed since 2008. These are noted as "Completed."

#	Jurisdiction	Barrier	Crossing	Status	Planning Cost ($ M)	Priority Status
BP44	Los Gatos	SR 85	Oka Rd	Unplanned	10	
BP49	Milpitas	Berryessa Creek	N. Hill View Dr	Unplanned	10	
BP53	Milpitas	Berryessa Creek	Yosemite	Completed		
BP51	Milpitas	Calera Creek	Arizona Ave	Planned (no funding)	10	
BP52	Milpitas	Lower Penintentia Creek	Marylinn	Planned (no funding)	10	
BP64	Milpitas	Lower Penitentia Creek	Calaveras	Unplanned	10	
BP65	Milpitas	Lower Penitentia Creek	Corning	Unplanned	10	
BP66	Milpitas	Lower Penitentia Creek	Sylvia	Unplanned	10	
BP185	Milpitas	Lower Penitentia Creek	Montague Expwy	Unplanned	10	
BP243	Milpitas	Penitencia Creek	California Circle	Unplanned	10	
BP244	Milpitas	Penitencia Creek	South Main Street	Completed		
BP54	Milpitas	SR 237	McCarthy Blvd	Planned (no funding)	10	
BP63	Milpitas	Tularcitos Creek	Tramway	Unplanned	10	
BP50	Milpitas	UPRR	Calaveras Blvd	Planned (no funding)	0.5	
BP61	Milpitas	UPRR	Curtis Ave	Unplanned	0.5	
BP48	Milpitas	UPRR	Great Mall Dr	In progress (some funding)	0.5	
BP45	Milpitas	Wrigley Ford Creek	Calaveras	Unplanned	10	

Category 1 ABCs: Inadequate Roadway Crossings - By Jurisdiction

Includes ABCs that have been addressed since 2008. These are noted as "Completed."

#	Jurisdiction	Barrier	Crossing	Status	Planning Cost ($ M)	Priority Status
BP67	Milpitas/ San Jose	UPRR	Montague Expy	Unplanned	0.5	
BP240	Morgan Hill	Caltrain	Tilton	Unplanned	0.5	
BP68	Morgan Hill	Caltrain	San Pedro Ave	Unplanned	0.5	
BP69	Morgan Hill	Caltrain	Middle Ave	Unplanned	0.5	
BP241	Morgan Hill	Little Llagas Creek	La Crosse Dr	Completed		
BP70	Morgan Hill	Little Llagas Creek	Cosmo	Unplanned	10	
BP71	Morgan Hill	Little Llagas Creek	Spring	Unplanned	10	
BP87	Palo Alto	Adobe Creek	Alma	Unplanned	10	
BP81	Palo Alto	Adobe Creek	El Camino Real	Planned (no funding)	10	
BP82	Palo Alto	Caltrain	University Ave	Planned (no funding)	0.5	
BP85	Palo Alto	Caltrain	Embarcadero	In progress (some funding)	0.5	
BP86	Palo Alto	Caltrain	Oregon Expy	Unplanned	0.5	
BP84	Palo Alto	Caltrain	Everett Ave	Planned (no funding)	0.5	
BP88	Palo Alto	Matadero Creek	Alma	In progress (some funding)	10	
BP260	Palo Alto	Matadero Creek	Matadero Ave	Completed		
BP78	Palo Alto	San Francisquito Creek	East Bayshore	In progress (some funding)	10	
BP89	Palo Alto	San Francisquito Creek	West Bayshore	Planned (no funding)	10	

Category 1 ABCs: Inadequate Roadway Crossings - By Jurisdiction

Includes ABCs that have been addressed since 2008. These are noted as “Completed.”

#	Jurisdiction	Barrier	Crossing	Status	Planning Cost ($ M)	Priority Status
BP80	Palo Alto	San Francisquito Creek	El Camino Real	Planned (no funding)	10	
BP98	San Jose	Berryessa Creek	Cropley	Planned (no funding)	10	
BP134	San Jose	Berryessa Creek	Morrill	Completed		
BP90	San Jose	Caltrain	Blossom Hill Rd	Unplanned	0.5	
BP178	San Jose	Caltrain	Live Oak Ave	Unplanned	0.5	
BP132	San Jose	Coyote Creek	Charcot	Completed		
BP97	San Jose	Coyote Creek	Julian St	Planned (no funding)	10	
BP92	San Jose	Coyote Creek	Santa Clara St	Planned (no funding)	10	
BP186	San Jose	Coyote Creek	San Antonio St	Unplanned	10	
BP135	San Jose	Coyote Creek	Williams	Completed		
BP111	San Jose	Guadalupe River	Willow Glen Way	In progress (some funding)	10	
BP187	San Jose	Guadalupe River	Malone Rd	In progress (some funding)	10	
BP133	San Jose	Guadalupe River	Curtner Ave	Completed		
BP151	San Jose	Guadalupe River	Foxworthy Ave	Unplanned	10	
BP182	San Jose	I-280	Macarthur Ave	Unplanned	10	
BP160	San Jose	I-280	Bascom Ave	In progress (some funding)	10	
BP150	San Jose	I-280	Leland Ave	Planned (no funding)	10	
BP141	San Jose	I-280	Leigh Ave	Planned (no funding)	10	

Category 1 ABCs: Inadequate Roadway Crossings - By Jurisdiction

Includes ABCs that have been addressed since 2008. These are noted as "Completed."

