HAYWARD BICYCLE & PEDESTRIAN MASTER PLAN

BICYCLE & PEDESTRIAN MASTER PLAN

City of Hayward

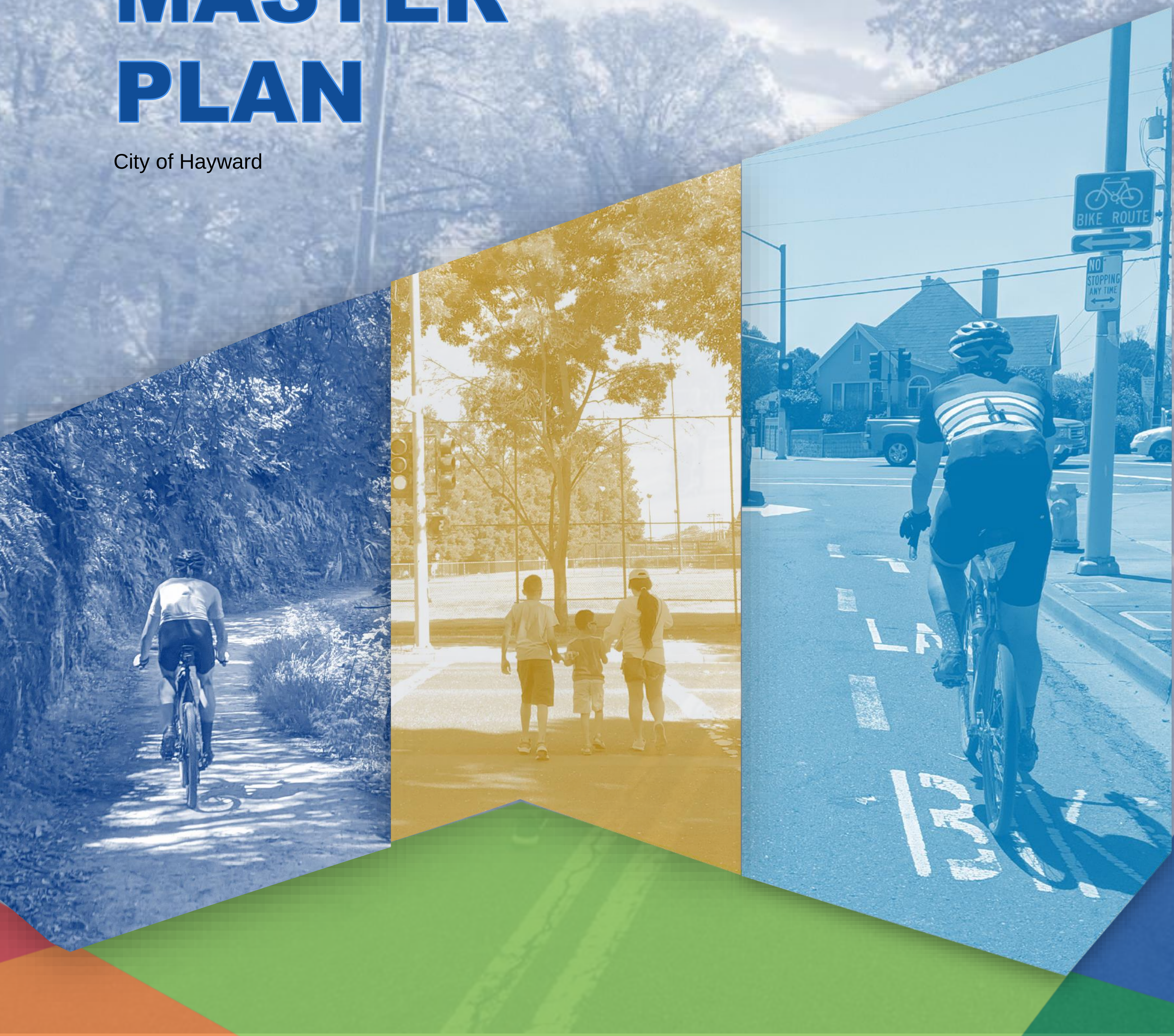
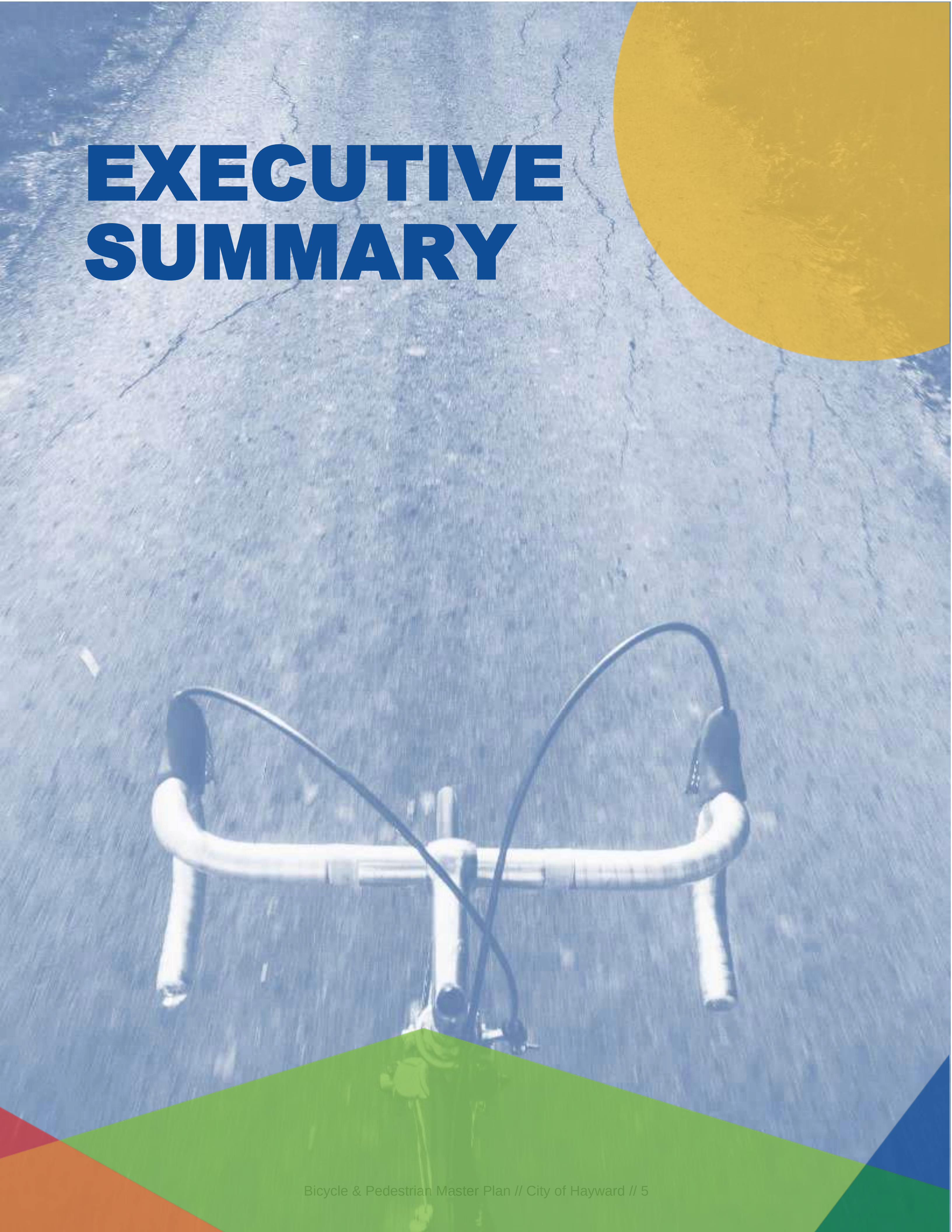


TABLE OF CONTENTS

List of Figures

LIST OF TABLES

EXECUTIVE SUMMARY



EXECUTIVE SUMMARY

INTRODUCTION

Residents and visitors of Hayward have long walked and biked as a means of travel and recreation. Still, walkers and bikers are vulnerable road users susceptible to safety risks, and work has to be done to ensure there is a network of quality bicycle and pedestrian facilities throughout Hayward. The City of Hayward's Bicycle and Pedestrian Master Plan (Plan) establishes the City's vision and comprehensive approach to improving walking and biking in Hayward.

The City of Hayward has promoted biking and walking throughout its history. The first bicycle plan was adopted in 1979, and the most recent update completed in 2007. Since then, the City has created various citywide and neighborhood-specific plans to promote these modes of transportation. The Plan builds on this work and is consistent with the City's General Plan and Complete Street policies, which emphasize a comprehensive, integrated, and connected network of transportation facilities and services for all modes of travel.

THE CITY OF HAYWARD'S BICYCLE AND PEDESTRIAN MASTER PLAN (PLAN) ESTABLISHES THE CITY'S VISION AND COMPREHENSIVE APPROACH TO IMPROVING WALKING AND BIKING IN HAYWARD.

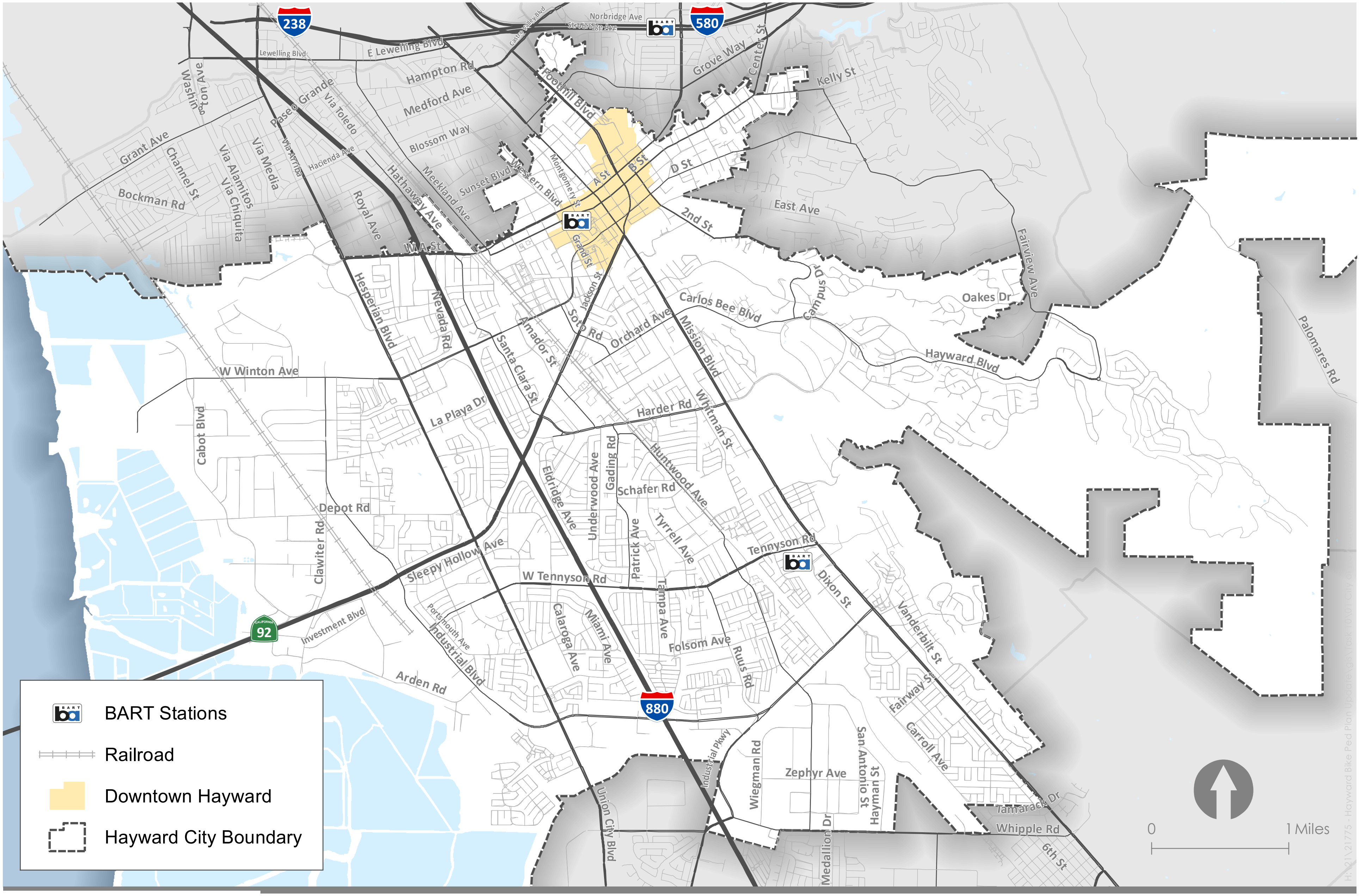
Multi-use path crossing at Industrial Parkway

BENEFITS OF BIKING AND WALKING

There are many benefits to biking and walking as a means of transportation, from improved health and well-being to the affordability and environmentally sustainable nature of both. Some of the benefits include:

- **Environmental Benefits:** Together, biking and walking allow for sustainable and affordable travel and improve access to employment, recreation, school, and other opportunities. Biking and walking also have the potential to mitigate the impacts of global warming by reducing greenhouse gas emissions from the transportation sector.
- **Public Health:** Promoting walking and biking as viable alternatives to driving can improve physical and emotional health and well-being. Walking and biking are associated with personal health benefits by providing an opportunity for individuals to incorporate physical activity into daily life. Walking and biking also have potential psychological health benefits, including treating anxiety and depression and improving cognitive functioning. Lastly, a decrease in vehicle use results in community health benefits, such as improved air quality, reduced noise pollution, and reduced greenhouse gas emissions.
- **First and Last Mile Connections**: Biking and walking also make important connections to transit more convenient, including to Bay Area Rapid Transit (BART) stations where parking availability can be limited and to local and regional Alameda-Contra Costa Transit (AC Transit) bus connections.

Bicyclist crossing at Fairway St. and Mission Blvd.
Crosswalk with in-pavement illumination at Amador St.



HAYWARD BICYCLE & PEDESTRIAN MASTER PLAN

KITTELSON & ASSOCIATES

TOOLE DESIGN

Figure 1

City of Hayward

PLAN VISION AND GOALS

The Plan is guided by the following vision:

Vision: The City of Hayward's transportation system provides a safe, comfortable, convenient, and connected walking and biking network for people of all ages and abilities and is supported by programs and policies that promote sustainable transportation and complete communities.

The Plan has four overarching goals that are related to this vision and guide the recommendations:

1 Safety

Increase the safety of people bicycling and walking in the City of Hayward by identifying projects that address the greatest safety needs and prioritizing safety for all modes.

2 Complete Streets

Provide complete streets that balance the diverse needs of users of the public right of-way.

3 Access & Mobility

Create connected networks and a continuous system of streets and trails that enable people of all ages and abilities to walk and bike to meet their daily needs and incorporate physical activity into everyday activities.

4 Funding & Implementation

Maintain sufficient funding to provide for existing and future transportation needs, including supporting programs and operation and maintenance.

PERFORMANCE MEASURES WERE CREATED IN ORDER TO MEASURE THE PLAN GOALS AND TO PROVIDE AN EASY WAY TO TRACK PROGRESS FOR THE LIFE OF THE PLAN.

Performance measures are listed below.

Table 1. Performance Measures

Goal	Performance Measure	Existing	Target
Safety	Average speed at specific locations measured annually*	Varies by location	85th percentile speeds at or below posted speed
	Number of pedestrian/bicycle fatalities and severe injury collisions	3.5 fatal/severe injury bicycle collisions per year 9.4 fatal/severe injury pedestrian collisions per year	Eliminate fatal and severe injury bicycle and pedestrian collisions by 2030
Complete Streets	Miles of new or replaced sidewalk*	Not inventoried	Add 2 miles of sidewalks per year
	Miles of new or upgraded bike lanes*	Class 1: 3 lane miles Class 2: 51 lane miles Class 3: 68 lane miles	Add 10 miles of bicycle facilities per year
	Number of new or enhanced crosswalks*	Not inventoried	Make all new or restriped crosswalks high visibility markings
Access & Mobility	Walk and bike mode share	Walk commute share: 2.3% Bike commute share: 1.1%	Double walk and bike commute mode share by 2030 Target bike mode share: 4.6% Target walk mode share: 2.2%
	Number of ADA improvements	Not inventoried	
Funding & Implementation	Percentage of network implementation	N/A	Recommended network 100% complete by 2030
	Amount of funding provided by grants*	N/A	

Increase   Maintain or increase

**Indicates performance measure from the Complete Streets Strategic Initiative: https://www.hayward-ca.gov/your-government/city-council/complete-streets-strategic-initiative*

PLAN OUTREACH AND COMMUNITY ENGAGEMENT

Public engagement was completed in three phases, as shown in **Figure 2** and supplemented by a Technical Advisory Committee (TAC). The TAC, which met four times during plan development, included staff from Public Works Department, Development Services Department, Economic Development Department, Environmental Services Department, Police Department, Streets Division, Hayward Area Recreation and Park District (HARD), transit agencies, local advocacy groups, Hayward Unified School District (HUSD), representatives from neighboring jurisdictions, the Alameda County Transportation Commission, Caltrans, Bike East Bay, Community resources for Independent Living (CRIL), and local business representatives.

- **Phase I**, conducted from May 2018 through October 2018, focused on increasing community awareness of the Plan and soliciting initial feedback on existing conditions and the plan's priorities. This phase established the foundation for planning efforts and included a website launch, an online interactive Wikimap for providing feedback, and pop-up stations at community events.
- **Phase II**, conducted from September 2018 through March 2019, solicited community input on recommended projects to be implemented. Activities included three community walking audits and more online engagement.
- **Phase III**, conducted from April 2019 through November 2019, gathered community feedback on initial project recommendations. These recommendations included the draft bicycle and pedestrian networks and the list of projects. This feedback was gathered online via Wikimap and through pop-up community events.

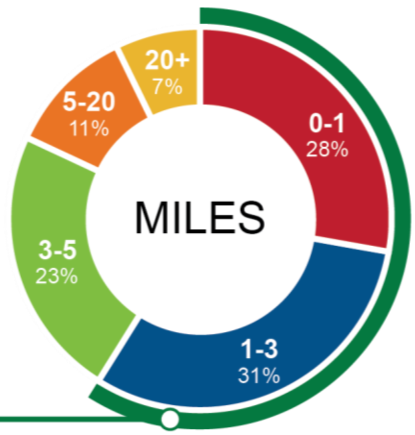
Figure 2. Public Engagement Process Summary

EXISTING CONDITIONS

EXISTING CONDITIONS WERE ASSESSED TO BETTER UNDERSTAND PREVAILING TRENDS AND CHALLENGES WITHIN THE CITY.

Key findings are as follows:

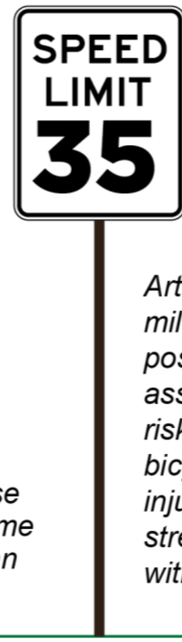
NON-WORK TRIP DISTANCES IN HAYWARD



59%

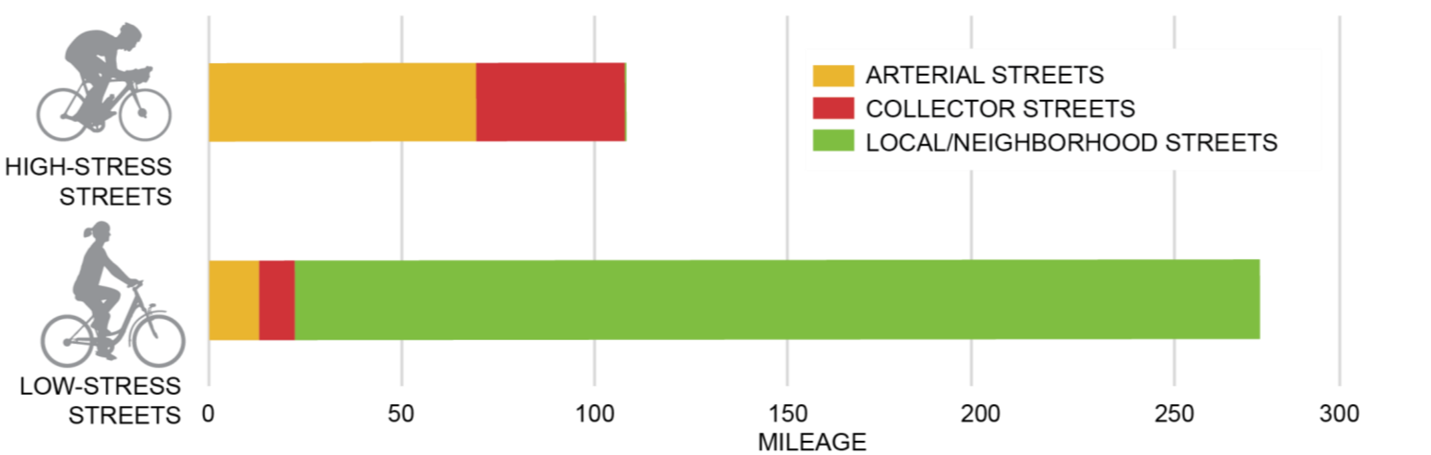
MAJORITY OF TRIPS IN HAYWARD ARE OF A WALKABLE OR BIKEABLE DISTANCE.