#	Jurisdiction	Barrier	Crossing	Status	Planning Cost ($ M)	Priority Status
BP99	San Jose	I-280	Race St	Planned (no funding)	10	
BP125	San Jose	I-280	Lincoln Ave	Completed		
BP100	San Jose	I-280	Vine St	Planned (no funding)	10	
BP183	San Jose	I-280	Almaden Ave	Unplanned	10	
BP129	San Jose	I-280	Second St	Completed		
BP118	San Jose	I-280	Third St	Completed		
BP107	San Jose	I-680	Cropley	Planned (no funding)	10	
BP122	San Jose	I-680	Jackson St	Completed		
BP142	San Jose	I-880	Fourth St	Planned (no funding)	10	
BP123	San Jose	I-880	Park Ave	Completed		
BP189	San Jose	I-880	Hedding St/ Pruneridge Ave	Planned (no funding)	10	
BP181	San Jose	I-880	Forest Ave	Unplanned	10	
BP121	San Jose	Los Gatos Creek	Park	Completed		
BP176	San Jose	Los Gatos Creek	San Carlos	Unplanned	10	
BP126	San Jose	Los Gatos Creek	Lincoln	Completed		
BP177	San Jose	Los Gatos Creek	Leigh	Unplanned	10	
BP114	San Jose	Los Gatos Creek	Bascom	In progress (some funding)	10	
BP115	San Jose	Lower Penitentia Creek	S. Abel St	Completed		
BP127	San Jose	SR 17	Moorpark Ave	Completed		

Category 1 ABCs: Inadequate Roadway Crossings - By Jurisdiction

Includes ABCs that have been addressed since 2008. These are noted as "Completed."

#	Jurisdiction	Barrier	Crossing	Status	Planning Cost ($ M)	Priority Status
BP179	San Jose	SR 85	Meridian Ave	Unplanned	10	
BP110	San Jose	SR 85	Winfield Blvd	Planned (no funding)	10	
BP131	San Jose	SR 85	Snell Ave	Completed		
BP180	San Jose	SR 85	Lean Ave	Unplanned	10	
BP130	San Jose	SR 85	Via Del Oro	Completed		
BP94	San Jose	SR 87	Airport Parkway	Planned (no funding)	10	
BP119	San Jose	SR 87	Hedding St	Completed		
BP148	San Jose	SR 87	Almaden Blvd	Planned (no funding)	10	
BP124	San Jose	SR 87	Santa Clara St	Completed		
BP116	San Jose	SR 87	San Fernando St	Completed		
BP106	San Jose	SR 87	San Carlos St	Planned (no funding)	10	
BP104	San Jose	SR 87	Virginia St	Unplanned	10	
BP103	San Jose	SR 87	Alma Ave	Planned (no funding)	10	
BP105	San Jose	SR 87	Almaden Rd	Planned (no funding)	10	
BP172	San Jose	SR 87	Mill Pond Dr	Unplanned	10	
BP191	San Jose	SR 87	Carol Dr	Unplanned	10	
BP93	San Jose	SR 87	Hillsdale Ave	Planned (no funding)	10	
BP120	San Jose	SR 87	Branham Ln	Completed		
BP128	San Jose	SR 87	Chynoweth Ave	Completed		
BP117	San Jose	US 101	San Antonio St	Completed		

Category 1 ABCs: Inadequate Roadway Crossings - By Jurisdiction

Includes ABCs that have been addressed since 2008. These are noted as "Completed."

#	Jurisdiction	Barrier	Crossing	Status	Planning Cost ($ M)	Priority Status
BP95	San Jose	US 101	Coyote Rd	Unplanned	10	
BP210	Santa Clara	Calabazas Creek	Mountain View-Alviso Road	Unplanned	10	
BP201	Santa Clara	Calabazas Creek	Tasman	In progress (some funding)	10	
BP211	Santa Clara	Calabazas Creek	Machado Ave	Unplanned	10	
BP204	Santa Clara	Calabazas Creek	El Camino Real	Unplanned	10	
BP208	Santa Clara	Calabazas Creek	Benton	Unplanned	10	
BP202	Santa Clara	Calabazas Creek	Pruneridge	Completed		
BP205	Santa Clara	Caltrain	De La Cruz/El Camino Real/Lewis St	Unplanned	0.5	
BP200	Santa Clara	San Tomas Aquino Creek	Walsh	Unplanned	10	
BP207	Santa Clara	San Tomas Aquino Creek	Monroe	Planned (no funding)	10	
BP258	Santa Clara	San Tomas Aquino Creek	Tasman	Completed		
BP259	Santa Clara	San Tomas Aquino Creek	Scott Blvd	Completed		
BP203	Santa Clara	Saratoga Creek	Cabrillo	Completed		
BP209	Santa Clara	US 101	Lafayette St	Unplanned	10	
BP212	Santa Clara/ County	San Tomas Aquino Creek	Central Expressway	Completed		
BP215	Saratoga	Saratoga Creek	Via Monte	Unplanned	10	
BP216	Saratoga	Saratoga Creek	Scotland	Unplanned	10	

Category 1 ABCs: Inadequate Roadway Crossings - By Jurisdiction

Includes ABCs that have been addressed since 2008. These are noted as "Completed."