A majority of trips within Hayward (59%) are 3 miles or less. These trips are within reasonable walking and biking distance. While some of these trips already are on foot or bike, the remainder present an opportunity for shifting travel mode.



Arterial roadways with 35 miles per hour or higher posted speed are associated with increased risk for pedestrian and bicycle collisions and injuries. Lower posted speed streets are less associated with these outcomes.

ROADWAY MILEAGE BY BICYCLE LEVEL OF TRAFFIC STRESS



Arterial streets make up the majority of high-stress streets in Hayward. This plan identifies opportunities to improve biking conditions along these streets, which would unlock low-stress connectivity among local and neighborhood streets.

PROJECT RECOMMENDATIONS

To encourage the implementation of complete streets, bicycle, pedestrian, and transit supportive investments are recommended together and held in equal importance. The project recommendations are thus presented as a package, with concurrent improvements to support all three alternative travel modes. The network development and prioritization were conducted with respect to biking and walking. Once the network recommendations and proposed projects were developed, transit infrastructure costs were incorporated to the project cost estimates as well.

PROJECT PRIORITIZATION AND METHODOLOGY

A prioritization framework was used to identify candidate pedestrian and bicycle project locations. The prioritization criteria were developed in cooperation with the Technical Advisory Committee and align with the Plan’s goals. These factors were given weights to emphasize safety and connectivity.

The weights were used to calculate priority scores for all road segments in the city, grouped by pedestrian and bicycle prioritization. The details of the prioritization process and scoring are provided in **Appendix C**.

The prioritization factors and criteria are shown in **Figure 3**, along with their relative weights.

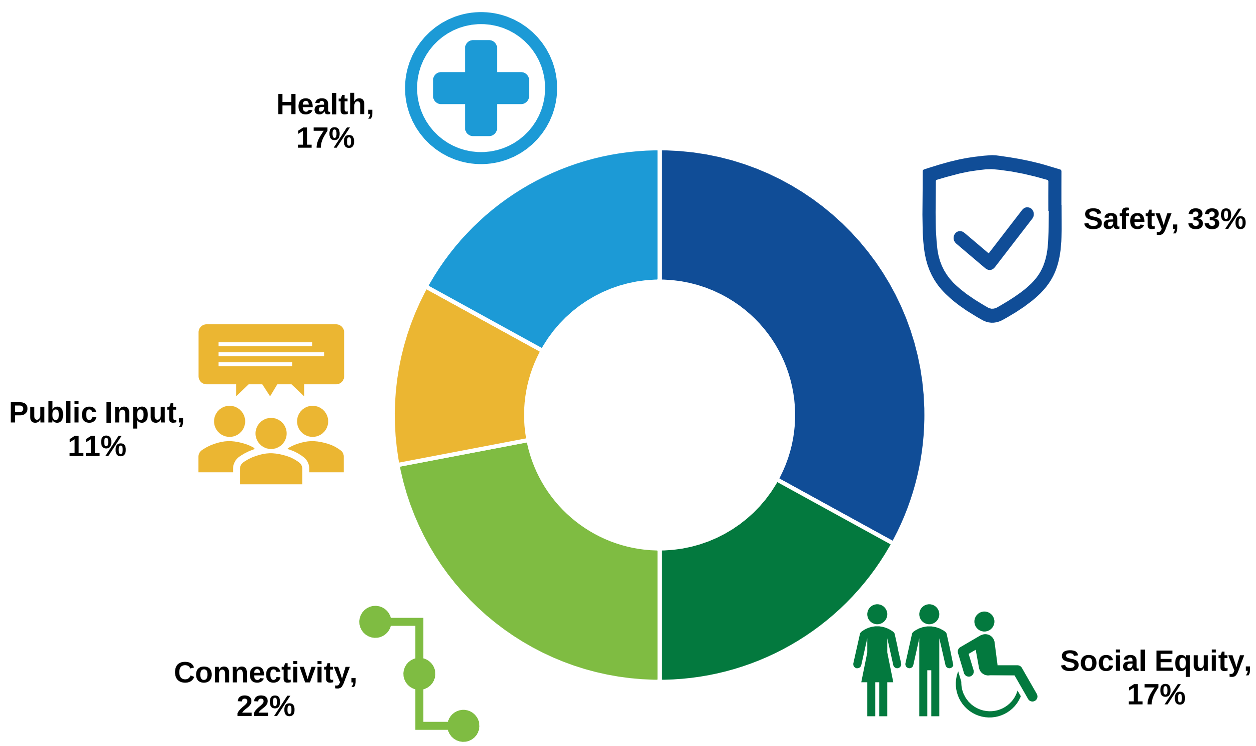


Figure 3. Prioritization Weights

ALL AGES AND ABILITIES NETWORK

The Plan's vision includes creating a safe, comfortable bicycle network that can be enjoyed by all residents, commuters, and visitors. With this in mind, an all ages and abilities bicycle network was developed to provide bikeways that will allow the largest segment of the population to feel comfortable while biking and will support pedestrians with infrastructure that promotes safety, accessibility, and a pleasant walking environment. The all ages and abilities network concept conveys that the recommended bicycle and pedestrian network provides connectivity suitable for as much of the population as can be achieved through infrastructure solutions.

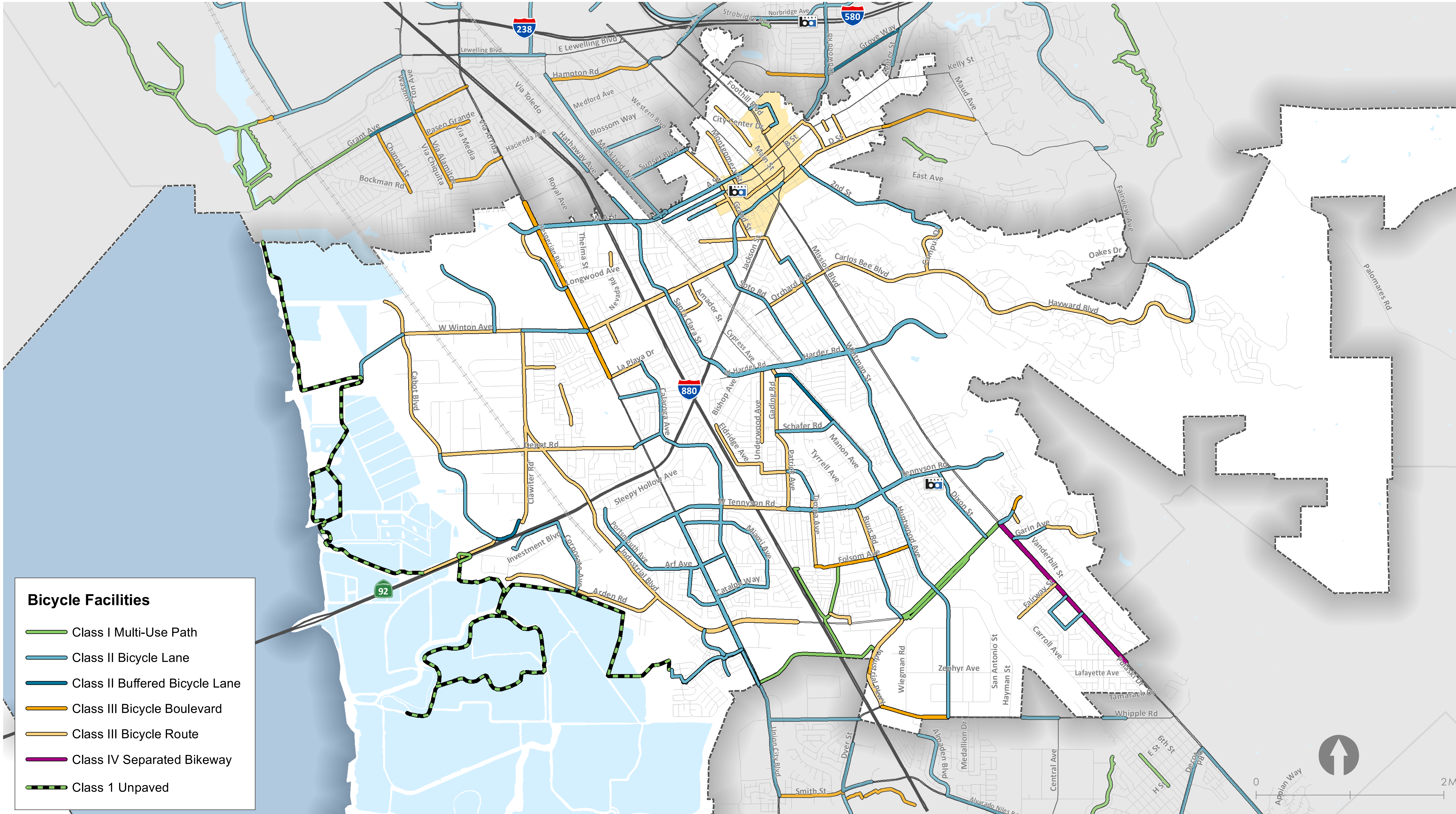
Source: spotmatikphoto via Adobestock

Recommended Bicycle Network

With the implementation of this network, every resident in Hayward would have access to low-stress, comfortable bikeways that connect to major destinations throughout the city, along with connected sidewalks and frequent and appropriate crossing locations and designs. These facilities are also supported by connectivity and gap closure recommendations that may not meet the American Association of State Highway and Transportation Officials (AASHTO) criteria for all ages and abilities bikeways but are important for other safety or local access purposes.

The existing and proposed bicycle network (**Figure 4** through **Figure 6**) illustrates the existing and proposed facility recommendations. Once the network was developed, the Plan used the prioritization methodology to rank each project corridor. The full project list can be found in **Appendix A**. The recommended facilities include:

- 32 miles of Class I paths
- 35 miles of Class II bike lanes
- 18 miles of Class III bike routes
- 68 miles of Class IV separated bike lanes



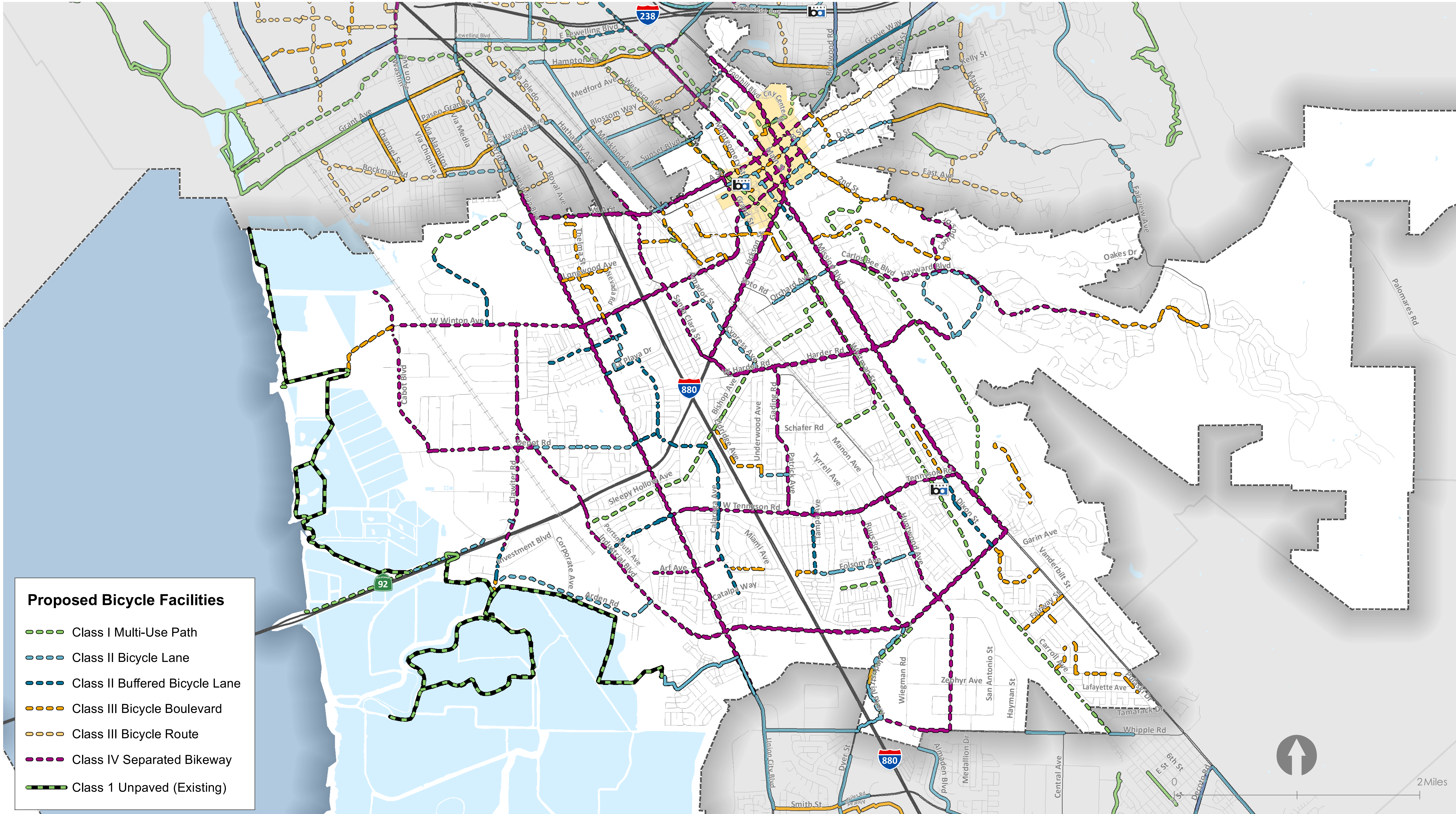
HAYWARD BICYCLE & PEDESTRIAN MASTER PLAN

KITTELSON & ASSOCIATES

TOOLE DESIGN

Figure 4

Existing Bicycle Network
City of Hayward



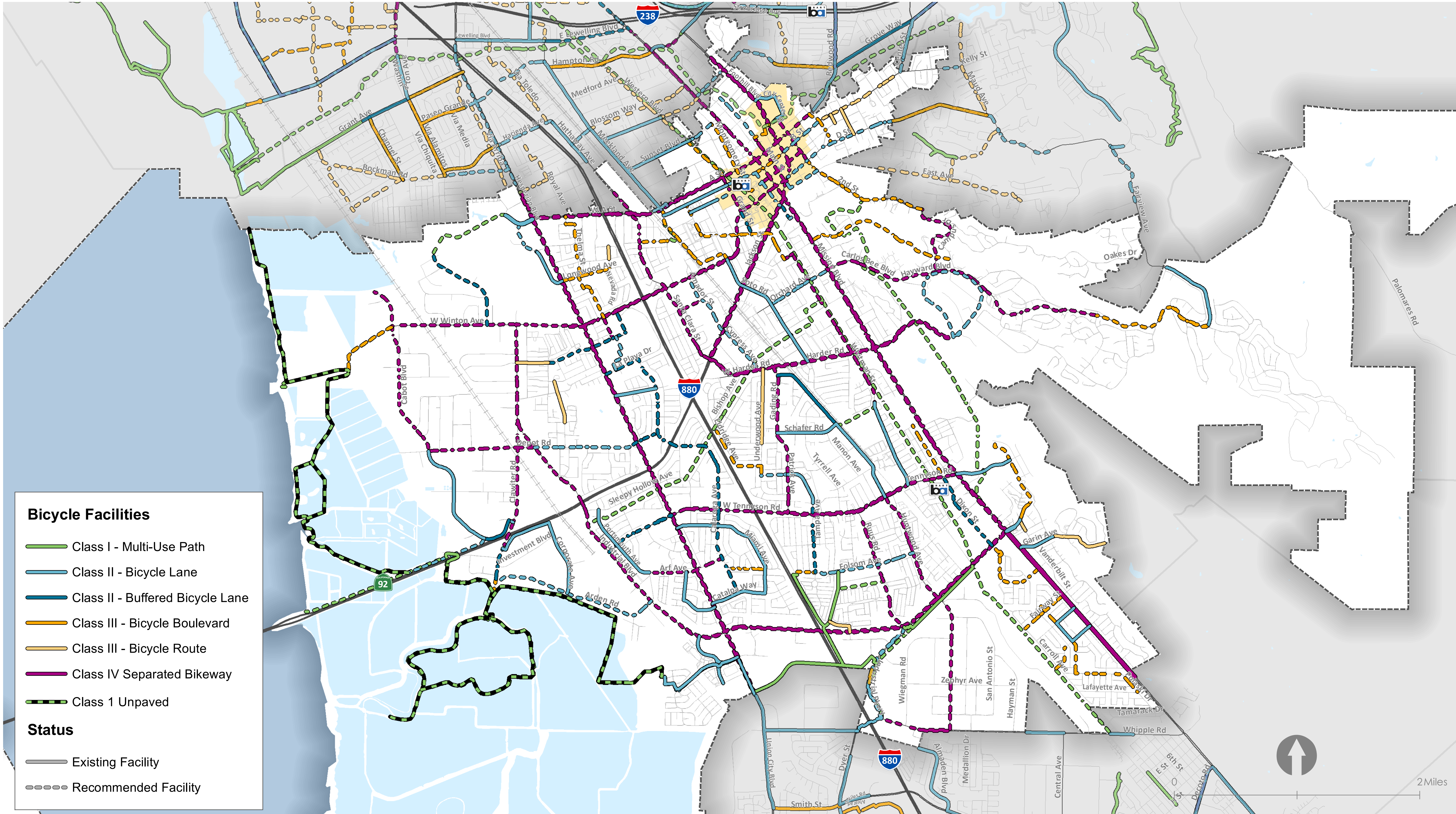
HAYWARD BICYCLE & PEDESTRIAN MASTER PLAN

KITTELSON & ASSOCIATES

TOOLE DESIGN

Figure 5

Recommended Bicycle Network
City of Hayward



HAYWARD BICYCLE & PEDESTRIAN MASTER PLAN

KITTELSON & ASSOCIATES

TOOLE DESIGN

Figure 6

Existing and Recommended Bicycle Network
City of Hayward

Recommended Pedestrian Network

The recommended pedestrian network was developed in tandem with the recommended bicycle network using a complete streets approach. A suite of pedestrian treatments is recommended to be implemented along project corridors, with different project assumptions based on roadway functional classification. In this way, when near-term or longer-term improvements are being identified, bicycle and pedestrian improvements can be planned for, designed, and implemented together. The pedestrian improvements include high-visibility crosswalks, ADA curb ramps, curb extensions, midblock rectangular rapid flashing beacons (RRFBs), and pedestrian hybrid beacons (PHBs), and signal improvements. **Figure 7** presents the recommended pedestrian network, and the suite of improvements associated with each functional class is presented on page 124.

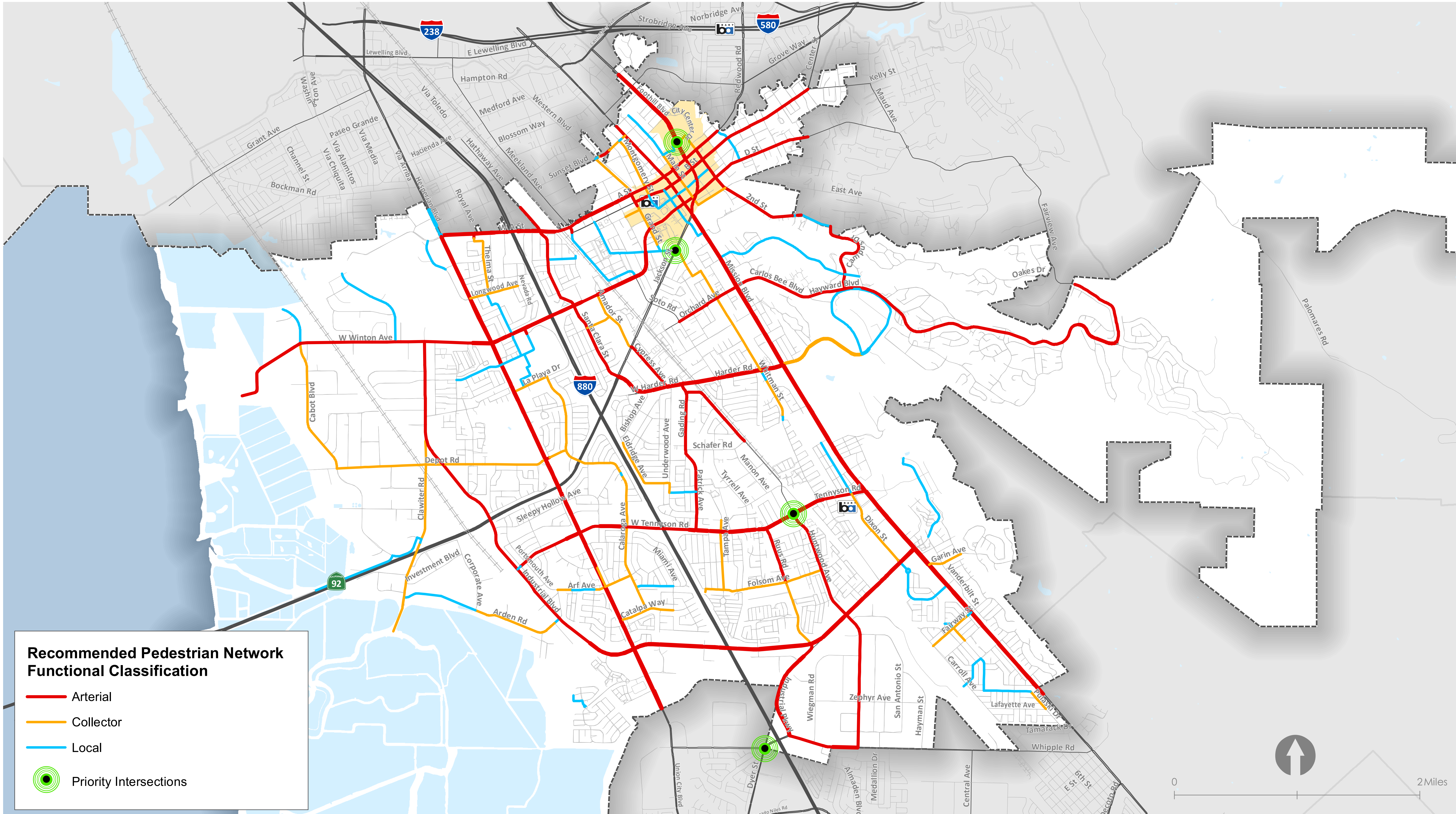
Transit Infrastructure

Once the recommended bicycle and pedestrian networks were developed, right-of-way improvements that support and facilitate walking access to transit and bicycle safety near transit lines were layered into the recommendations. These improvements, organized and classified by transit corridor priority, include transit stop area improvements on the sidewalk and in the roadway. Incorporating all three elements together allows projects to be implemented as complete corridors rather than as separate projects by mode. **Figure 8** presents the locations and cost levels of recommended transit infrastructure.

Priority Intersections

In addition to the recommended bicycle and pedestrian network, there are intersection locations in the City that exhibit a relatively high pedestrian collision history relative to the rest of the network in terms of severity and frequency. These intersections are presented with their 2012-2016 pedestrian collision history and should be considered for future pedestrian safety improvements:

- **West Tennyson Road and Huntwood Avenue**: eight pedestrian collisions (including three severe injury collisions)
- **Jackson Street and Silva Avenue / Meek Avenue**: five pedestrian collisions (including one severe injury and one fatal collision)
- **Whipple Road and Dyer Street**: four pedestrian collisions (including two severe injury collisions)
- **Foothill Boulevard and City Center Drive**: two pedestrian collisions (including one fatal and one severe injury collision)



HAYWARD BICYCLE & PEDESTRIAN MASTER PLAN

KITTELSON & ASSOCIATES

TOOLE DESIGN

Figure 7

Recommended Pedestrian Network
City of Hayward

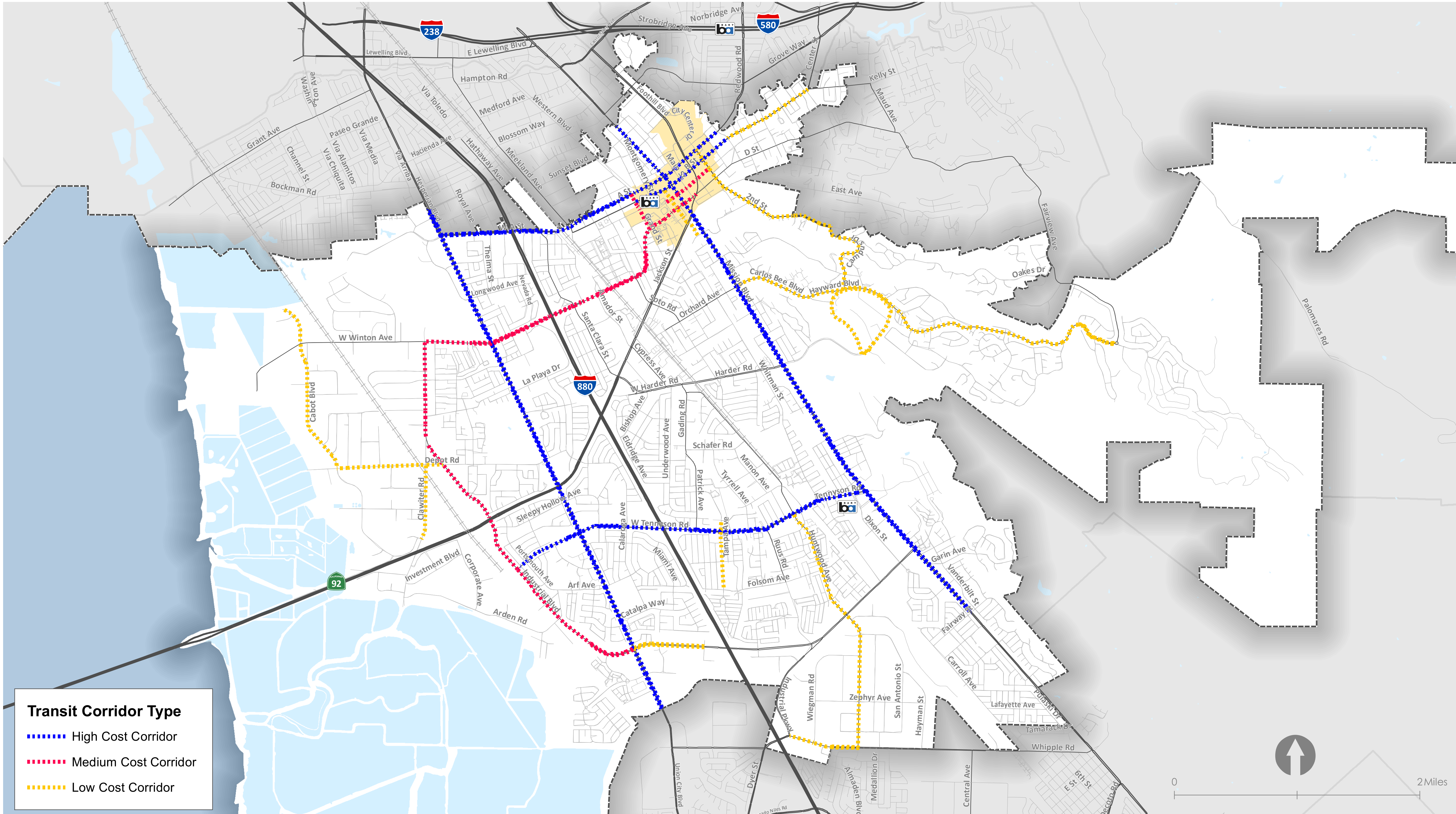


Figure 8

Proposed Transit Supportive Improvements
City of Hayward

PROGRAM AND POLICY RECOMMENDATIONS

As part of developing the Plan, the City identified policies, programs, and practices to improve conditions for walking and biking in Hayward. City staff from multiple departments, including Public Works, Environmental Services, and Planning, participated in an interview to assess how the City is implementing existing policies, programs, and practices. The interviews focused on five main categories of recommendations: infrastructure and operations, evaluation and planning, funding, project implementation, and education, and enforcement. City staff ranked the highest priorities, shown in **Table 2**, for inclusion in the Plan.

Table 2. Summary of Recommendations for Policies, Programs, and Practices

Category	Topic Area	Recommendations
Infrastructure and Operations	Attention to Crossings and Barriers	• Accommodating bicycles and pedestrians at freeway interchanges
	Bike Parking Requirements	• Short-/long-term bicycle parking requirements and standards
	Intersections and Interchanges	• Develop standards for Leading Pedestrian Interval (LPI) applications • Develop standards for modifying signals for full accessibility
	Crosswalks and Traffic Control Devices	• Design standards and applications for PHBs and RRFBs • Develop a crosswalk installation policy and/or decision matrix including applications for midblock crossings
	Design Guidance	• Develop and adopt bicycle and pedestrian design standards
	Off-street Multi-Use Paths and Separated Facilities	• Develop language for implementing easements and private property paths
Evaluation and Planning	Development Standards, Site Plan Review, and Traffic Impact Studies	• Develop an Americans with Disabilities Act review checklist
	Roadway Reconfiguration	• Develop methodology for roadway reconfiguration feasibility studies • Adopt a resolution or ordinance supporting a roadway reconfiguration policy to streamline implementation of roadway reconfigurations (see recommended policy language on page 113)
Funding	Strategies for Funding	• Develop a list of potential grant and alternative funding strategies
	Staff	• Hire a dedicated Bicycle and Pedestrian staff person
Project Implementation	Construction Zones	• Create guidance for accommodating bicyclists and pedestrians in construction zones
	Rapid and Interim Facilities	• Develop strategies for rapid network implementation and interim design treatments
Education and Enforcement	Safety and Education	• Coordinate with the Alameda County Safe Routes to School Program and encourage all Hayward schools to participate

IMPLEMENTATION STRATEGY

The Plan cost estimate represents complete corridor costs, including bicycle, pedestrian, and transit infrastructure improvements. Recommendations are tailored to what can be reasonably provided with existing right-of-way, and the planning-level cost estimates include design costs but not right-of-way acquisition. The combined bicycle, pedestrian, and transit supportive infrastructure costs provide an opportunity for the City to seek funding for implementation of complete street projects that support multiple modes.

The total cost for all bicycle facilities is $25.9 to $43.3 million; the total cost for pedestrian facilities is approximately $61.2 million, and the total cost for all transit elements is approximately $9.6 million (all costs presented in 2019 dollars). A range for the cost estimate for bicycle facilities is provided to account for potential low-cost and high-cost implementation scenarios for Class IV Separated Bikeways, which will need to be determined on a corridor by corridor basis. The total cost of all the projects identified in the Plan is between approximately $97-114 million.

Table 3. Costs for Recommended Improvements

Component	Low-End Estimate ($Million)	High-End Estimate ($Million)
Bicycle Network	$25.9	$43.3
Pedestrian Network	$61.2	
Transit Supportive Facilities	$9.6	
Total	$96.7	$114.1

Note: All costs presented in 2019 dollars.

The implementation strategy is broken down into near-term investments and long-term investments. To implement projects rapidly, the City's near-term investments should focus on closing gaps in the existing network and providing access to transit and schools within the next five years. Long-term investments focus primarily on large arterial projects since additional time may be needed for design and construction.

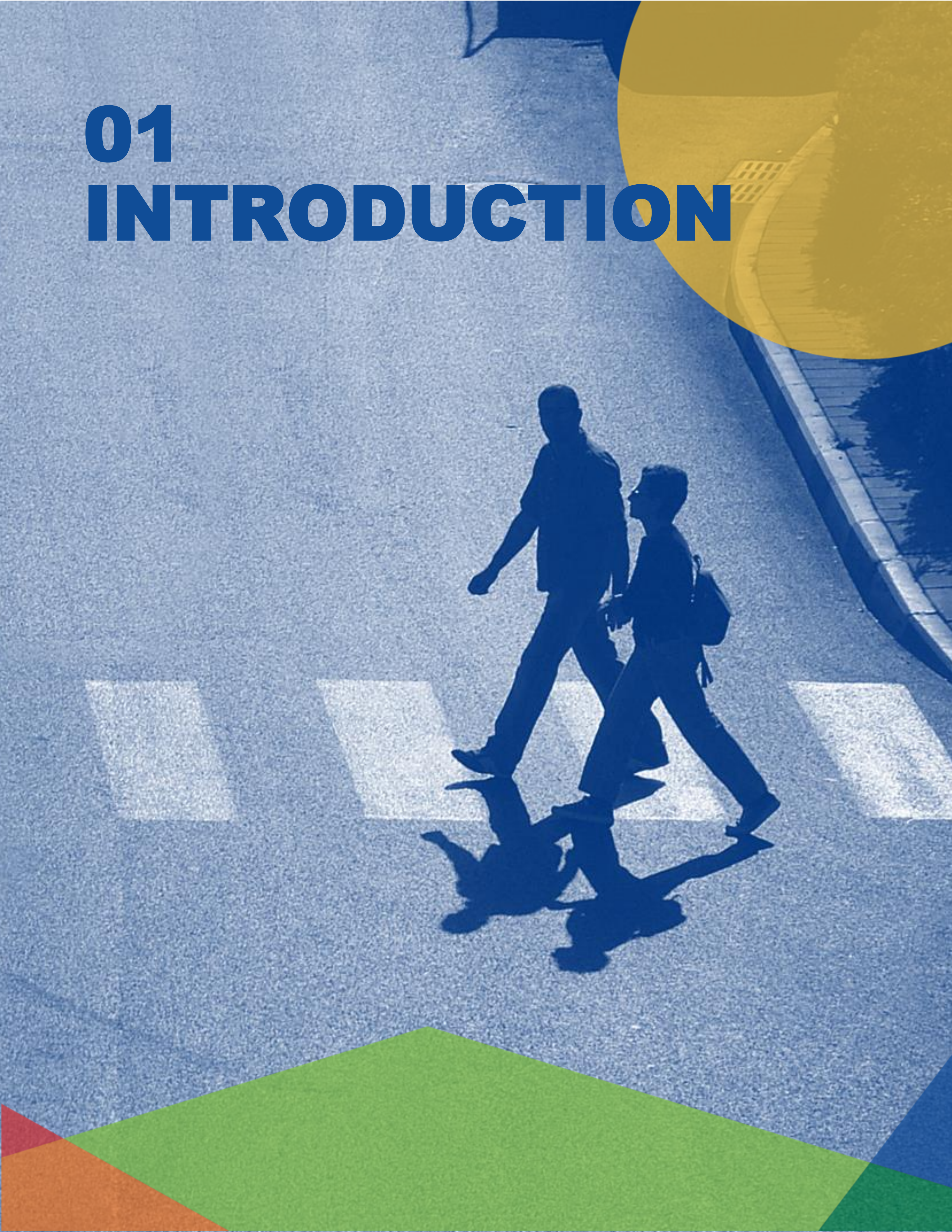
A funding strategy is included in the Plan and summarizes possible funding sources available for projects, policies, and programs over the life of the Plan. Sources include federal, state, regional, and local programs.

Primary sources of funding for the Plan include the sources listed in **Table 4**.

Table 4. Costs for Recommended Improvements

Federal Programs	State Programs	Regional/Local Programs
• Better Utilizing Investments to Leverage Development (BUILD) Grants • Congestion Mitigation and Air Quality (CMAQ) Improvement Program • Surface Transportation Block Grant (STBG) Program • Land and Water Conservation Fund (LWCF) • Rivers, Trails, and Conservation Assistance Program • Community Development Block Grants	• Active Transportation Program (ATP) grants • Sustainable Communities Grants • Strategic Partnership Grants • Adaptation Planning Grants • State Highway Operation and Protection Program (SHOPP) • Highway Safety Improvement Program (HSIP) • Systemic Safety Analysis Report Program (SSARP) • Transit and Intercity Rail Capital Program (TIRCP) • State Transportation Improvement Program (STIP) • Trade Corridor Enhancement Program (TCEP) • State-Local Partnership Program (LPP) • Office of Traffic Safety (OTS Grants • Recreational Trails Program (RTP) • Affordable Housing and Sustainable Communities (AHSC) Program • Transformative Climate Communities (TCC) Program • Environmental Enhancement and Mitigation (EEM) Grant Program • Urban Greening Grant Program • Environmental Justice (EJ) Small Grants Program • Stormwater Management Program • AB 2766 Subvention Program • Coastal Conservancy	• One Bay Area Grants (OBAG) • Transportation Development Act (TDA) Article 3 • Regional Measure 1, 2, 3 and Future Regional Measures • Regional Active Transportation Program • Transportation Fund for Clean Air (TFCA) • Bicycle Rack Voucher Program (BRVP) • Measure WW Urban Creek Grant • Measure FF • Local BART Sales Tax • Measure RR • Measure B • Measure BB • Lifeline Transportation Program (LTP) • Vehicle Registration Fees • Developer Impact Fees • Business Improvement District funds • General Obligation Bonds • Tax Increment Financing (TIF) in new development areas • Voter-approved sales taxes or other levies • User fees • Parking meter revenues

01 INTRODUCTION



INTRODUCTION

The City of Hayward's Bicycle and Pedestrian Master Plan (Plan) establishes the City's vision and comprehensive approach to improving walking and biking in Hayward. The Plan is consistent with the City's General Plan and Complete Street policies, which emphasize a comprehensive, integrated, and connected network of transportation facilities and services for all modes of travel.

PURPOSE OF THE PLAN

The Plan updates and replaces the City's 2007 Bicycle Master Plan. It includes both a bicycle and pedestrian emphasis and sets forth detailed goals and objectives that provide a universally accessible, safe, convenient, and integrated system that promotes walking and biking.

The Plan represents a comprehensive citywide effort that will be used to guide, prioritize, and implement a network of quality bicycle and pedestrian facilities to improve mobility, connectivity, public health, physical activity, and recreational opportunities. The Plan seeks to increase transportation options, reduce environmental impacts of the transportation system, and enhance the overall quality of life for Hayward residents, visitors, shoppers, and commuters.

BENEFITS AND BARRIERS TO BIKING AND WALKING

Safe and convenient places for walking and biking are critical for vibrant, sustainable, and livable communities. Biking and walking bring the following benefits:

- **Environmental Benefits**: Together, biking and walking allow for sustainable and affordable travel and improve access to employment, recreation, school, and other opportunities. The current pace of global warming and sea-level rise has the potential to make active transportation less comfortable, impact the available inhabitable land, and dramatically increase the cost of building and maintaining transportation infrastructure. Promotion of active transportation will play an important role in reversing these trends by promoting a reduction in greenhouse gas emissions from the transportation sector.
- **Public Health:** Promoting walking and biking as viable alternatives to driving can improve physical and emotional health and well-being. Walking and biking with frequency are associated with personal health benefits by providing an opportunity for individuals to incorporate physical activity into daily life. In order to achieve the recommended 30 to 60 minutes of physical activity per day, individuals are generally required to add leisure-time physical activity, including active transportation. Walking and biking also have potential psychological health benefits, including treating anxiety and depression and improving cognitive functioning and subjective well-being. Lastly, health benefits also result from a decrease in vehicle use. This includes improved air quality, reduced noise pollution, and reduced greenhouse gas emissions.
- **First and Last Mile Connections**: Biking and walking also make important connections to transit more convenient, including to BART stations where parking availability can be limited and to local and regional AC Transit bus connections.

There are also considerable barriers to biking and walking. A general typology of bicyclist types has been developed, showing that 51% of the population classified as “Interested but Concerned” with respect to riding.[1] Research has shown that barriers keep individuals from riding, most notably safe infrastructure. There may be other barriers, including inadequate end-of-trip facilities (secure long-term bike parking) or feeling uncomfortable on a bicycle (a need for bicycle education among youth and adults).

Similar safety and security barriers exist for walking. Land use patterns and road infrastructure play a big part in the perception of walking as a viable travel mode, and safe facilities are a prerequisite to encourage walking. As infill development continues in Hayward, higher levels of traffic and scarcity of parking may encourage walking, provided that the infrastructure is in place.

This section provides an overview of existing plans and documents relevant to the Plan. **Table 5** lists relevant existing plans by the types of guidance and direction they can provide for the Plan. Additional detail on the plans and policies is summarized below.