#	Jurisdiction	Barrier	Crossing	Status	Planning Cost ($ M)	Priority Status
BP217	Saratoga	Saratoga Creek	Crestbrook	Unplanned	10	
BP218	Saratoga/ Cupertino	UPRR	Prospect Rd	Planned (no funding)	0.5	
BP222	SC County	Caltrain	Palm Ave	Unplanned	0.5	
BP219	SC County	Caltrain	San Martin Station	Planned (no funding)	0.5	
BP221	SC County	Caltrain	Church St	Planned (no funding)	0.5	
BP220	SC County	Caltrain	Masten Ave	Planned (no funding)	0.5	
BP223	SC County	Caltrain	Rucker Ave	Unplanned	0.5	
BP225	Sunnyvale	Calabazas Creek	Lochinvar	Unplanned	10	
BP231	Sunnyvale	Caltrain	Mary Ave	Planned (no funding)	0.5	
BP239	Sunnyvale	Caltrain	Mathilda	Completed		
BP227	Sunnyvale	Caltrain	Sunnyvale Ave	In progress (some funding)	60	Priority
BP228	Sunnyvale	SR 237	Fair Oaks/Java Dr	Planned (no funding)	10	

Category 2 ABCs: Unfriendly Freeway Interchanges

Category 2 ABCs are locations where a freeway interchange has free on/off ramps, no bicycle lane or shoulder through the interchange, or both.

Category 2 ABCs: Unfriendly Freeway Interchanges - By Jurisdiction

Includes ABCs that have been addressed since 2008. These are noted as "Completed."

No.	Jurisdiction	Barrier	Crossing	Status	Planning Cost ($ M)	Priority Status
BP4	Campbell	SR 17	Hamilton	Planned (no funding)	0.5	
BP10	Campbell/County	SR 17	San Tomas Expressway/ Camden	In progress (some funding)	0.5	
BP14	County	US 101	San Martin	Planned (no funding)	0.5	
BP13	County	US 101	Masten	Unplanned	0.5	
BP19	County/Cupertino	I-280	Foothill Expy	Planned (no funding)	0.5	Priority
BP20	County/Palo Alto/Los Altos Hills	I-280	Page Mill Expy	In progress (some funding)	0.5	Priority
BP25	Cupertino	I-280	Wolfe	In progress (some funding)	Addressed by 280/Wolfe Interchange project	
BP27	Cupertino/Mountain View/Sunnyvale	SR 85	Homestead	Planned (no funding)	0.5	Priority
BP30	Gilroy	US 101	Tenth	Planned (no funding)	0.5	
BP29	Gilroy	US 101	Leavesley	Planned (no funding)	0.5	
BP39	Los Altos Hills	I-280	El Monte	Unplanned	0.5	
BP38	Los Altos Hills	I-280	Magdalena	Unplanned	0.5	
BP42	Los Gatos	SR 17	Lark	Planned (no funding)	0.5	
BP43	Los Gatos	SR 17	Highway 9	Planned (no funding)	0.5	
BP57	Milpitas	I-680	Jacklin	Planned (no funding)	0.5	

Category 2 ABCs: Unfriendly Freeway Interchanges - By Jurisdiction

Includes ABCs that have been addressed since 2008. These are noted as "Completed."

No.	Jurisdiction	Barrier	Crossing	Status	Planning Cost ($ M)	Priority Status
BP56	Milpitas	I-680	SR 237/ Calaveras	Planned (no funding)	0.5	
BP55	Milpitas	I-680	Landess/Montague Expy	Planned (no funding)	0.5	Priority
BP46	Milpitas	I-880	Dixon Landing	Unplanned	0.5	
BP62	Milpitas	I-880	SR 237/Calaveras	Unplanned	0.5	
BP60	Milpitas	I-880	Tasman/Great Mall Parkway	Planned (no funding)	0.5	
BP235	Morgan Hill	US 101	Cochrane Rd	Planned (no funding)	0.5	
BP236	Morgan Hill	US 101	Dunne Ave	Unplanned	0.5	
BP237	Morgan Hill	US 101	Tennant Ave	Completed		
BP72	Mountain View	SR 85	Moffett	Planned (no funding)	0.5	
BP76	Mountain View	SR 85	El Camino Real	Planned (no funding)	0.5	Priority
BP75	Mountain View	US 101	Rengstorff/ Amphitheatre	Planned (no funding)	0.5	Priority
BP74	Mountain View	US 101	Shoreline	In progress (some funding)	0.5	
BP73	Mountain View	US 101	Ellis	Planned (no funding)	0.5	
BP77	Mountain View/Palo Alto	US 101	San Antonio	In progress (some funding)	Addressed by 101/Rengstorff San Antonio Interchange project.	
BP83	Palo Alto	US 101	Embarcadero	Planned (no funding)	0.5	
BP163	San Jose	I-280	Saratoga	Planned (no funding)	0.5	

Category 2 ABCs: Unfriendly Freeway Interchanges - By Jurisdiction

Includes ABCs that have been addressed since 2008. These are noted as "Completed."