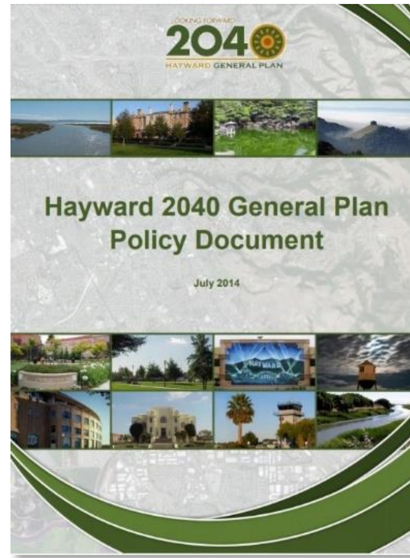
Table 5. Existing Plans & Policy Summary

Plan	Bike Policies	Pedestrian Policies	Facility/ Network Maps	Design Guidelines	Street-Specific Design Concepts	Program Recommen-dations
Hayward 2040 General Plan	●	●	●			●
2007 Hayward Bicycle Master Plan	●		●			●
Hayward Complete Streets Resolution	●	●				
Hayward Design Guidelines	●	●		●		
Mission Boulevard Corridor Specific Plan	●	●		●	●	
Route 238 Corridor Improvement Project	●	●		●	●	
South Hayward BART Development, Design, and Access Plan	●	●	●	●	●	
Downtown Specific Plan	●	●	●		●	●
Neighborhood Plans (16)	●	●	●			●

[1] “Types of Cyclists.” *Jennifer Dill, Ph.D.*, 26 Mar. 2017, https://jenniferdill.net/types-of-cyclists/.

CITYWIDE PLANS AND POLICIES

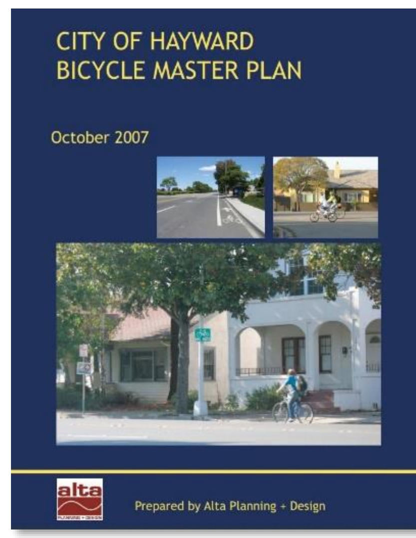
Hayward 2040 General Plan (2014)



https://www.hayward2040generalplan.com/

The Hayward 2040 General Plan provides a blueprint for the City's land use, growth and development, safety, and open space conservation in the coming decades. The Mobility Element of the plan is most applicable to the Bicycle & Pedestrian Master Plan. It presents goals for providing a connected multimodal transportation system; reducing impacts of regional travel; providing complete streets; building a transportation network that is safe and accessible; and decreasing vehicular travel, congestion, and parking demand through transportation demand management strategies.

Hayward Bicycle Master Plan (2007)



https://www.hayward-ca.gov/sites/default/files/Hayward%20Bicycle%20Master%20Plan%202007.pdf

The 2007 Hayward Bicycle Master Plan (BMP) was an update of the 1997 Bicycle Master Plan. It provided long-term vision and direction for bicycle transportation and recreation in Hayward. According to the BMP, its purpose was to expand Hayward's bikeway network and close gaps in the existing network, integrate the city bicycle network into the regional network, develop an implementation strategy (i.e., provide cost estimates and potential funding sources) for proposed bicycle facilities, maximize funding sources, and enhance the quality of life in the city. This plan also inventoried existing bike paths, bike lanes, and bike routes in the city (pre-2007) and provided a list of proposed bikeways, bicycle support facilities, and projects.

Hayward Complete Streets Resolution (2013)

https://www.hayward-ca.gov/your-government/city-council/complete-streets-strategic-initiative

The City of Hayward adopted a Complete Streets Policy in 2013 with the vision of creating and maintaining a safe and efficient transportation system that promotes the health and mobility of residents and visitors, supporting better access to businesses and neighborhoods, and fostering new opportunities. The resolution details complete streets commitments, safe travel requirements, effects on policies and studies, and performance standards and evaluation.

NEIGHBORHOOD AND SPECIFIC PLANS & POLICIES

Mission Boulevard Corridor Specific Plan (2014)

https://www.hayward-ca.gov/sites/default/files/documents/140128-MissionBlvdSpecificPlanEntireDocument.pdf

The Mission Boulevard Corridor Specific Plan guides the redevelopment of Mission Boulevard into a vibrant commercial corridor with safe, desirable, and pedestrian-friendly neighborhoods. The Specific Plan ties into many of the strategies listed in the Land Use Element of the 2040 General Plan and relies heavily on form-based code to regulate redevelopment of the corridor.

Route 238 Corridor Improvement Project (2015)

http://cityofhayward-ca.gov/CITY-GOVERNMENT/BOARDS-COMMISSIONS-COMMITTEES/PLANNING-COMMISSION/pc/2012/pca030812-P01.pdf

The Route 238 Corridor Improvement Project reconstructed curbs, gutters, drainage facilities, sidewalks, median islands, and many pedestrian crossings to include accessible curb ramps. It also retrofitted streetlights and poles with LED lighting, relocated overhead utility lines underground along Mission Boulevard, replaced median concrete with landscaping and street trees, added downtown gateway enhancements, and upgraded traffic signals.

South Hayward BART Development, Design, and Access Plan (2006)

https://www.bart.gov/sites/default/files/docs/SouthHaywardDevelopDesignAccessPlanpartA.pdf

BART adopted a Development, Design, and Access Plan for the South Hayward station to help facilitate efforts to redevelop the station area into a more vibrant and pedestrian-friendly mixed-use neighborhood with increased BART ridership. The Plan works towards achieving BART's transit-oriented development policy, station modal access hierarchy, and modal split goals. The Plan encompasses all land owned by BART, including surface parking lots, an intermodal bus facility, and undeveloped parcels.

Downtown Specific Plan (2019)

https://www.hayward-ca.gov/downtown-specific-plan

The Downtown Specific Plan (Specific Plan) provides a strategy to achieve the community's vision of a resilient, safe, attractive, and vibrant historic downtown by outlining an implementation plan, delineating an inclusive, multimodal circulation system, integrating public open spaces, and establishing new regulations that clearly establish downtown Hayward as the heart of the city and a destination for visitors and residents. The Specific Plan lays out strategies for achieving seven goals, four of which are directly applicable to the Bicycle & Pedestrian Master Plan – community design, travel demand management and parking, circulation, and infrastructure and public facilities. Each goal has strategies, objectives, and recommendations.

PUBLIC OUTREACH/ COMMUNITY INVOLVEMENT PLAN

As part of the Bicycle & Pedestrian Master Plan process, three phases of public engagement activities were conducted to gather input on various Plan components and report what was heard back to the community. The goal of outreach was to inform community members about the Plan, offer ways for individuals to comment on existing bicycle and pedestrian infrastructure, and receive feedback on new walking or biking opportunities. The planned activities and events reached multiple audiences throughout Hayward, not just those who self-identify as bicyclists or pedestrians.

In general, the goals for the Plan's public engagement were:

- To inform the Hayward community about the Plan, planning process, and opportunities for involvement
- To identify and engage key stakeholders interested in, or potentially affected by, the proposed Plan policies, projects, and programs
- To solicit input on current biking and walking issues and opportunities in Hayward
- To identify community needs and priorities for enhancing biking and walking in Hayward
- To build momentum and support for the future implementation of bicycle and pedestrian projects
- To be equitable and balanced across the Hayward community

The public engagement was broken into three phases, as shown in **Figure 9**. The sections below detail the goals of each phase and what activities were conducted.

Figure 9. Public Engagement Process Summary

TECHNICAL ADVISORY COMMITTEE

Community involvement also included the formation and regular meetings of a Technical Advisory Committee (TAC). The TAC included staff from the Public Works Department, Development Services Department, transit agencies, local advocacy groups, Hayward Unified School District, representatives from neighboring jurisdictions, Caltrans, and local business representatives. The City of Hayward extends a very special thanks to members of the TAC who are listed in **Table 6**. The TAC met four times throughout the planning process at key project milestones and helped staff to confirm feedback received from the greater community, develop preliminary recommendations, and `advise on project work.

Table 6. Technical Advisory Committee Members and Organizations

Name	Organization
David Berman & Nathan Landau	AC Transit
Chris Marks	Alameda County Transportation Commission
Ruben Izon	Alameda County Public Works
Mariana Parreiras & Charlie Ream	BART
Susie Hufstader	Bike East Bay
Sergio Ruiz & Gregory Currey	Caltrans District 4
Jeremy Lochirco	City of Hayward Development Services
Suzanne Philis	City of Hayward Economic Development
Erik Pearson	City of Hayward Environmental Services
Gale Bleth	City of Hayward Police Department
Charmine Solla	City of Hayward Public Works Department
Rodney Alfonso	City of Hayward Streets Division
Justina Victoriano	Community Resources for Independent Living (CRIL)
Karl Zabel & Larry Lepore	Hayward Area Recreation and Park District
Kim Huggett	Hayward Chamber of Commerce
Tim Cody	Hayward Unified School District
Reh-Lin Chen	City of San Leandro
Carmela Campbell	City of Union City
Ben Schweng	United Merchants Downtown Hayward

PHASE I – ESTABLISHING THE FOUNDATION (MAY 2018 TO AUGUST 2018)

The first phase of public involvement focused on understanding the current experience of walking and biking in Hayward. Public engagement in this phase included developing online engagement resources (e.g., website and social media content), publishing a Hayward Stack article and an online Wikimap, and tabling at three city events.

Website Launch and On-going Social Media Presence

A project website was created for the project and went live in May 2018. It provided community members with information about the project, including existing conditions, why the Plan is being updated, the Plan schedule, and information on engagement opportunities. The website can be found at: https://www.hayward-ca.gov/content/bike-and-pedestrian-master-plan-update.

In addition to the website, details on the Plan and engagement opportunities were posted on Facebook and Twitter. The City posted content to Twitter on July 10th and July 14th and to Facebook on July 15th in 2018.

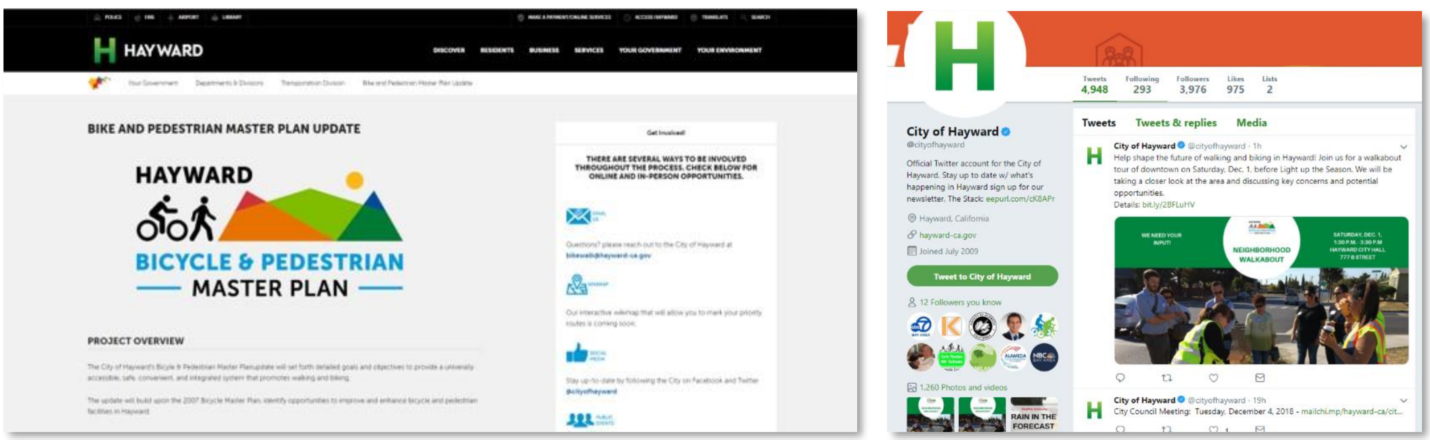


Figure 10. Example Screenshot of Project Website and Social Media Post

Figure 11. Online Wikimap

Online Wikimap

The online interactive Wikimap was accessible to the public via the City's website between May and August 2018. Using the Wikimap, participants were able to give location-specific feedback on existing conditions for walking and biking in Hayward. Participating community members were asked to provide basic demographic information and to mark locations on the map based on how comfortable they felt while walking and biking. Participants could note routes that they liked, stressful routes, barriers to walking or biking, and specific areas that they liked or would like to walk or bike to. A screenshot of the Wikimap is shown in **Figure 11**.

In-Person Pop-Up Stations

During Phase I, project staff attended three community events in Hayward where community members were asked to provide feedback on the existing walking and biking conditions in multiple locations across the city. Community members had the opportunity to write comments and mark up a map with stickers and markers to detail where they liked to walk or bike and where they felt uncomfortable walking or biking. These local events included:

- Downtown Hayward Street Party - June 21, 2018
- Summer Movies in the Plaza - June 29, 2018
- All American Festival - June 30, 2018



Plan Community Engagement Events

Summary of Feedback from Phase I

Input from both the in-person and online feedback was layered to create a set of maps showing where participants wanted to focus bicycle and pedestrian improvements. In general, over 300 comments identified that the key corridors needing bicycle and/or pedestrian improvements were Mission Boulevard, A Street, Winton Avenue/D Street, Harder Road, Tennyson Road, and Industrial Parkway.

Input from the in-person events varied slightly from the online engagement and highlight an interest in new opportunities in downtown Hayward while improving comfort and safety along critical corridors like Industrial Parkway, Tennyson Road, Huntwood Avenue, and Santa Clara Street. Additionally, many participants discussed the Interstate 880 freeway interchanges as a major barrier to east/west access through Hayward. Regional bikeway connectivity was supported through improvements near the potential East Bay Greenway, the San Francisco Bay Trail, and California State University East Bay. Pedestrian comfort and crossing improvements were identified primarily along downtown corridors and on Jackson Street.

Online input focused on major high vehicle traffic corridors including Mission Boulevard, A Street, Hesperian Boulevard, Winton Avenue, and D Street. It was requested that A Street include pedestrian improvements as this route provides access between BART, Downtown Hayward, and the Amtrak station. As with the in-person input, there was a heavy focus on downtown Hayward and Tennyson Road. **Figure 12** shows a heatmap summary of the areas where community members felt improvements were needed (in-person and Wikimap feedback layered together on a single map).

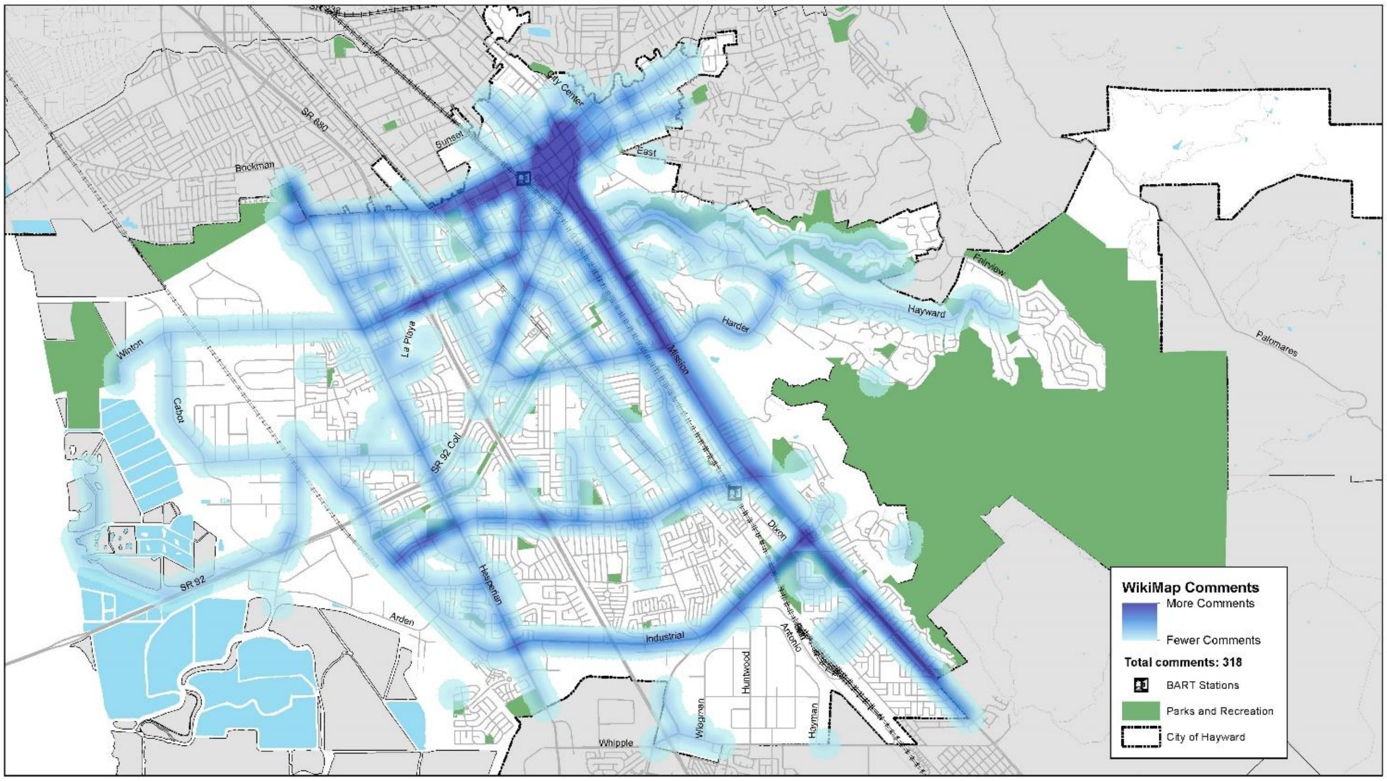


Figure 12. Heatmap Overview of All Input from Phase I Outreach

Beyond location-specific feedback themes, participants were asked about key trends regarding potential barriers to biking and walking in Hayward, as well as what makes biking or walking stressful. **Table 7** summarizes these trends, based on the feedback provided.

Table 7. Top Barriers to Walking and Biking in Hayward

What makes bike routes stressful?	• No designated lanes • Traffic is too fast • Too much traffic
What makes walking routes stressful?	• Generally uncomfortable • Traffic is too fast • Not enough lighting
What are barriers to biking?	• High-speed vehicles • Heavy traffic • Safety at intersections
What are barriers to walking?	• Safety at intersections • High-speed vehicles • Highway or railroad barriers

In addition to the feedback shown in **Table 7**, community members identified some areas where Hayward's bike and pedestrian networks fall short. These included:

- Lack of crosswalks and curb ramps
- Lack of lighting under bridges and at railroad crossings
- Lack of bicycle detection at intersections
- Lack of enforcements for cars parked in bike lanes
- Bike lanes are not continued through intersections

PHASE II – INITIAL RECOMMENDATIONS (SEPTEMBER 2018 TO MARCH 2019)

Using public input from Phase I, multiple locations were selected for community walking audits. These tours offered opportunities for community members to interact with project staff and each other while experiencing the walking and biking environment in various areas of Hayward. The goal of the walking audits was to identify priority projects within each neighborhood or area, which could be integrated into the Plan's recommended project list.

The walking audits were:

- Tennyson Corridor (September 21, 2018): Community Pedestrian & Bicycle Safety Training in partnership with CalWalks and UC Berkeley SafeTrec at the Weekes Community Center
- Downtown Hayward (December 1, 2018): Community walk from Hayward City Hall
- Hesperian Corridor (January 24, 2019): Community walk from Chabot College Community Event Center

Summary of Feedback from Phase II

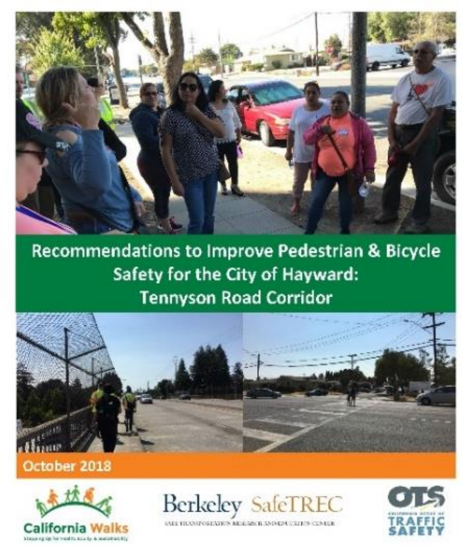
At the end of each walking audit tour, each group produced a map that highlighted major challenges or barriers and reported what they experienced back to the group. To help narrow down priorities, each group was asked to identify the top three things in the project area that they would like to see included in the final project recommendations. The main issues and needs identified at each walking audit are described below, along with accompanying pictures.