No.	Jurisdiction	Barrier	Crossing	Status	Planning Cost ($ M)	Priority Status
BP166	San Jose	I-280	Winchester	In progress (some funding)	Addressed by 280/Winchester interchange project.	
BP190	San Jose	I-280	Meridian	Planned (no funding)	0.5	
BP145	San Jose	I-280	Bird	Planned (no funding)	0.5	
BP149	San Jose	I-280	First/Monterey	Planned (no funding)	0.5	
BP138	San Jose	I-280	Tenth	Completed		
BP139	San Jose	I-280	Eleventh	Completed		
BP158	San Jose	I-680	N. Capitol Avenue	Planned (no funding)	0.5	Priority
BP159	San Jose	I-680	Hostetter	Planned (no funding)	0.5	Priority
BP157	San Jose	I-680	Berryessa	Planned (no funding)	0.5	Priority
BP165	San Jose	I-680	McKee	Planned (no funding)	0.5	Priority
BP144	San Jose	I-680	King	Planned (no funding)	0.5	Priority
BP188	San Jose	I-680	Alum Rock	Planned (no funding)	0.5	
BP137	San Jose	I-880	Brokaw	Completed		
BP143	San Jose	I-880	Montague Expy	Planned (no funding)	0.5	
BP108	San Jose	I-880	Old Bayshore Highway	Planned (no funding)	0.5	
BP101	San Jose	I-880	First	Planned (no funding)	0.5	
BP136	San Jose	I-880	Stevens Creek	Completed		
BP96	San Jose	I-880	The Alameda	Unplanned	0.5	

Category 2 ABCs: Unfriendly Freeway Interchanges - By Jurisdiction

Includes ABCs that have been addressed since 2008. These are noted as "Completed."

No.	Jurisdiction	Barrier	Crossing	Status	Planning Cost ($ M)	Priority Status
BP175	San Jose	I-880	Washington/Bascom	Planned (no funding)	0.5	
BP146	San Jose	SR 237	North First	Planned (no funding)	0.5	
BP91	San Jose	SR 237	Zanker	In progress (some funding)	0.5	
BP169	San Jose	SR 85	Camden	Planned (no funding)	0.5	
BP154	San Jose	SR 85	Almaden Expy	Planned (no funding)	0.5	
BP153	San Jose	SR 85	Blossom Hill	Planned (no funding)	0.5	
BP109	San Jose	SR 85	Cottle	Planned (no funding)	0.5	
BP102	San Jose	SR 85	Great Oaks	Planned (no funding)	0.5	
BP174	San Jose	SR 87	Skyport	Unplanned	0.5	
BP170	San Jose	SR 87	Coleman	Planned (no funding)	0.5	
BP112	San Jose	SR 87	Julian	Planned (no funding)	0.5	
BP155	San Jose	SR 87	Park	Unplanned	0.5	
BP152	San Jose	SR 87	Curtner	Unplanned	0.5	
BP140	San Jose	SR 87	Taylor	Completed		
BP162	San Jose	US 101	De La Cruz/Trimble	In progress (some funding)	Addressed by 101/Trimble/ De La Cruz interchange project.	
BP156	San Jose	US 101	Brokaw	Planned (no funding)	0.5	
BP161	San Jose	US 101	Old Oakland Road	Planned (no funding)	0.5	

Category 2 ABCs: Unfriendly Freeway Interchanges - By Jurisdiction

Includes ABCs that have been addressed since 2008. These are noted as "Completed."

No.	Jurisdiction	Barrier	Crossing	Status	Planning Cost ($ M)	Priority Status
BP147	San Jose	US 101	Story	In progress (some funding)	0.5	
BP238	San Jose	US 101	Tully	Completed		
BP167	San Jose	US 101	Yerba Buena	Planned (no funding)	0.5	
BP164	San Jose	US 101	Blossom Hill/Silver Creek Valley Road	In progress (some funding)	Addressed by 101/Blossom Hill interchange project.	
BP168	San Jose	US 101	Bernal	Planned (no funding)	0.5	
BP184	San Jose	US 101	Coyote Creek Golf Course Drive	Unplanned	0.5	
BP173	San Jose	US 101	Alum Rock	Unplanned	0.5	
BP113	San Jose	US 101	North First Street	Unplanned	0.5	
BP171	San Jose	US 101	McKee	Unplanned	0.5	
BP192	San Jose/County	I-680	Capitol Expy/ San Antonio St.	Planned (no funding)	0.5	Priority
BP195	San Jose/County	US 101	Capitol Expy	Unplanned	0.5	
BP193	San Jose/County	US 101	Hellyer	Planned (no funding)	0.5	
BP194	San Jose/County	US 101	Bailey	Planned (no funding)	0.5	
BP196	San Jose/Cupertino	SR 85	De Anza	Completed		
BP197	San Jose/Los Gatos/County	SR 85	Bascom	Planned (no funding)	0.5	
BP206	Santa Clara	US 101	Bowers/Great America	Planned (no funding)	0.5	
BP213	Santa Clara/County	US 101	San Tomas/ Mont Expy	Planned (no funding)	0.5	

Category 2 ABCs: Unfriendly Freeway Interchanges - By Jurisdiction

Includes ABCs that have been addressed since 2008. These are noted as "Completed."