Tennyson Corridor (25 participants):

- Streetscape and roadway improvements with enhanced pedestrian crossing treatments on Patrick Avenue
- Pedestrian-oriented street lighting on the primary street and at crossings community-wide
- Low-stress bikeways to connect with BART and across the freeway on Tennyson Road

Downtown Hayward (12 participants):

- Pedestrian improvements, such as signal heads with countdowns, well-lit crosswalks, and push buttons community-wide
- Near-term bikeway connectivity on 2nd Street/Main Street and B Street/C Street Couplet
- Long-term bikeway connections to downtown on Foothill Road and Mission Boulevard



Source: City of Hayward

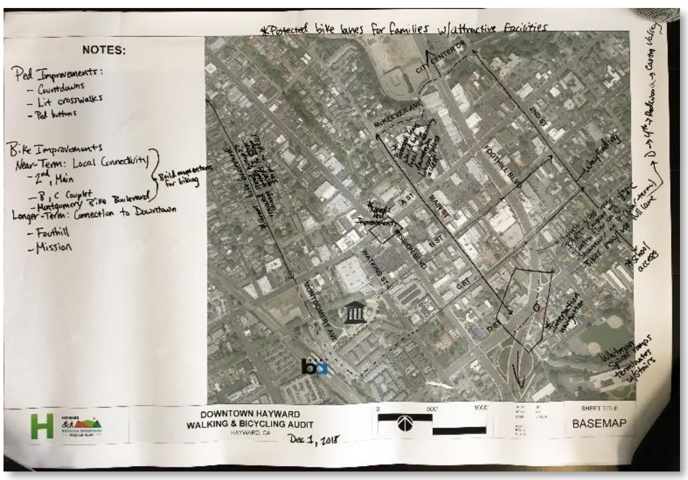
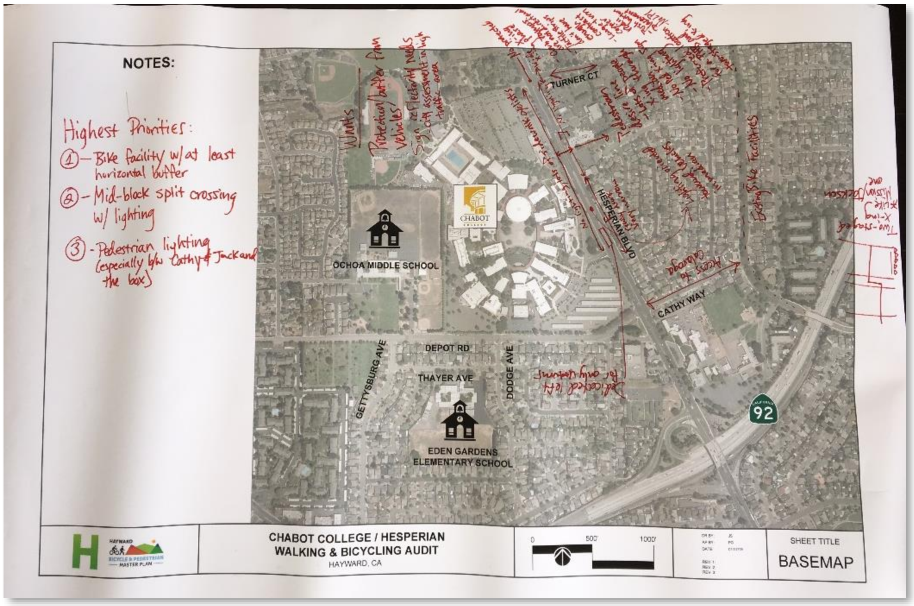


Figure 13. Tennyson Corridor and Downtown Walking Audit, Community Input Map, and Safety Training Photos

Hesperian Corridor (11 participants):

- Bike facilities with raised buffers on Hesperian Boulevard
- Midblock, split-phase Pedestrian Hybrid Beacon crossing with lighting in front of Chabot College
- Better pedestrian-scale lighting community-wide
- Dedicated bike facility to provide access to Chabot College, Anthony W. Ochoa Middle School, and Eden Gardens Elementary School on Depot Road
- Traffic calming and intersection improvements to improve safety and comfort near Eden Garden Elementary School



Hesperian Boulevard Corridor Walking Audit Example Community Input Map and Tour Photo

The feedback from these walking audits was compared with a previous bike network evaluation, which measured collision rates, determined level of traffic stress, and reviewed other citywide priorities. More about these efforts can be found in the Existing Conditions, Bicycle Network Development, and Program and Policy Recommendations sections of this Plan. This comparison helped the project team create a draft walking and bicycle network to be evaluated in Phase III.

PHASE III – PRIORITIZATION AND FINAL RECOMMENDATIONS (APRIL 2019 TO NOVEMBER 2019)

Public engagement for Phase III was designed to review the draft network and project list and to help identify which of the proposed facilities are the most important to prioritize. Phase III consisted of three components, including an online interactive web map, pop-up input stations, and a Technical Advisory Committee meeting.

Online Interactive Web Map

An online interactive Wikimap was accessible to the public via the City's website for the months of May and June 2019. The Wikimap showed the current and proposed bicycle network and allowed participants to comment. About 50 participants provided input on locations where improvements should be prioritized.

In-Person Pop-Up Input Stations

During Phase III, project staff attended two community events in Hayward where community members were able to comment on the proposed network and learn more about the implementation of the Plan. Participants were given three voting dots to indicate which proposed recommendations were most important to them. These local events are listed below.

- Earth Day 36th Annual Clean-up (April 27, 2019)
- Bike to Work Day BART Energizer Stations: Downtown & South Hayward Stations (May 9, 2019)

Photos from the Earth Day and Bike to Work Day Pop-Up Input Events

Input from both the online survey and in-person pop-up input stations were combined to assess citywide priorities. These corridors are listed below and presented in **Figure 14**.

- Downtown Corridors
  - A, B, C, and D Streets
  - Main Street
  - 2nd Street
  - Foothill Boulevard
  - Mission Boulevard
- Winton Ave/D Street
- West A Street
- Whitman Street
- Hesperian Boulevard
- Industrial Parkway
- Industrial Boulevard
- Tennyson Road
- Patrick Avenue
- Harder Road
- San Francisco Bay Trail
- East Bay Greenway
- Eden Greenway & I-880 Bicycle/Pedestrian Crossing
- Clawiter Road
- San Lorenzo Creek Trail

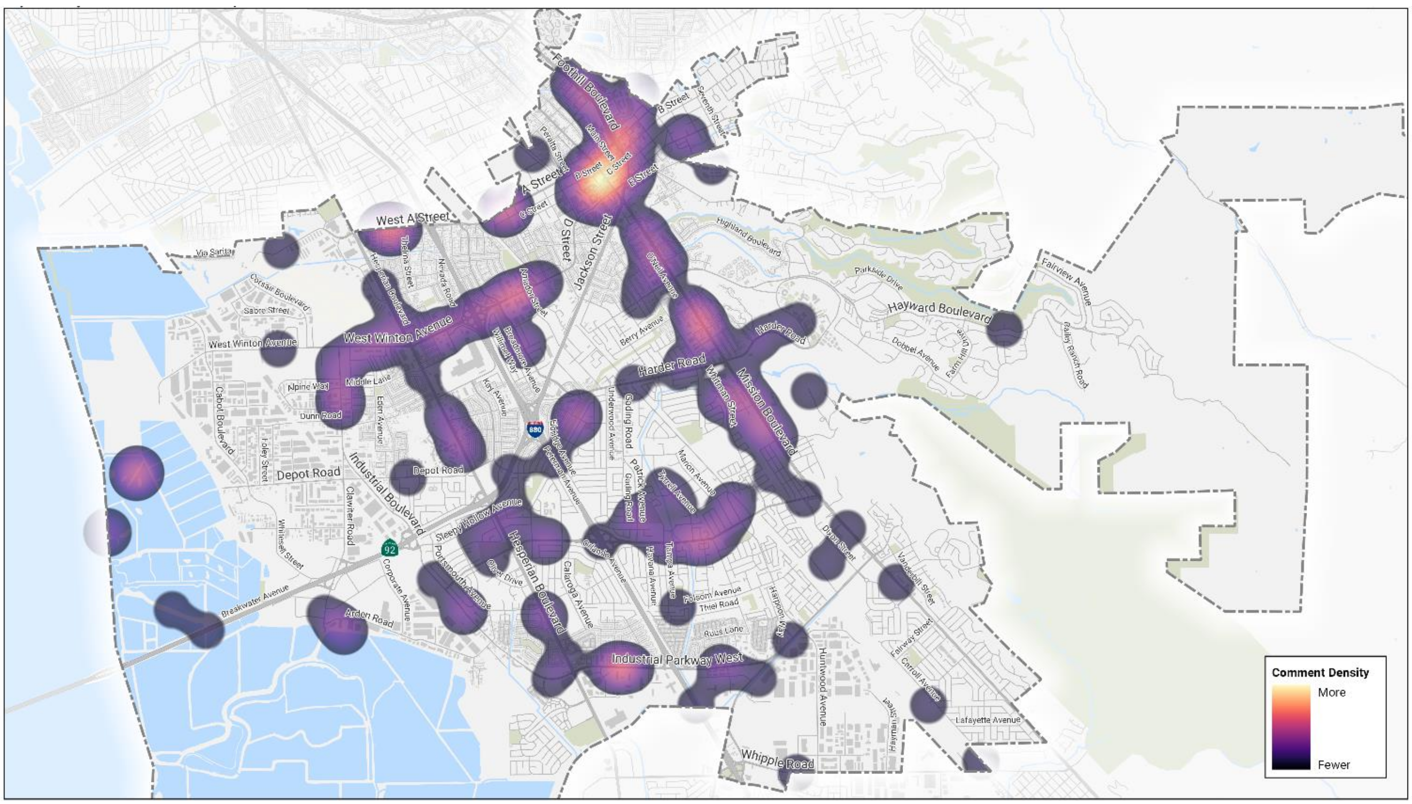
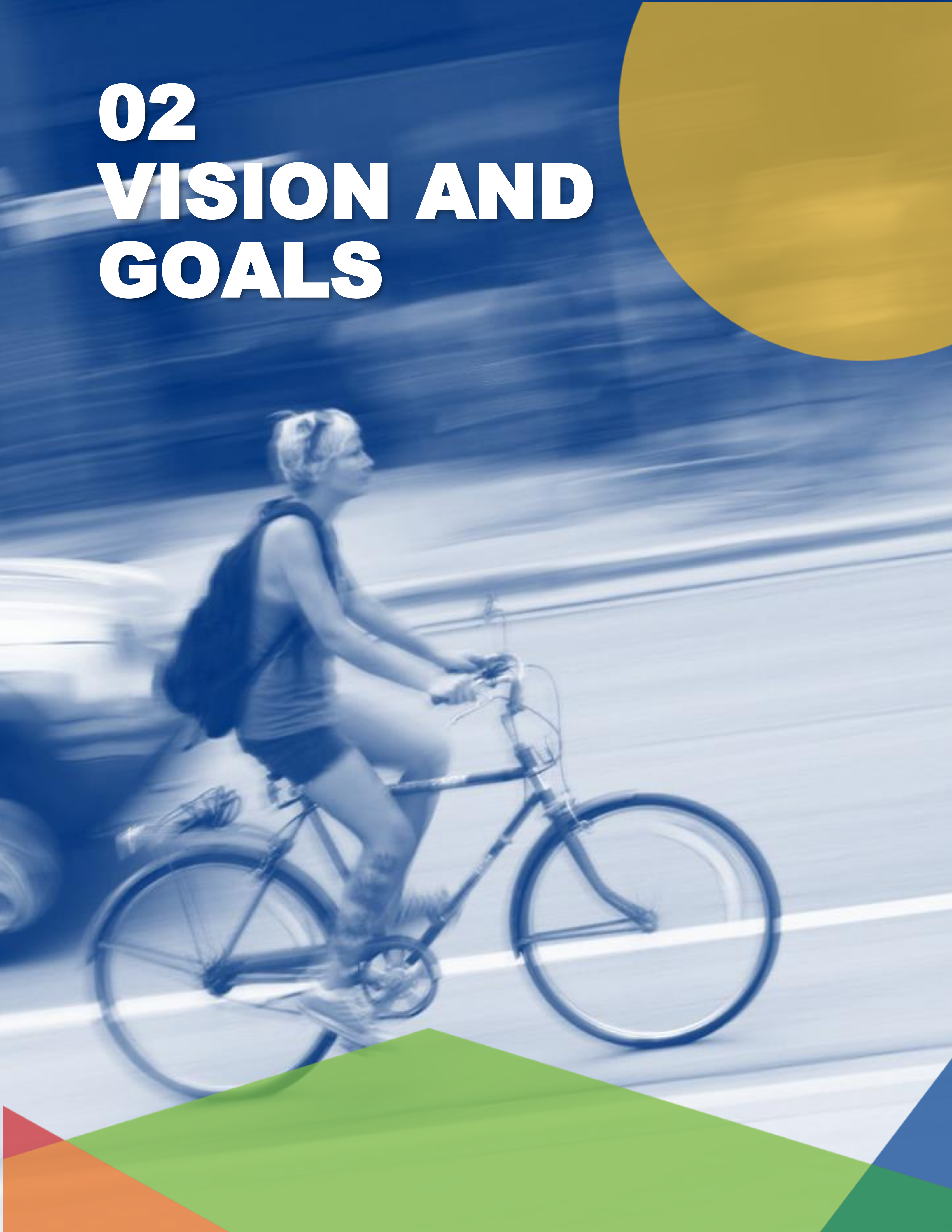


Figure 14. Heatmap Overview of All Input from Phase III Outreach

02 VISION AND GOALS



VISION AND GOALS

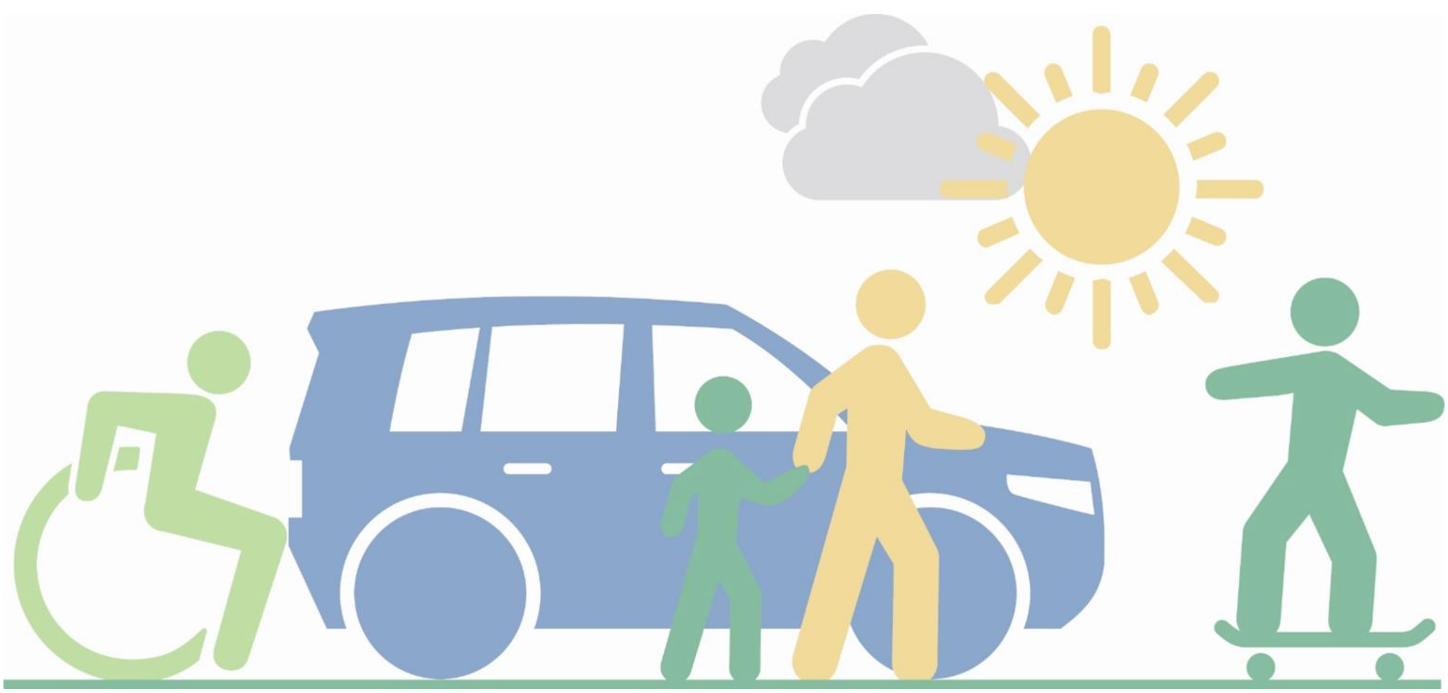
This chapter presents the visions and goals developed to guide the City with improving active transportation. It also summarizes the performance measures that the City will use to track the progress of the Plan's implementation.

VISION STATEMENT

The vision statement below is based on the following General Plan Guiding Principle and Complete Streets Strategic Initiative.

- **General Plan Guiding Principle 7**: Hayward residents, workers, and students should have access to an interconnected network of safe, affordable, dependable, and convenient transportation options.
- **Complete Streets Strategic Initiative** to build streets that are safe, comfortable, and convenient for travel for everyone, regardless of age or ability, including motorists, pedestrians, bicyclists, and public transportation riders.

VISION STATEMENT: The City of Hayward's transportation system provides a safe, comfortable, convenient, and connected walking and biking network for people of all ages and abilities and is supported by programs and policies that promote sustainable transportation and complete communities.



GOALS

The vision helped to provide the framework for the Plan's goals to improve walking and biking in Hayward. The goals are based on those identified in the 2040 General Plan and Complete Streets Strategic Initiative. The goals of this Plan are Safety, Complete Streets, Access & Mobility, and Funding & Implementation.

Plan Goals

1 Safety

Increase the safety of people bicycling and walking in the City of Hayward by identifying projects that address the greatest safety needs and prioritizing safety for all modes.

2 Complete Streets

Provide complete streets that balance the diverse needs of users of the public right of-way.

3 Access & Mobility

Create connected networks and a continuous system of streets and trails that enable people of all ages and abilities to walk and bike to meet their daily needs and incorporate physical activity into everyday activities.

4 Funding & Implementation

Maintain sufficient funding to provide for existing and future transportation needs, including supporting programs and operation and maintenance.

PERFORMANCE MEASURES

In order to measure the success of the goals, performance measures and targets were developed to quantify each goal. These measures were developed and refined in consultation with the Plan's Technical Advisory Committee (TAC). Some of the performance measures were developed based on the City's Strategic Initiative, Two-Year Action Plan, and 2040 General Plan. These performance measures are intended to provide an easy way to track progress for the life of the Plan. These performance measures are listed in **Table 8**.

Table 8. Performance Measures

Goal	Proposed Performance Measure	Existing	Target
Safety	Average speed at specific locations measured annually*	Varies by location	85th percentile speeds at or below posted speed
	Number of ped/bike fatalities and serious injury collisions	3.5 fatal/severe injury bicycle collisions per year 9.4 fatal/severe injury pedestrian collisions per year	Eliminate fatal and severe injury bicycle and pedestrian collisions by 2030
Complete Streets	Miles of new or replaced sidewalk*	Not inventoried	Add 2 miles of sidewalks per year
	Miles of new or upgraded bike lanes*	Class 1: 3 lane miles Class 2: 51 lane miles Class 3: 68 lane miles	Add 10 miles of bicycle facilities per year
	Number of new or enhanced crosswalks*	Not inventoried	Make all new or restriped crosswalks high-visibility markings
Access & Mobility	Walk and bike mode share	Walk commute share: 2.3% Bike commute share: 1.1%	Double walk and bike commute mode share by 2030 Target bike mode share: 4.6% Target walk mode share: 2.2%
	Number of ADA improvements	Not inventoried	
Funding & Implementation	Percentage of network implementation	N/A	100% priority network complete by 2030
	Percentage of funding provided by grants*	N/A	

 Increase  Maintain or increase

Notes:

**Indicates performance measure from the Complete Streets Strategic Initiative:*

https://www.hayward-ca.gov/your-government/city-council/complete-streets-strategic-initiative

03 EXISTING CONDITIONS

EXISTING CONDITIONS

This chapter discusses the state of biking and walking in Hayward, the existing bicycle and pedestrian network, and the analyses performed with respect to these networks. These findings helped to determine recommendations for programs and policies, bikeway and pedestrian facility improvements, and the overall creation of the Plan.

STATE OF BIKING AND WALKING IN HAYWARD

To better plan for future walking and bicycle infrastructure and programs, it is important to understand who is currently being served by existing infrastructure and who could be better served by the Plan. **Table 9** summarizes the key demographic trends related to walking and biking in Hayward. The following sections go into more detail on why these trends exist and the data behind them.