No.	Jurisdiction	Barrier	Crossing	Status	Planning Cost ($ M)	Priority Status
BP214	Santa Clara/San Jose	I-280	Stevens Creek	In progress (some funding)	0.5	
BP224	Sunnyvale	SR 237	Mathilda	In progress (some funding)	Addressed by Mathilda/237/ 101 project	
BP226	Sunnyvale	SR 85	Fremont	Completed		
BP230	Sunnyvale	US 101	Mathilda	In progress (some funding)	0.5	Priority
BP229	Sunnyvale	US 101	Fair Oaks	Planned (no funding)	0.5	
BP233	Sunnyvale/County	SR 237	Caribbean/ Lawrence Expy	Unplanned	0.5	
BP232	Sunnyvale/County	US 101	Lawrence Expy	Planned (no funding)	0.5	
BP234	Sunnyvale/ Mountain View	SR 237	Maude	Unplanned	0.5	

Category 3 ABCs: Large Distance Between Existing Crossings of Major Barriers

Category 3 ABCs are locations where physical crossings of a major barrier (freeway, waterway, rail line) are a mile or more apart.

Category 3 ABCs: Large Distance Between Existing Crossings of Major Barriers - By Jurisdiction

Includes ABCs that have been addressed since 2008. These are noted as "Completed."

No.	Jurisdiction	Barrier	Limits	Mileage	Status	Priority Status
50	Campbell	Los Gatos Creek	Campbell Park to San Tomas Expwy	1.13	Planned not funded	Priority
49	Campbell	SR 17	Campbell Ave to San Tomas Expwy	1.29	Planned not funded	Priority
95	Campbell	SR 17	San Tomas Expwy to Hwy 17 Bike-Ped Bridge	1.01	Planned not funded	
71	County	Caltrain	Laguna Ave to Palm Ave	1.32	Unplanned	
72	County	Caltrain	Palm Ave to Live Oak Ave	1.46	Unplanned	
73	County	Caltrain	Live Oak Ave to Tilton Ave	1.03	Unplanned	
74	County	Caltrain	Tilton Ave to Monterey St	1.18	Unplanned	
75	County	Caltrain	Tenant Ave to Middle Ave	1.30	Unplanned	
76	County	Caltrain	San Martin Ave to Church Ave	1.30	Planned not funded	
97	County	Caltrain	Middle Ave to San Martin Ave	1.25	Unplanned	
66	County	Hwy 101	Tennant Ave to Middle Ave	1.32	Unplanned	
67	County	Hwy 101	Middle Ave to San Martin Ave	1.25	Unplanned	
68	County	Hwy 101	San Martin Ave to Church Ave	1.29	Unplanned	
69	County	Hwy 101	Church Ave to Masten Ave	0.86	Unplanned	
0	County	Hwy 101	Masten Ave to Buena Vista Ave	1.12	Unplanned	
0	County	Hwy 101	Buena Vista Ave to Leavesley Rd	1.55	Planned not funded	

Category 3 ABCs: Large Distance Between Existing Crossings of Major Barriers - By Jurisdiction (Continued)

Includes ABCs that have been addressed since 2008. These are noted as "Completed."

No.	Jurisdiction	Barrier	Limits	Mileage	Status	Priority Status
77	County	Llagas Creek	San Martin Ave to Church Ave	1.44	Planned not funded	
78	County	Llagas Creek	Church Ave to Masten Ave	1.48	Planned not funded	
79	County	Llagas Creek	Buena Vista Ave to Leavesley Rd	1.60	Planned not funded	
80	County	Llagas Creek	Leavesley Rd to Gilman Rd	1.02	Planned not funded	
81	County	Llagas Creek	Gilman Rd to Pacheco Pass Hwy	1.22	Planned not funded	
158	County Parks	SR 17	Main St to Bear Creek Rd	1.86	Unplanned	
52	Cupertino	SR 85	Homestead Rd to Stevens Creek Blvd	1.17	Planned not funded	Priority
53	Cupertino	UPRR	McClellan Rd to Rainbow Dr	1.06	Planned not funded	Priority
4	Gilroy	Caltrain	Luchessa Ave to Bolsa Rd	1.86	Unplanned	
2	Gilroy	Hwy 101	Leavesley Rd to 6th Street	0.96	Planned not funded	Priority
3	Gilroy	Uvas Creek	Miller Ave to Luchessa Ave	0.92	Planned not funded	
5	Gilroy	Uvas Creek	Hecker Pass Hwy to Santa Teresa Blvd	1.72	In progress	
6	Gilroy	Uvas Creek	Santa Teresa Blvd to Miller Ave	0.96	Planned not funded	

Category 3 ABCs: Large Distance Between Existing Crossings of Major Barriers - By Jurisdiction (Continued)

Includes ABCs that have been addressed since 2008. These are noted as "Completed."