Table 9. Demographic Summary

WHO IS WALKING MORE	WHO IS BIKING MORE
• Low-income workers • High school and college students • Workers ages 25 to 44 • People slightly above the poverty line • People with one or two vehicles available at home • Women • Hispanic/Latinx residents	• Low-income and high-income workers • High school and college students • People below the poverty line • People with no vehicles available • Men • Hispanic/Latinx residents • People aged 65 and older
WHO IS WALKING LESS	**WHO IS BIKING LESS**
• High-income workers • Workers ages 45 to 55 years old • People with three or more vehicles available at home • People aged 65 years and older • Men	• Moderate-income workers • Workers aged 45 to 55 years old • People with only one vehicle available at home • Women • Black or African American Residents

As the table reveals, the prevailing groups of people walking and biking in Hayward are consistent with general trends. Vehicle ownership and income are negatively associated with walking. Hispanic/Lantinx residents walk and bike more relative to other races and ethnicities.

SUMMARY OF COMMUTING DATA

Hayward is located in the heart of the San Francisco Bay Area in central Alameda County. It is a major suburban center with a growing downtown, and it is uniquely situated to provide access to major employment hubs in Oakland, San Francisco, Silicon Valley, and the Tri-Valley. Hayward is the third largest city in Alameda County, with a population of approximately 160,000 people.

Approximately 75,000 Hayward residents commute to work throughout the Bay Area, with most people commuting by car (82% of commuters). A much smaller proportion of residents take transit (9.3%), walk, or bike to work (2.3% and 1.1%, respectively). Of the 9.3% who take transit to work, many may walk or bike to reach transit stops, as shown in **Figure 15.** Additionally, over 75% of Hayward residents commute outside of the city for work, including 35% of residents who travel outside of Alameda County for work. Commute data provides an understanding of how people travel to and from work. However, the US Census only provides Journey to Work data for the primary mode of transportation, which would not include information on other trips, such as walking or biking trips that connect with regional transit services. Additionally, work and work-related trips only account for 16% of all travel.

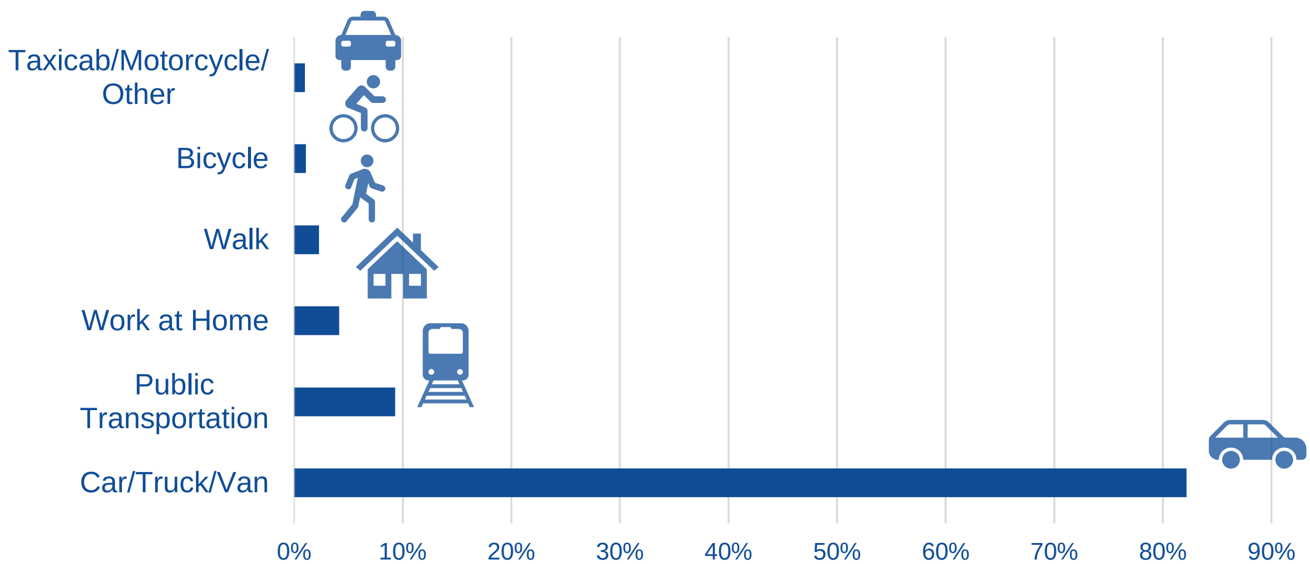


Figure 15. Community Mode Share, Hayward Residents

Source: US Census, ACS 2016 1-year estimates
Note: *These data represent respondents' primary reported commute modes. Respondents reporting transit as their primary mode may be walking or biking to transit connections; those trips would not be captured here.*

NON-COMMUTE TRIPS

Hayward residents travel for many reasons other than work commutes. In fact, as shown in **Figure 16**, running errands and shopping account for almost half of all trips within Hayward. Recreational and social outings account for another quarter of all trips made within the city. Planning for better connections to key destinations for shopping, entertainment, and recreation areas may provide more opportunities to encourage people to walk or bike.

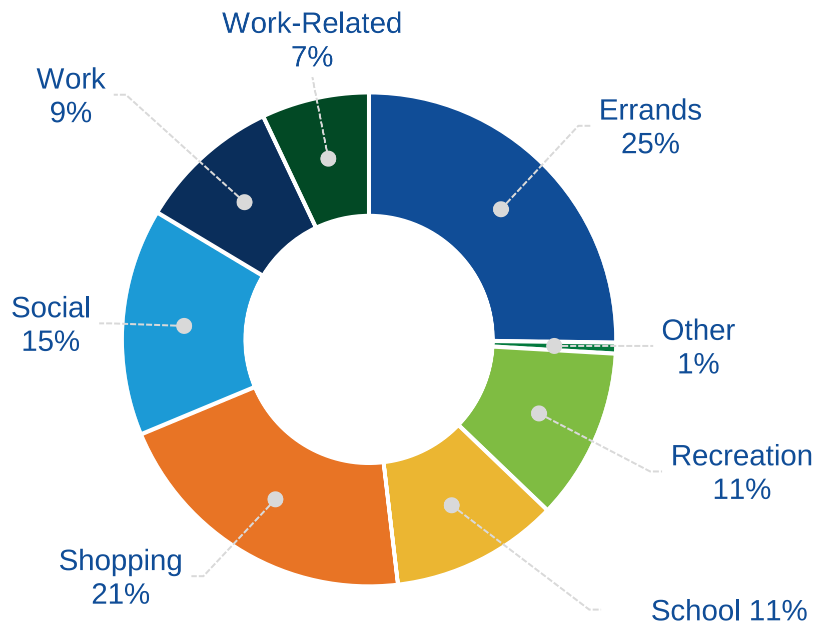


Figure 16. Trip Purposes for All Transportation Modes
Source: California Household Travel Survey, 2013

Short trips present an opportunity for walking or biking. Almost 30% of all non-work trips made by Hayward residents are less than one mile in length. Another 30% of all non-work trips that start or end within the city fall within the one to three-mile range which is a relatively accessible biking distance for many people, depending on a number of factors including age, ability, comfort level, equipment, weather, perception of safety, vehicle speeds and volumes, presence of bike facilities, and topography. **Figure 17** shows the distribution of trip distances among non-work trips that start or end within the city.

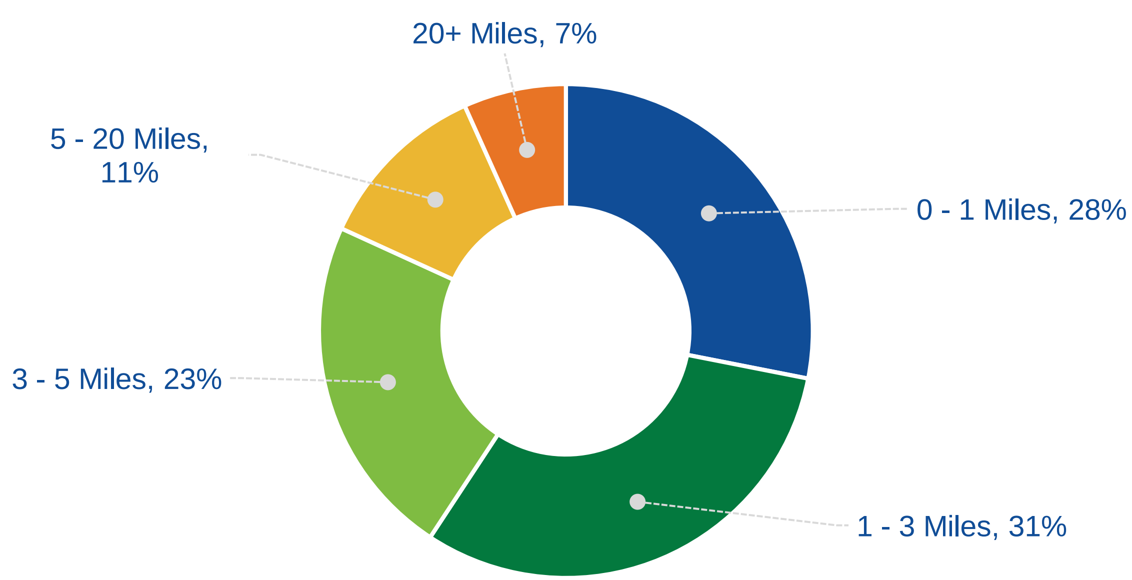


Figure 17. Non-Work Trip Distances for All Transportation Modes
Source: California Household Travel Survey, 2013

DEMOGRAPHICS

Race & Ethnicity

As demonstrated by Hayward's Commitment for an Inclusive, Equitable, and Compassionate Community (CIECC), Hayward supports diverse and inclusive communities. Approximately 42% of Hayward's population is Latinx, 28% is Asian or Pacific Islander, 18% is White, 7% is Black, and 5% are of mixed race. **Figure 18** presents Hayward's population by racial groups, as well as biking and walking commute rates by race. Latinxs make up the largest proportion of the population, and almost half of the proportion of users who walk or bike to work at approximately 42%. Asian or Pacific Islanders make up the second-highest proportion of the population but make disproportionately fewer walk or bike trips (approximately 27%) relative to their population share.

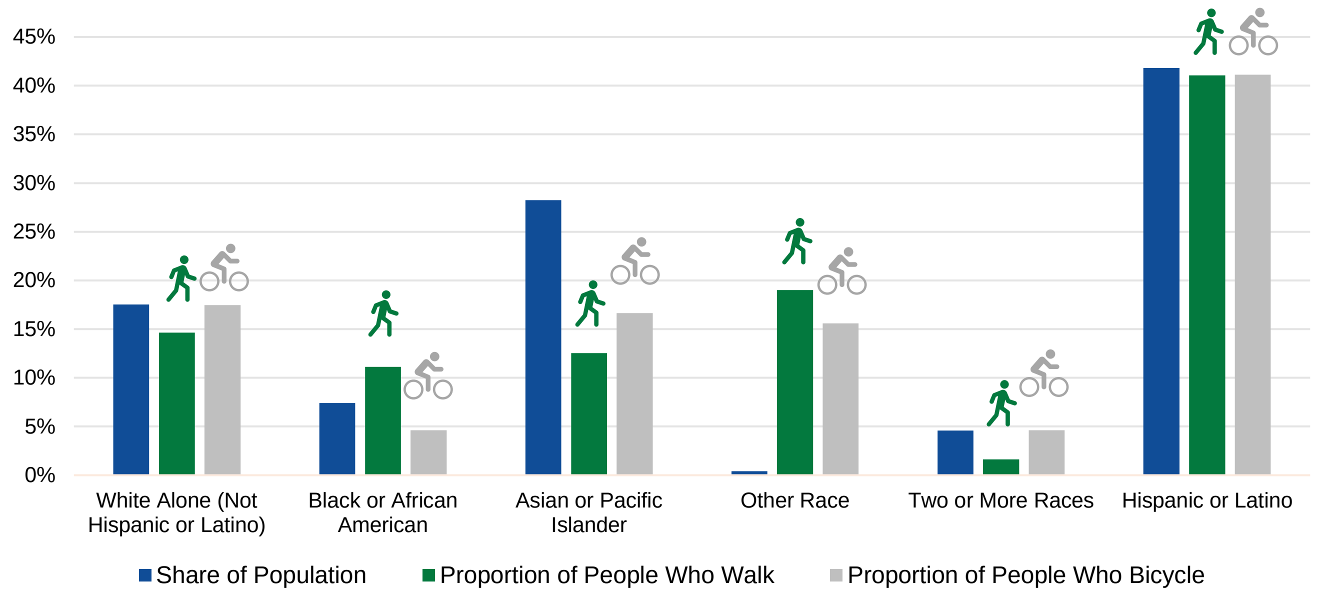


Figure 18. Population and Walk/Bike Commute Mode Share by Race

Source: US Census, ACS 2016: 1-year estimate

AS DEMONSTRATED BY HAYWARD'S COMMITMENT FOR AN INCLUSIVE, EQUITABLE, AND COMPASSIONATE COMMUNITY (CIECC), HAYWARD SUPPORTS DIVERSE AND INCLUSIVE COMMUNITIES

INCOME & POVERTY STATUS

Approximately 35% of workers in Hayward earn an annual income of less than $25,000 per year. More than half of walking and bicycle commuters have incomes below $25,000 per year. Workers with annual incomes over $75,000 make up about 20% of the population, but approximately 32% of the bicycle commuter population. This means that people in both the highest and lowest annual income categories are more likely to bike to work. However, residents making over $75,000 per year are far less likely to walk to work. **Figure 19** shows all commuter income levels compared with those of just people who walk or bike.

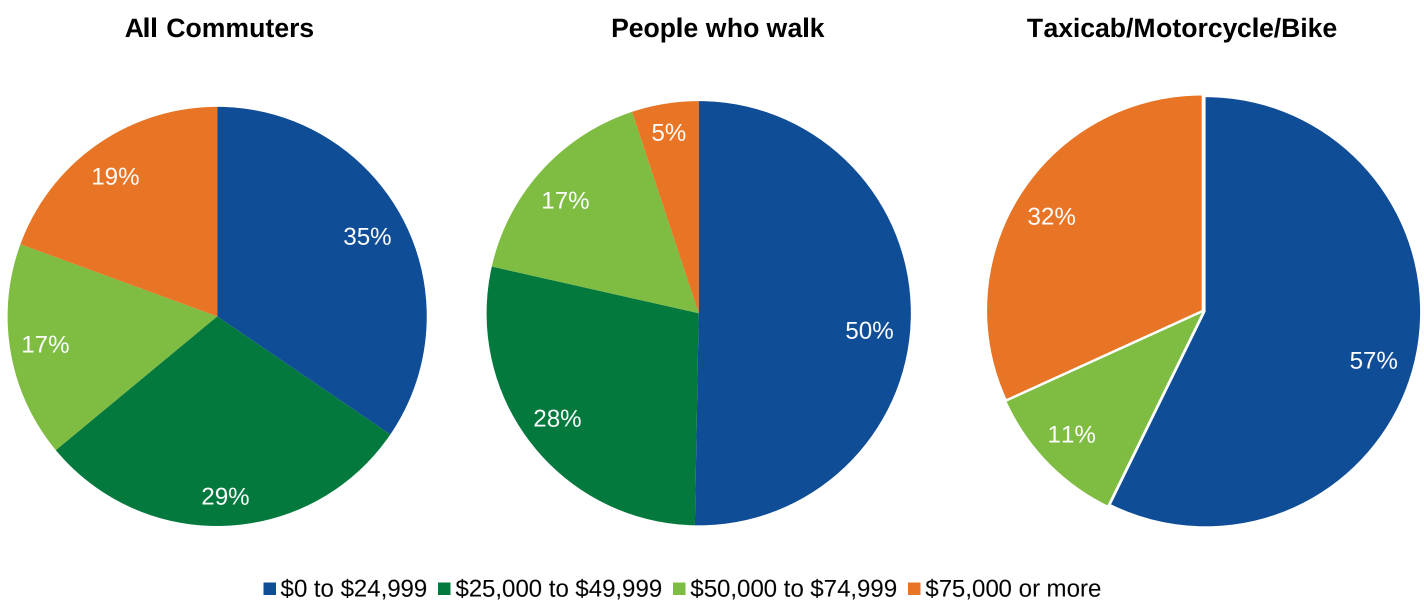


Figure 19. Income and Walk/Bike Mode Share

Source: US Census, ACS 2016: 1-year estimates

Many of Hayward's residents may need to walk or ride out of necessity, to get to work. Poverty status is one indicator of need; the Census sets poverty thresholds based on family size (i.e., number of children). For a family of four, the poverty line is approximately $25,000 annual income. Almost five percent of Hayward's population is below the poverty line, while another six percent makes at or below 1.5 times the poverty threshold.

VEHICLE OWNERSHIP

Over 80% of Hayward workers have two or more vehicles available at home. Almost half of people who walk to work own two or more vehicles. Interestingly, over 40% of people who bike to work own three or more vehicles, as shown in **Figure 20**. The number of vehicles available to a household is not by itself a predictor of commute mode in Hayward.

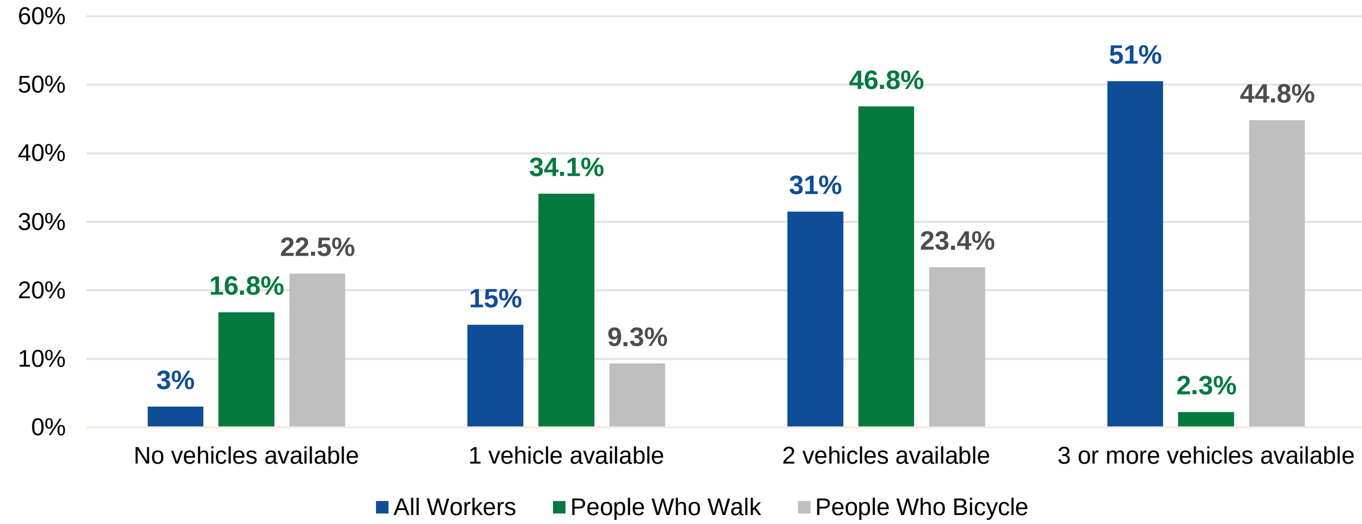


Figure 20. Vehicle Ownership and Walk/Bike Mode Share

Source: US Census, ACS 2016: 1-year estimate

Gender

Hayward has an almost 50/50 split of male and female commuters, as seen in **Figure 21**. However, consistent with national trends, men are more likely than women to bike to work. In contrast, the number of women that walk to work is twice the number of men that walk to work.