No.	Jurisdiction	Barrier	Limits	Mileage	Status	Priority Status
0	Gilroy	Uvas Creek	Luchessa Ave to Bloomfield Ave	3.79	Unplanned	
56	Los Altos Hills	I-280	Robleda Rd to El Monte Rd	0.95	Unplanned	
59	Los Gatos	Los Gatos Creek	Lark Ave to Pepper Tree Ln	1.30	Planned not funded	Priority
57	Los Gatos	SR 17	Lark Ave to Blossom Hill Rd	1.22	Planned not funded	
58	Los Gatos	SR 85	Pollard Rd to Winchester Blvd	0.98	Unplanned	
9	Milpitas	Coyote Creek	Tasman Dr to Montague Expwy	1.25	Unplanned	
10	Milpitas	I-680	Chardonnay Dr to Jacklin Rd	1.57	Unplanned	
7	Milpitas	I-880	Tasman Dr to Montague Expwy	1.00	Unplanned	
83	Milpitas	I-880	Dixon Landing Rd to Calaveras Blvd	2.02	Unplanned	
8	Milpitas	UPRR	Calaveras Blvd to Montague Expwy	1.56	Planned not funded	
12	Milpitas	UPRR	Dixon Landing Rd to Abel St	0.99	Unplanned	
60	Morgan Hill	Hwy 101	Cochrane Rd to Main Ave	1.05	Planned not funded	Priority
61	Morgan Hill	Hwy 101	Dunne Ave to Tennant Ave	0.93	Planned not funded	
62	Morgan Hill	Llagas Creek	Santa Teresa Blvd to Monterey Rd	1.43	Planned not funded	
15	Mountain View	Caltrain	Rengstorff Ave to Shoreline Blvd	0.85	Planned not funded	
0	Mountain View	Hwy 101	San Antonio Rd to Shoreline Blvd	1.01	Completed	
13	Mountain View	SR 85	El Camino Real and Fremont Ave	1.87	Planned not funded	Priority
16	Mountain View	Stevens Creek	Crittenden Ln to US 101	1.12	Unplanned	

Category 3 ABCs: Large Distance Between Existing Crossings of Major Barriers - By Jurisdiction (Continued)

Includes ABCs that have been addressed since 2008. These are noted as "Completed."

No.	Jurisdiction	Barrier	Limits	Mileage	Status	Priority Status
84	Mountain View	Stevens Creek	Sleeper Ave to Fremont Ave	1.59	Planned not funded	Priority
18	Palo Alto	Caltrain	Oregon Expwy to Meadow Dr	1.17	Planned not funded	Priority
17	Palo Alto	Hwy 101	Oregon Expwy to Meadow Dr	1.30	In progress	Priority
19	Palo Alto	Hwy 101	University Ave to Embarcadero Rd	1.25	Planned not funded	
20	Palo Alto/Los Altos	Adobe Creek	Terman Park to Foothill Expwy	1.53	Unplanned	
33	San Jose	Caltrain	Blossom Hill Rd to Bernal Rd	2.06	Unplanned	
34	San Jose	Caltrain	Bernal Rd to Blanchard Rd	2.17	Unplanned	
35	San Jose	Coyote Creek	Oakland Rd to Berryessa Rd	1.13	Planned not funded	Priority
36	San Jose	Coyote Creek	Taylor St to Julian St	0.92	In progress	Priority
37	San Jose	Coyote Creek	Tully Rd to Capitol Expwy	1.52	Planned not funded	
38	San Jose	Coyote Creek	Silver Creek Valley Rd to Silicon Valley Blvd	1.57	Planned not funded	Priority
91	San Jose	Coyote Creek	Story Rd to Tully Rd	2.21	In progress	Priority
0	San Jose	Coyote Creek	Hellyer Ave to Coyote Creek Park	2.13	Unplanned	
39	San Jose	Guadalupe River	Tasman Dr to River Oaks Pl	1.23	Planned not funded	Priority
40	San Jose	Guadalupe River	Branham Ln to Blossom Hill Rd	1.06	Planned not funded	Priority
92	San Jose	Guadalupe River	Montague Expwy to Trimble Rd	1.16	Planned not funded	Priority
24	San Jose	Hwy 101	N First St to N 10th St	1.22	In progress	

Category 3 ABCs: Large Distance Between Existing Crossings of Major Barriers - By Jurisdiction (Continued)

Includes ABCs that have been addressed since 2008. These are noted as "Completed."