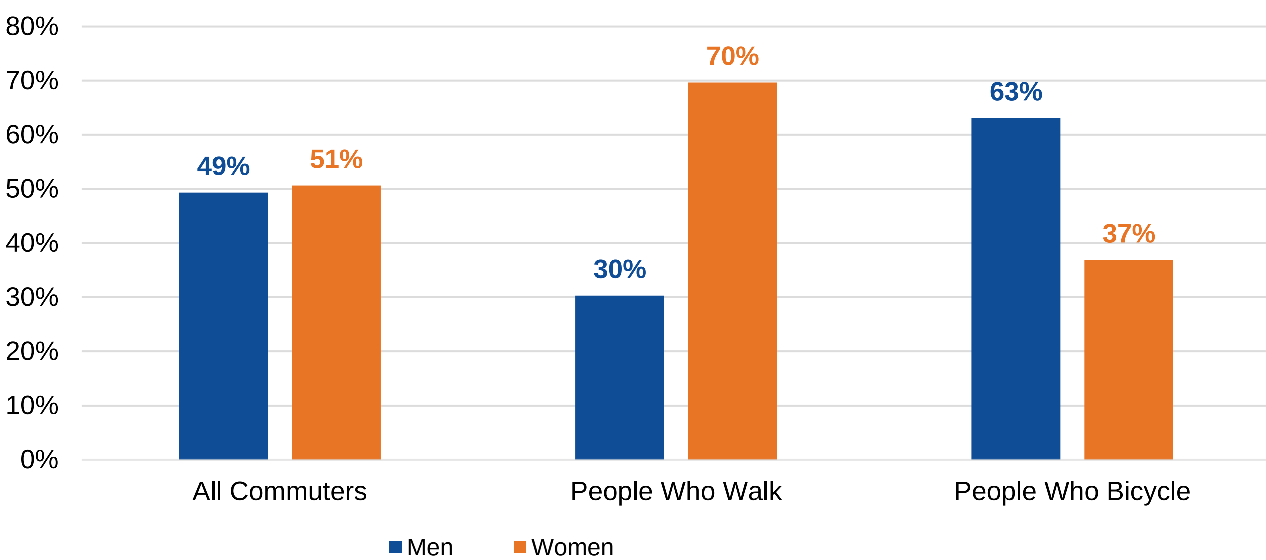


Figure 21. Gender and Walk/Bike Mode Share

Source: US Census, ACS 2016: 1-year estimates

DISADVANTAGED NEIGHBORHOODS

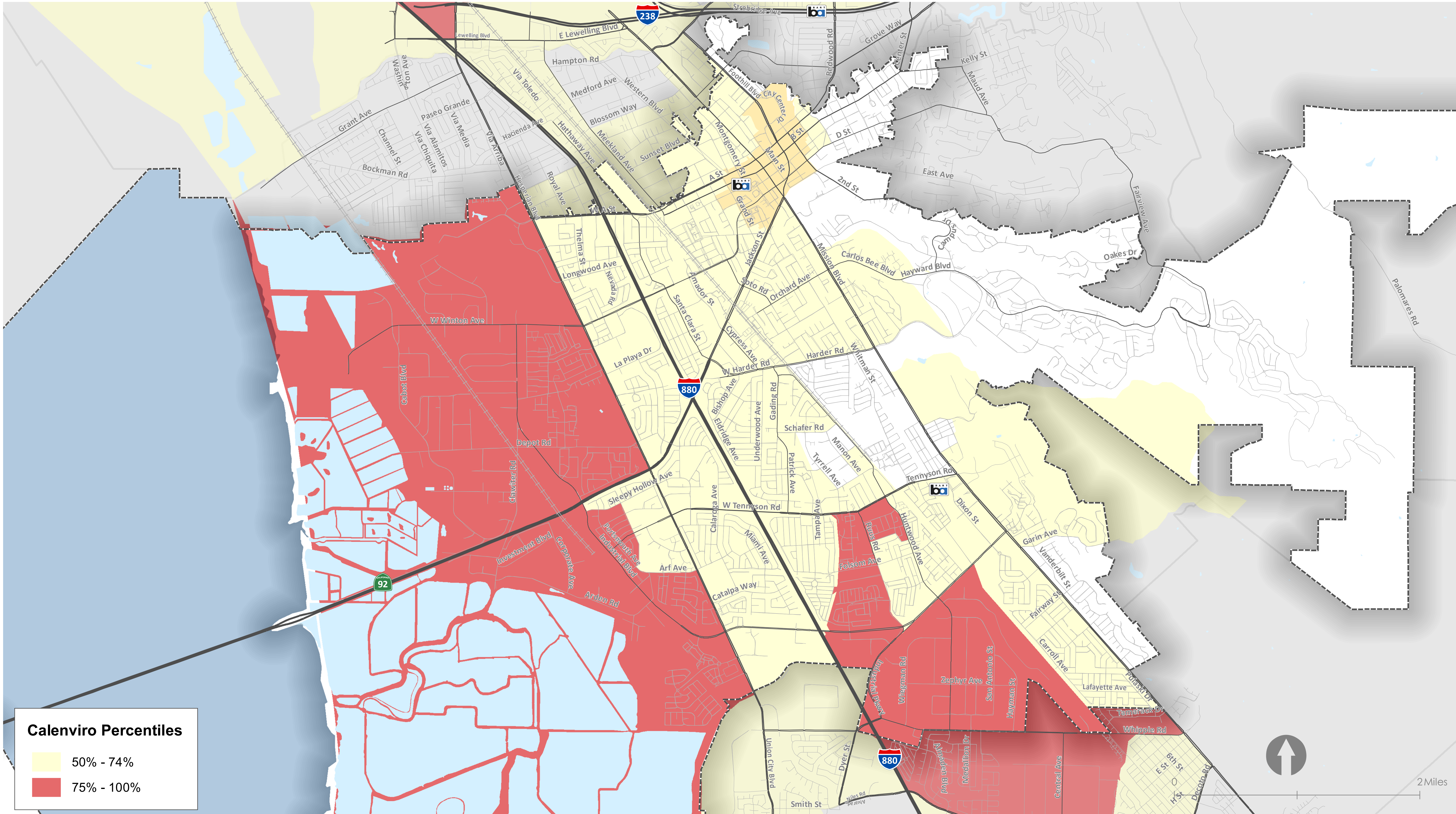
Local neighborhood characteristics and equity issues were assessed using the Office of Environmental Health Hazard Assessment's (OEHHA) CalEnviroScreen tool. The CalEnviroScreen tool uses socioeconomic and environmental health data to map disadvantaged areas as determined by a number of indicators. Specifically, it uses pollution exposure, environmental effect, sensitive population, and socioeconomic indicators. **Table 10** provides a summary of the pollution burden and population characteristics analyzed as part of the CalEnviroScreen tool.

Table 10. CalEnviroScreen Disadvantaged Communities Indicators

Pollution Burden	Population Characteristics
EXPOSURE • **Ozone concentrations in air** • **PM 2.5 concentrations in air** • **Pesticide Use** • **Diesel particulate matter emissions** • **Drinking water contaminants** • **Toxic releases from facilities** • **Traffic density**	**SENSITIVE POPULATIONS** • Asthma emergency department visits • Cardiovascular disease (emergency department visits for heart attacks) • Low birth-weight infants
ENVIRONMENTAL EFFECTS • **Toxic cleanup sites** • **Groundwater threats from leaking underground storage sites and cleanups** • **Hazardous waste facilities and generators** • **Impaired water bodies** • **Solid waste sites and facilities**	**SOCIO-ECONOMIC FACTORS** • Educational attainment • Housing burdened low-income households • Linguistic isolation • Poverty • Unemployment

Source: CalEnviroScreen, California Office of Environmental Health Hazard Assessment

The CalEnviroScreen tool produces an overall score for each census tract and compares the results as percentiles across all of California. Communities within the top 25th percentile statewide are considered disadvantaged communities under the California Department of Transportation (Caltrans) Active Transportation Program grant guidelines. These areas within Hayward are in the western and southern industrial portions of the city. Additional opportunity focus areas that do not meet the statewide definition but are still within the top 40th percentile are adjacent to many of the industrial areas and along major transportation corridors. **Figure 22** shows the distribution of CalEnviroScreen scores for areas of Hayward.



HAYWARD BICYCLE & PEDESTRIAN MASTER PLAN

KITTELSON & ASSOCIATES

TOOLE DESIGN

Figure 22

Disadvantaged Communities (Top 25th Percentile) and Opportunity Focus Areas (Top 40th Percentile)
City of Hayward

TRANSIT ACCESS/ VEHICLE USE

The two largest transit providers in Hayward are Bay Area Rapid Transit (BART) for rail service and AC Transit for bus service. Additionally, California State University East Bay (CSUEB) operates a shuttle service that connects with the Hayward and Castro Valley BART stations and is provided for free or at a reduced cost for students and faculty. **Figure 23** shows all AC Transit bus stops in Hayward and identifies the top 20 stops in terms of daily boardings/alightings. The highest ridership stops typically fall along major arterials within Hayward (e.g., Hesperian Boulevard, Tennyson Road, and Mission Boulevard) at large retail sites, employment centers, transportation hubs, or schools (e.g., Southland Mall, Chabot College, AC Transit Division 6 Facility, Hayward and South Hayward BART stations, and downtown Hayward). Most of these stops are not well connected to Hayward's existing network of bike lanes and signed bicycle routes.

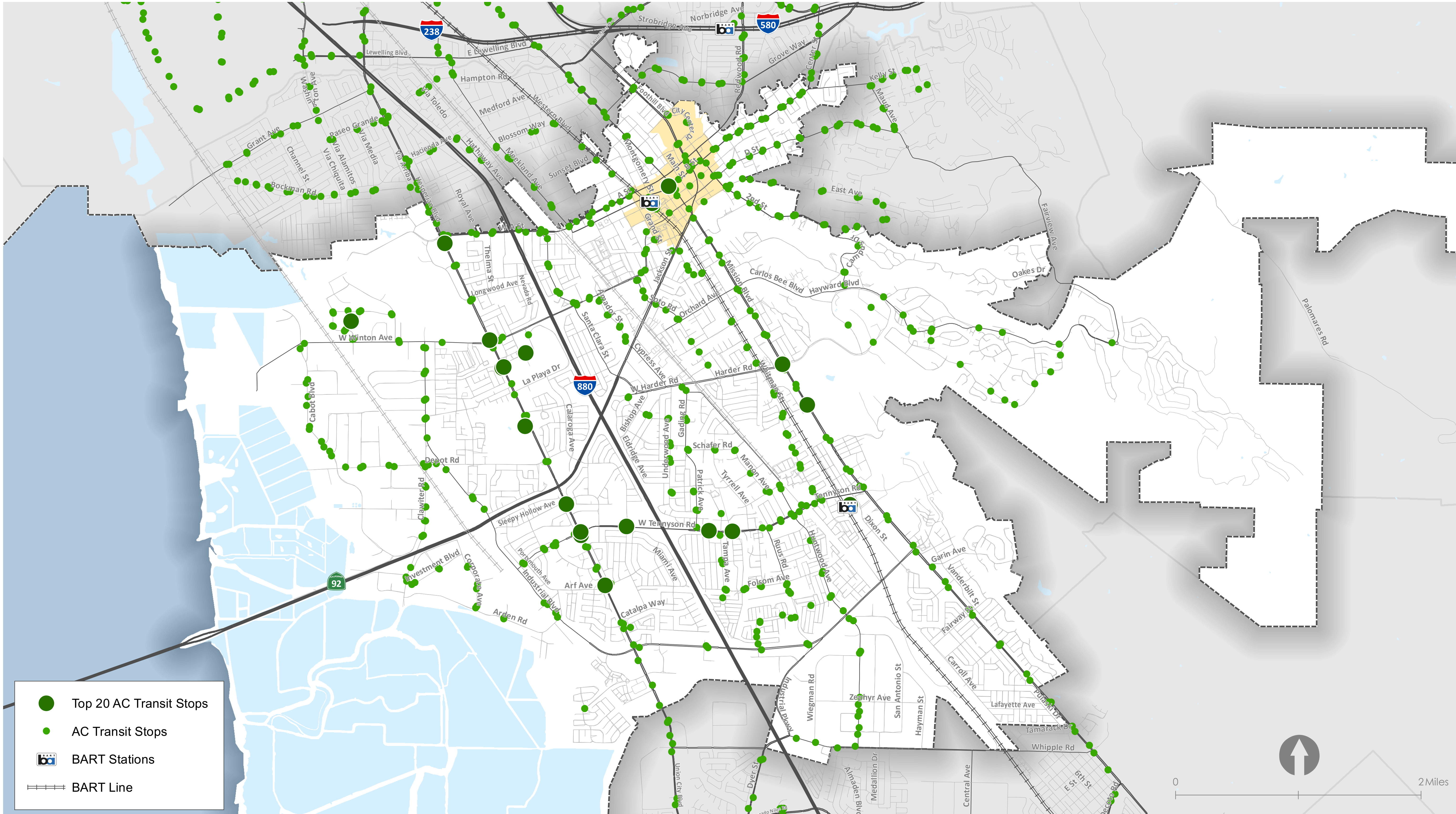


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Figure 23

AC Transit Bus Stops in Hayward
City of Hayward

Located in Hayward's downtown, the Hayward BART station serves about 5,600 daily riders. The South Hayward BART station serves almost 3,500 daily riders and is in a primarily residential setting between the Tennyson-Alquire and Mission-Garin neighborhoods in the southeastern portion of the city. **Figure 24** shows the makeup of the different transportation modes used to get to and from each BART station. Almost one-third of riders using the downtown Hayward BART station and a quarter of riders using the South Hayward station walk to access BART. A larger proportion of riders walk to BART at each Hayward station (24-31%) than bike to each (5%). A lower bicycle mode share to BART stations may be attributed to relatively disconnected or existing high-stress networks of bicycle facilities serving each station area and a low number of secure bicycle parking spaces at the stations. The Hayward BART station has 106 total bike parking spaces, of which only 26 are secure spaces (electronic or keyed lockers). The South Hayward BART station has 132 total bike parking spaces, of which 46 are secure spaces. Neither BART station has a dedicated bicycle station like those at the 19th Street station in Downtown Oakland or the Downtown Berkeley station.

With almost 10% of residents using public transportation to get to work, there is an opportunity to encourage more people to walk or bike to BART. This can be accomplished by focusing on convenient, safe first-mile/last-mile connections to these stations and secure end-of-trip facilities.

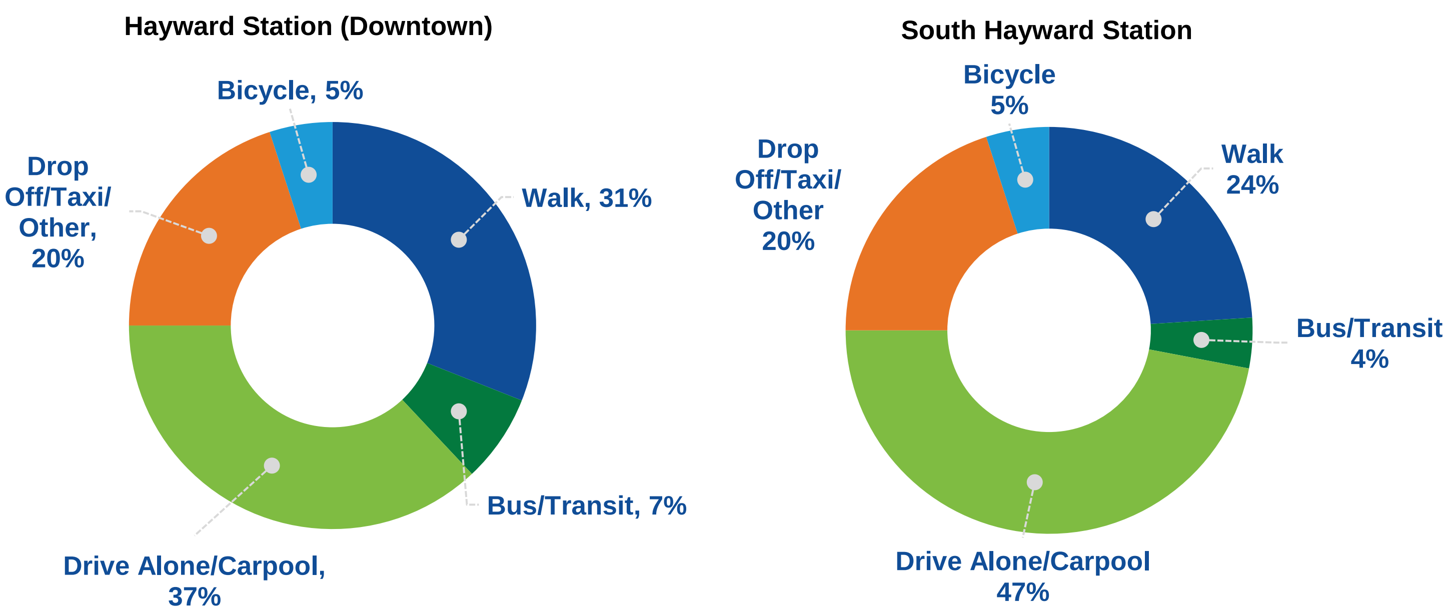

Figure 24. Mode Split for Access to BART Stations

Source: Bart Station Profile Study, 2015

EXISTING BICYCLE/ PEDESTRIAN NETWORK

TYPES OF BIKEWAYS

Hayward's existing bikeway system consists of a network of bicycle paths, bicycle lanes, and bicycle routes. There are four types of bikeways as defined by Chapter 1000 of the Caltrans Highway Design Manual (2017):

- Bicycle Paths (Class I)
- Bicycle Lanes (Class II)
- Bicycle Routes (Class III)
- Separated Bikeways (Class IV)

Bicycle Path (Class I)

Bicycle paths provide a separate facility designed for the exclusive use of bicycles and pedestrians with minimal vehicle crossflows. Generally, bicycle paths serve corridors not served by streets or are parallel to roadways where right-of-way is available. Bicycle paths provide both recreational and high-speed commute routes for bicyclists with minimal conflicts with other road users. This class of bikeway exists in the southern section of Mission Boulevard in the southeastern portion of Hayward.

Figure 25. Rendering of Class I Bikeway

Bicycle Lane (Class II)

Bicycle lanes are on-street bikeways that provide a designated right-of-way for the exclusive or semi-exclusive use of bicycles.

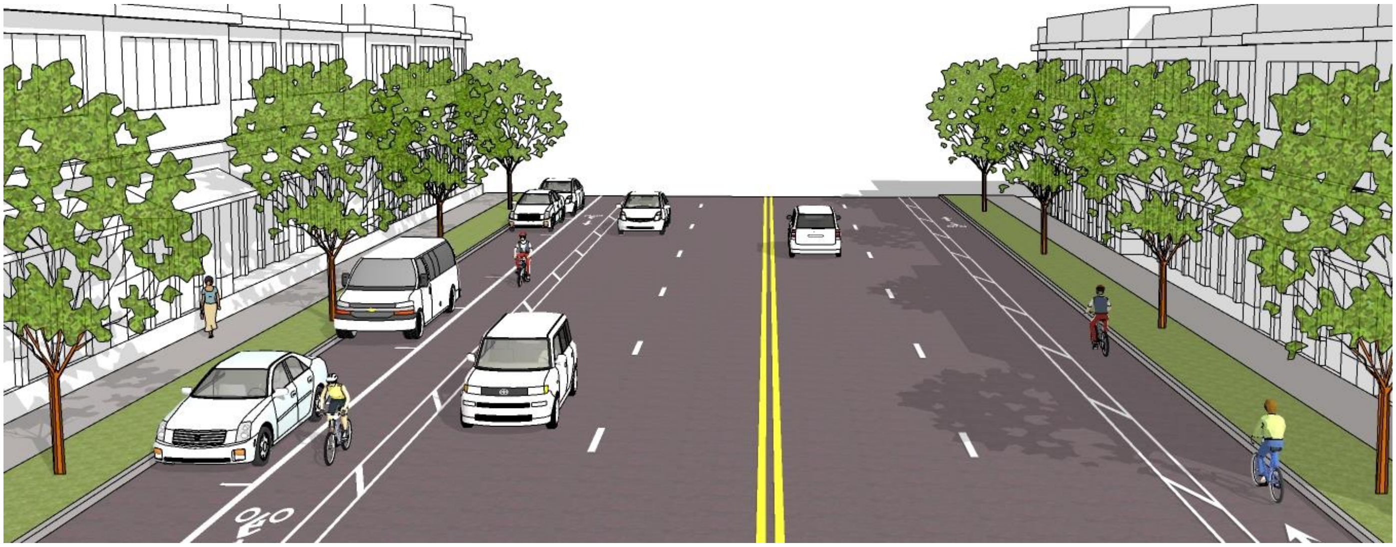

Figure 26. Rendering of Class II Bikeway

Through travel by motor vehicles or pedestrians is prohibited, but vehicle parking and crossflows by pedestrians and motorists are permitted. This class of bikeway exists along Harder Road up to Mission Boulevard.

Bicycle Route (Class III)

Bicycle routes provide a right-of-way designated by signs or permanent markings and shared with motorists. Roadways designated as Class III bicycle routes should have sufficient width to accommodate motorists, bicyclists, and pedestrians. Shared lane markings ("sharrows") can be used to provide an additional alert to drivers of the shared roadway environments with bicyclists. This class of bikeway exists on Clawiter Road.