No.	Jurisdiction	Barrier	Limits	Mileage	Status	Priority Status
25	San Jose	Hwy 101	Blossom Hill Rd to Bernal Rd	1.56	Unplanned	
85	San Jose	Hwy 101	Story Rd to Tully Rd	1.51	Planned not funded	Priority
86	San Jose	Hwy 101	Tully Rd to Capitol Expwy	1.32	Planned not funded	
87	San Jose	Hwy 101	Coyote Rd to Blossom Hill Rd	1.47	Planned not funded	Priority
0	San Jose	Hwy 101	Bernal Rd to Metcalf Rd	1.72	Completed	
26	San Jose	I-280	Lawrence Expwy to Saratoga Ave	1.20	Planned not funded	
27	San Jose	I-280	11th St to McLaughlin Ave	0.94	In progress	Priority
28	San Jose	I-680	Hostetter Rd to Berryessa Rd	0.97	Planned not funded	
21	San Jose	I-880	Montague Expwy to Brokaw Rd	1.30	Planned not funded	Priority
29	San Jose	I-880	Brokaw Rd to Old Bayshore Hwy	1.05	Unplanned	
0	San Jose	Light Rail Tracks	Curtner Ave to Monterey Rd	1.86	Planned not funded	
41	San Jose	Los Alamitos	Mazzone Dr to Graystone Ln	1.49	Planned not funded	
42	San Jose	Los Alamitos	Greystone Ln to Harry Rd	2.18	Planned not funded	
93	San Jose	Los Alamitos	Harry Rd to Shillingsburg Ave	2.02	Planned not funded	
43	San Jose	Penitencia Creek	Dorel Dr to Penitentia Creek Trl	0.90	Planned not funded	
44	San Jose	Silver Creek	Greenyard St to Hassler Pkwy	1.34	Unplanned	

Category 3 ABCs: Large Distance Between Existing Crossings of Major Barriers - By Jurisdiction (Continued)

Includes ABCs that have been addressed since 2008. These are noted as "Completed."

No.	Jurisdiction	Barrier	Limits	Mileage	Status	Priority Status
45	San Jose	Silver/Thompson Creek	Yerba Bunea Ave to Yerba Buena Rd	1.30	Planned not funded	Priority
30	San Jose	SR 237	N First St to Zanker Rd	1.07	Planned not funded	
31	San Jose	SR 237	Zanker Rd to McCarthy Blvd	0.92	Planned not funded	
32	San Jose	SR 87	Skyport Dr to Hedding St	1.13	Unplanned	
88	San Jose	UPRR	Trade Zone Blvd to Hostetter Rd	1.03	Unplanned	
90	San Jose	UPRR	Montague Expwy to Oakland Rd	1.09	Unplanned	
23	San Jose	UPRR/Caltrain	Brokaw Rd to Hedding St	1.23	Planned not funded	
64	Santa Clara	Caltrain/UPRR	Lawrence Expwy to Bowers Ave	1.07	Planned not funded	
63	Santa Clara	Hwy 101	San Tomas Expwy to Lafayette St	0.90	Planned not funded	
65	Saratoga	San Tomas Aquino Creek	Fruitvale Ave to Saratoga-Los Gatos Rd	1.38	Completed	
82	Sunnyvale	Caltrain	Wolfe Rd to Lawrence Expwy	0.95	Unplanned	
48	Sunnyvale	Hwy 101 And 237	Ellis St to Mathilda Ave	1.33	In progress	Priority
96	Sunnyvale	SR 237	Lawrence Expwy to San Tomas Aquino Creek Trail	1.09	In progress	
94	Sunnyvale-Mountain View	Caltrain	Whisman Rd to Mary Ave	1.10	In progress	Priority

Appendix 8.1 Cost Assumptions

VTA used the following unit cost assumptions when developing planning-level costs for Cross County Bicycle Corridors (CCBCs) and Across Barrier Connections (ABCs). These are rough estimates. Prior to budgeting or requesting funding, cities should develop project-specific costs. Actual cost of an individual project will vary.

The cost estimates include the typical materials and labor, as well as traffic control, mobilization, and miscellaneous contingencies. They are in 2017 dollars and have no inherent escalation factor for increases in construction cost over time. In addition to the typical elements, the cost estimates take into account: (1) Planning/environmental work; (2) Plans Specifications & Estimates design; and (3) Construction administration.

Cost estimates for ABCs were developed based on the type of ABC.

Per Unit ABC Cost Assumptions

ABC Type	Assumed Improvement	Cost per Project
Inadequate Roadway Crossings (Category 1) Creek and freeway crossings	Bridge widening to permit additional space for bicycle lanes assuming a typical concrete bridge approximately 150 feet in length.	$1,000,000
Inadequate Roadway Crossings (Category 1) Railroad crossings	At grade improvements to railroad crossing, assuming new crossing requiring new railroad circuitry.	$500,000
Unfriendly Freeway Interchanges (Category 2)	Interim improvements to adjust signing/striping to increase visibility of bicyclists at interchanges. Cost based on typical cloverleaf. Long-term civil/geometric improvements, such as squaring up ramps, assumed to be incorporated into interchange redesign.	$500,000
Large Distance between Crossings (Category 3)	Standalone bicycle/pedestrian bridge, assuming large feature structure.	$10,000,000

In developing estimates for CCBCs, we used the following assumptions:

- All proposed off-street CCBCs would be built at as bicycle paths.
- All proposed on-street priority CCBCs would be built as cycle tracks (or equivalent cost of alternative treatment).
- All other proposed on-street CCBCs would be built as bicycle lanes.

Per Mile CCBC Cost Assumptions

Bikeway Type	Per Mile Cost
Bicycle path	$3 million
Cycle tracks	$800,000
Bicycle lanes	$600,000

Appendix 8.2 Funding Sources

The following table summarizes several competitive grant funding programs available to local agencies for bicycle-related plans, infrastructure, or education/encouragement programs. Grant sources and requirements change often. Readers are advised to contact the agencies in charge of administering each grant to confirm information presented in this appendix.

Prior to submitting an application for grant funds, a local agency should consider the additional staff time required to administer a grant if selected. Typically, grants that use federal and state funds require more staff time to administer than grants that use regional or local funds.

Name	Administering Agency	Funding Streams	Local Match	Eligible Projects	Requirements
Active Transportation Program (ATP)	Caltrans and MTC	▪ Transportation Alternatives Program (state share) ▪ Bicycle Transportation Account ▪ State Safe Routes to School ▪ Senate Bill 1	Not always required, but committing local funds improves score	▪ Bicycle infrastructure ▪ Bicycle education/ encouragement programs ▪ Bicycle plans	▪ Requirements change with each funding cycle ▪ In past rounds, projects had to show potential for increased walking and bicycling and potential for reduced collisions/improved safety
Highway Safety Improvement Program (HSIP)	Caltrans	▪ Highway Safety Improvement Program funds	Not required, but federal funds are limited for engineering, ROW purchase, and construction of non-safety-related elements	▪ Local roadway infrastructure projects with demonstrated crash reduction factors	▪ Projects located in areas with high crash rates or high risk for crashes ▪ Non-safety elements cannot exceed 10% of construction costs

Name	Administering Agency	Funding Streams	Local Match	Eligible Projects	Requirements
2016 Measure B	VTA	▪ 2016 Measure B half-cent sales tax revenues	Can be used as local match source for regional, state, and federal funds	▪ Bicycle infrastructure ▪ Bicycle planning ▪ Bicycle education/ encouragement programs	▪ Infrastructure projects must be identified in Measure B project funding list (all Countywide Bicycle Plan projects are included) ▪ Scoring criteria include countywide significance, safety improvements, and access improvements ▪ Project sponsor agencies must comply with Complete Streets requirements
OneBayArea Grant Program (OBAG)	MTC and VTA	▪ Surface Transportation Block Grant Program (STBGP) ▪ Congestion Mitigation and Air Quality (CMAQ) funds	11.47% of total project cost in local funds	▪ Bicycle infrastructure ▪ Bicycle planning ▪ Safe Routes to School planning, infrastructure, and education/ encouragement	▪ Projects must be located in or near Priority Development Areas (PDAs) identified in Plan Bay Area ▪ Project sponsor agencies must comply with MTC's Complete Streets requirements

Name	Administering Agency	Funding Streams	Local Match	Eligible Projects	Requirements
Transportation Development Act Article 3 (TDA3) Local Transportation Fund	MTC and VTA	▪ TDA funds (1/4 cent sales tax revenue; 2% are allocated to bicycle and pedestrian funds)	None	▪ Bicycle infrastructure ▪ Bicycle education programs (up to 5% of each jurisdiction's allocation)	▪ Bikeway projects must meet Caltrans minimum safety design criteria per the California Highway Design Manual ▪ All projects must be reviewed by a Bicycle Pedestrian Advisory Committee ▪ Projects require CEQA clearance prior to TDA funded elements
Transportation Fund for Clean Air (TFCA) grant program	Bay Area Air Quality Management District (BAAQMD) and VTA	▪ Transportation Fund for Clean Air – separate grant programs administered by BAAQMD (60%) and county-level agencies, including VTA (40%)	None	▪ Bicycle infrastructure ▪ Expansions of the Bay Area Bike Share system	▪ Bicycle facility projects must reduce motor vehicle emissions and be consistent (where applicable) with California Highway Design Manual ▪ Bike share expansions must demonstrate viability
Transportation Investment Generating Economic Recovery (TIGER) grant program	US DOT	▪ Annual federal appropriations	20%	▪ Bicycle infrastructure, particularly innovative multi-modal and multi-jurisdictional projects	▪ Requirements change with each funding cycle ▪ In past rounds, permissible project costs ranged from $5-100M

Name	Administering Agency	Funding Streams	Local Match	Eligible Projects	Requirements
Vehicle Emissions Reductions Based at Schools (VERBS)	VTA	▪ CMAQ and TFCA funds, via MTC's Climate Initiatives Safe Routes to School Creative Grants Program	11.47%	▪ New or improved bicycle and bicycle/pedestrian infrastructure ▪ Secure bicycle storage	▪ Facilities must reduce vehicle trips and/or improve safety and access for bicycle users ▪ Funds must directly benefit students traveling to school