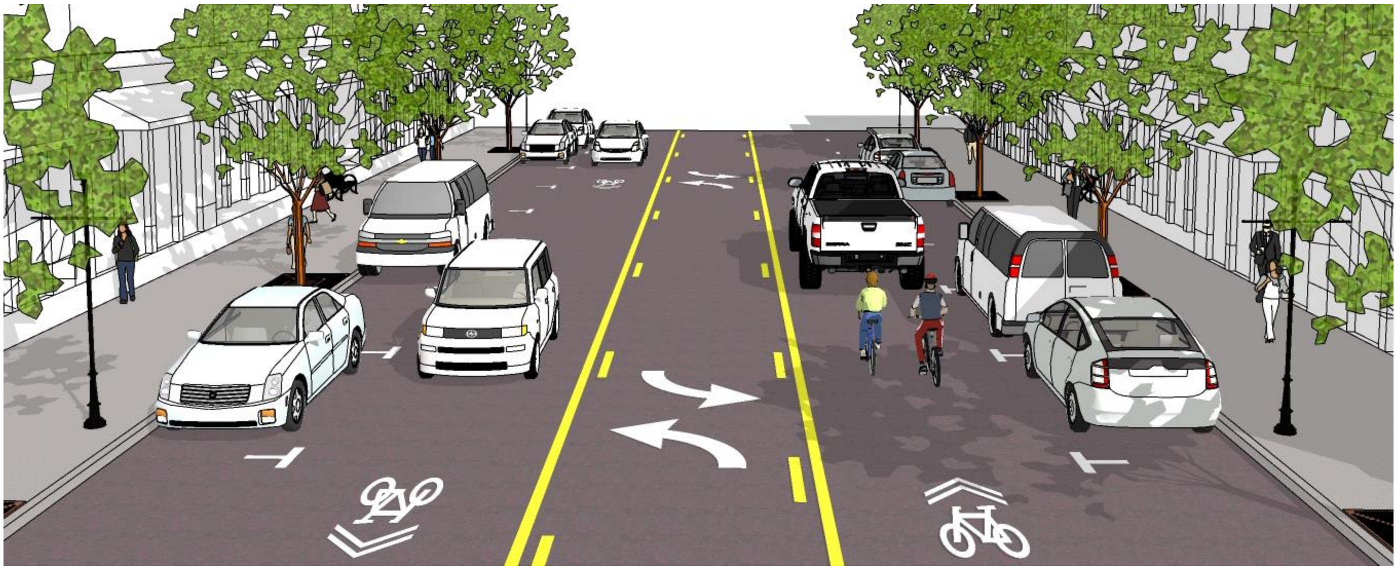

Figure 27. Rendering of Class III Bikeway

Separated Bikeway (Class IV)

Separated bikeways provide a physical separation from vehicular traffic. This separation may include grade separation (i.e., provided at sidewalk level), flexible posts, planters or other inflexible physical barriers, or on-street parking. These bikeways provide some bicyclists a greater sense of comfort and security, especially in the context of high speed roadways. Separated facilities can provide one-way or two-way travel and may be located on either side of a one-way roadway. This class of bikeway exists on the southern portion of Mission Boulevard.

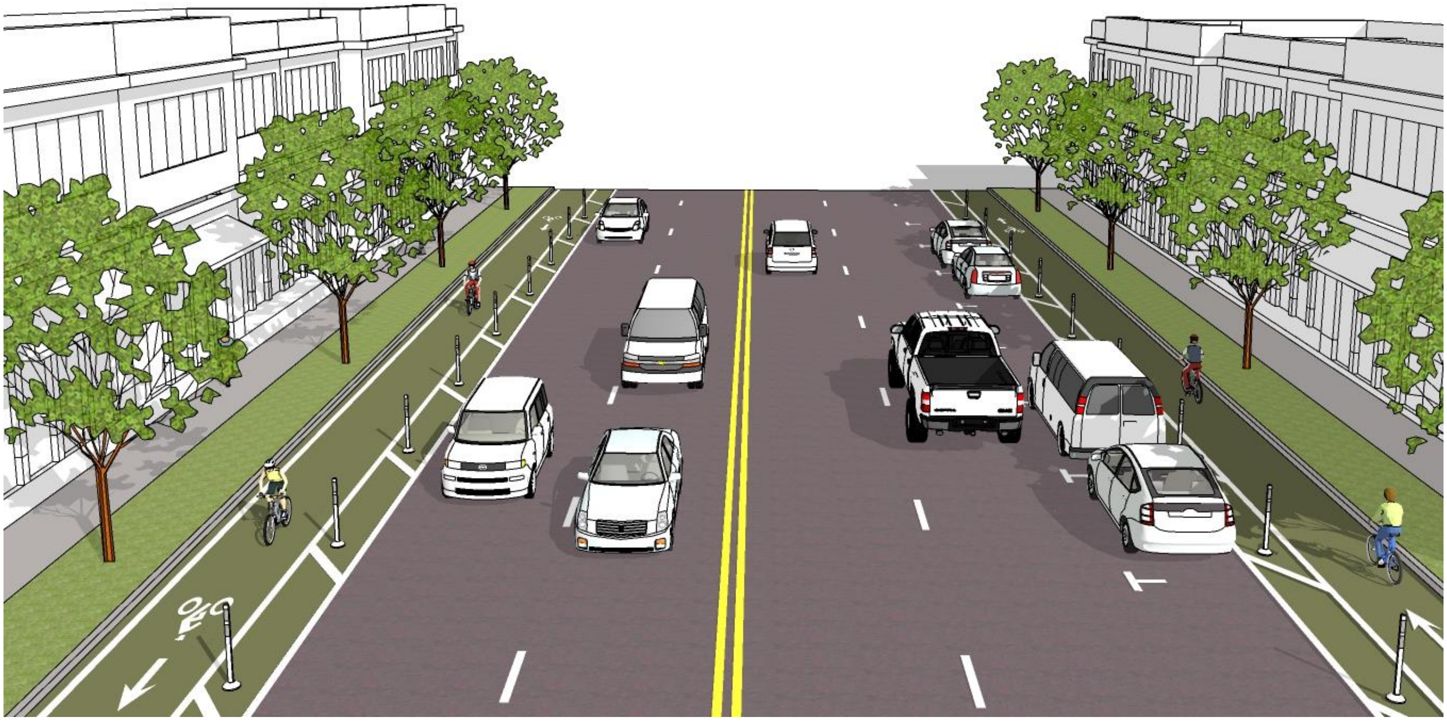

Figure 28. Rendering of Class IV Bikeway

Figure 29 shows the City's existing bike network.

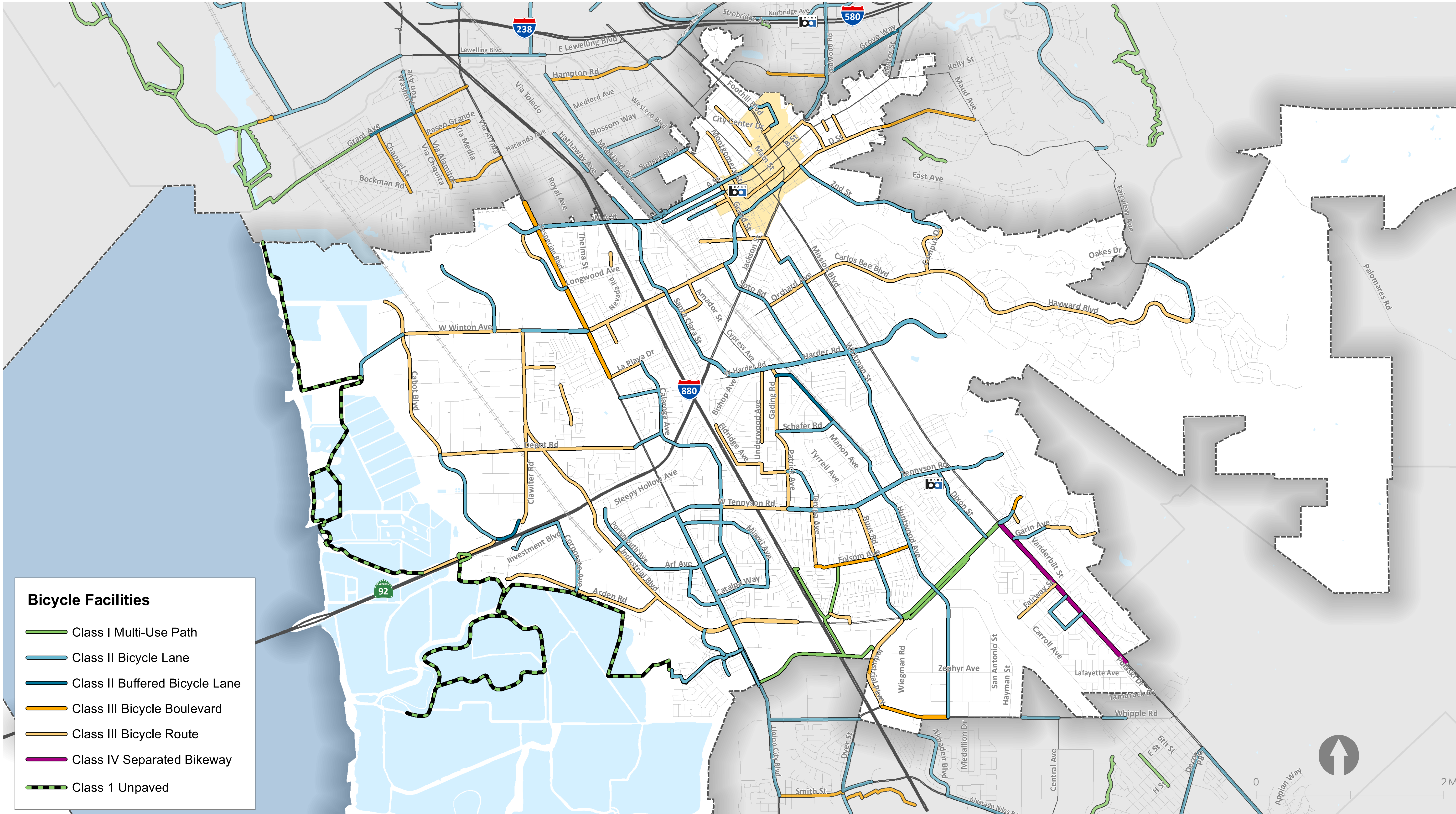

Figure 29

Existing Bicycle Network
City of Hayward

OTHER SUPPORTING INFRASTRUCTURE

Other bicycle infrastructure is also essential to support biking as a viable mode of transportation. Some of these elements are discussed below.

Bicycle Parking

Secure short-term and long-term bicycle parking are necessary to support biking. The amount of parking generally relates to the land uses served. Short-term bicycle parking is adequate for retail land uses, for example, while long-term bike parking is more appropriate for residential and office land uses where people will be expected to park their bicycle for several hours or days at a time. New development provides an opportunity to ensure adequate provision of short- and long-term bicycle parking. Currently, the City's municipal code does not specify bicycle parking requirements associated with land uses. Section 10-2.406 City's Municipal Code requires bicycle parking only for land uses where more than 50 vehicle parking spaces are required. There is a credit system in place by which four bicycle spaces provided can provide credit for one vehicle parking space. Refer to **Appendix D** for more information on bicycle parking.

Bike rack in Hayward, CA

Bike Share

Bike sharing allows for flexible transportation options and can introduce biking to community members who previously lacked access to a bicycle. The City currently does not have any options for bike share.

Miami Beach, FL bike share bikes

LEVEL OF STRESS ANALYSIS

Level of Traffic Stress (LTS) is a measure given to a road segment or crossing indicating the traffic stress it imposes on bicyclists. It is based on the premise that a person’s level of comfort on a bicycle increases with separation from vehicular traffic and is negatively impacted as traffic volumes and speeds increase.

When interpreting LTS analysis, it is important to consider the range of people who ride bikes. On one end of the bicyclist spectrum are people who are comfortable riding with traffic. These are highly confident bicyclists (e.g., adult regular bike commuters), and they are willing to ride on roads with little or no bicycle infrastructure. The other end of the bicyclist spectrum includes those who are not comfortable riding with or adjacent to traffic (e.g., children, the elderly, and non-regular adult bicyclists). They prefer off-street bicycle facilities or biking on low-speed, low-volume streets. They may not bike at all if bicycle facilities do not meet their comfort preferences.

The middle of the spectrum includes bicyclists who prefer separated facilities but are willing to ride with or adjacent to traffic if needed**. Figure 30** provides additional information on different types of bicyclists and their preferences when biking. A full summary and methodology of the LTS Analysis conducted for this Plan can be found in **Appendix B.**

Design user profile	NON-BICYCLE	INTERESTED BUT CONCERNED	SOMEWHAT CONFIDENT	HIGHLY CONFIDENT
Bicycling Preferences	Uncomfortable bicycling in any condition, have no interest in bicycling, or are physically unable to bicycle.	Often not comfortable with bike lanes, may bike on sidewalks even if bike lanes are provided; prefer off-street or separate bicycle facilities or quiet or traffic-calmed residential roads. May not bike at all if bicycle facilities do not meet needs for perceived comfort.	Generally prefer more separated facilities but are comfortable riding in bicycle lanes or on paved shoulders if need be.	Comfortable riding with traffic, will use roads without bike lanes.
Percent of General Public	31-37%	51-56%	5-9%	4-7%

Figure 30. Comfort Typology of Bicyclists

Figure 31 displays the LTS results for all facilities within the City. The major arterial roadways in Hayward present the most stressful conditions to the average bicyclist. This is due to a lack of bicycle facilities on these roadways, with little separation from high-speed, high-volume traffic. However, it is also important to note that Hayward's street network is predominantly comprised of low-stress local streets, which can be used to support a citywide network by offering alternatives to using arterials, as necessary. The connections among those low-stress routes are key to promote biking among the interested but concerned riders.

THE MAJOR ARTERIAL ROADWAYS IN HAYWARD PRESENT STRESSFUL CONDITIONS TO THE AVERAGE BICYCLIST DUE TO A LACK OF BICYCLE FACILITIES AND THE HIGH VOLUMES AND SPEED OF VEHICLE TRAFFIC.

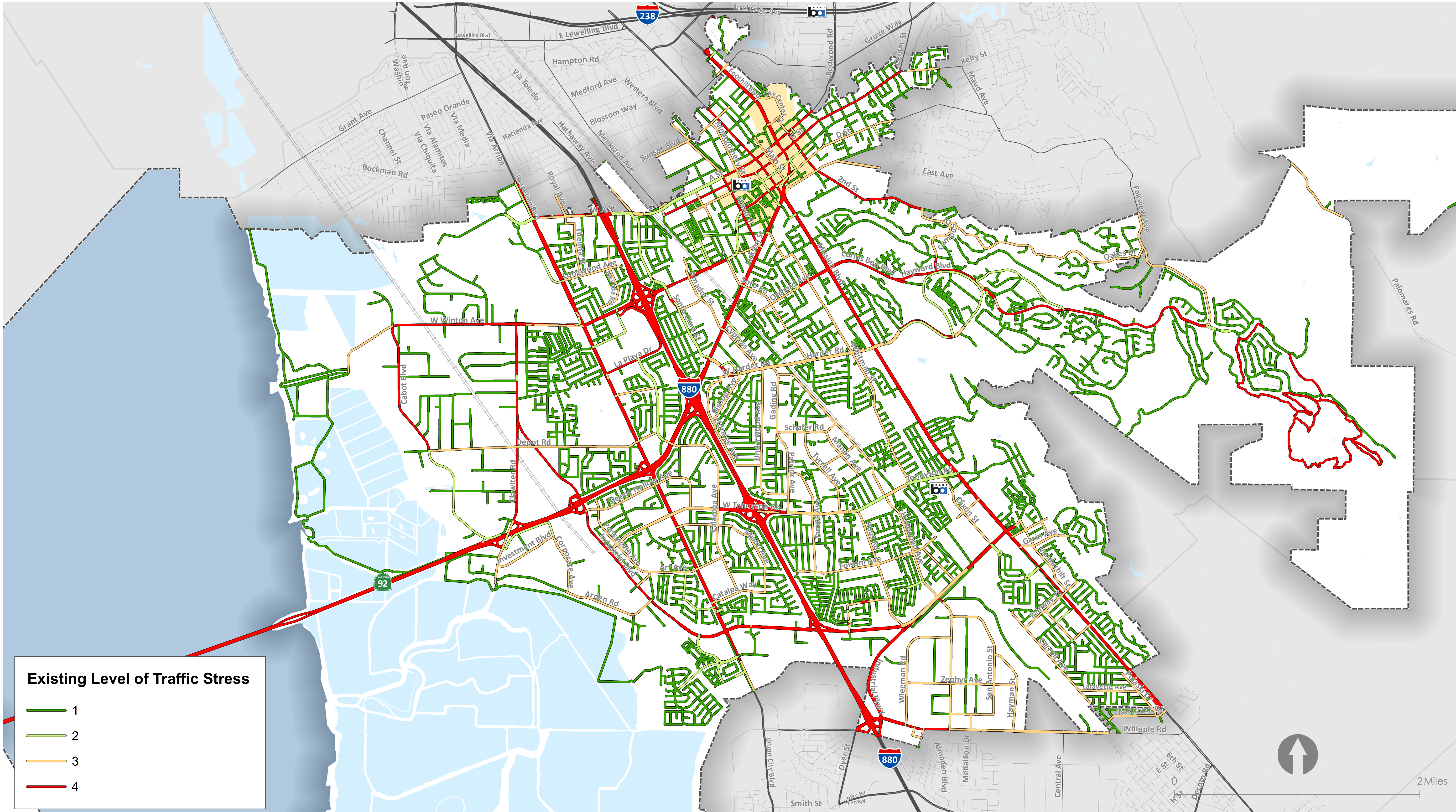

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Figure 31

Existing Level of Traffic Stress for All Streets
City of Hayward

The LTS findings are useful in determining appropriate low-stress bicycle facilities and where these facilities should be located in the city. Hayward's extensive network of low-speed, low-volume local neighborhood streets already serves as a backbone for a low-stress biking network; however, these streets are currently isolated pockets throughout the City, separated by higher stress arterial and collector streets.

Enhancements to some of these low-stress streets coupled with separated bicycle facilities on targeted segments of higher speed and higher volume collectors and arterials would result in a connected low-stress bicycle network serving key destinations in the city. For example, a separated bicycle lane on Hesperian Boulevard from Sleepy Hollow Avenue to Cathy Way would help to provide a low-stress north-south connection between Hayward's Glen Eden and Mount Eden neighborhoods, each of which currently has a large network of low-stress local streets. This link would also serve as a low-stress connection over State Route 92, a major barrier to Hayward's street network, and provide access to Chabot College and Southgate Park.

COLLISION ANALYSIS

Historical pedestrian and bicyclist collision data were analyzed to capture safety trends citywide. Analysis results are presented with descriptive findings summarizing the factors, severity, and temporal nature of collisions as well as spatial results, which are used to identify high injury corridors.

These findings helped determine which areas to prioritize for bicycle and pedestrian safety improvements.

Data and Approach

The analysis used the most recent complete five years of collision data (2012 to 2016), which included reported totals of 177 bicycle collisions and 292 pedestrian collisions. Collisions that occurred on freeways or freeway ramps were omitted from the data used for analysis, as these roadways are grade-separated and under the jurisdiction of the Caltrans. Collisions that occurred at ramp terminal intersections and all other city roads were included in analysis.

Roadway Data

Roadway data provided by the City of Hayward was used in order to associate roadway characteristics with spatial collision patterns. This data was supplemented with data from OpenStreetMap data. The roadway data included the following characteristics:

- Functional class
- One-way or two-way designation
- Bicycle infrastructure presence
- Posted speed

Bicyclist Collisions

In the five-year period from 2012 to 2016, total bicyclist collisions maintained a steady trend between 30 and 40 collisions per year, as presented in **Table 11**. Five of the 177 reported bicyclist collisions were single party collisions, while the remaining 165 collisions involved two parties or more.

Table 11. Bicyclist Collisions Year over Year, Hayward, 2012 – 2016

Year	2012	2013	2014	2015	2016
Reported Collision Count	33	39	30	38	37

Source: SWITRS

Further analysis included identifying trends among the following attributes:

- **Collision severity:** The reporting officer's assessment of the most severe injury incurred.
- **Primary collision factors:** A road user's violation or movement associated with the collision. These categories represent an aggregation of California Vehicle Code violations.

Collision Severity

Among the 177 bicycle collisions, 15 collisions (8%) resulted in severe injury, and two collisions (1%) resulted in fatality. **Table 12** presents collisions by severity level. **Figure** 32 presents a map of the reported collisions by severity.

Table 12. Severity of Bicyclist Collisions, Hayward 2012 – 2016

Collision Severity	Collision Count	Collision Share
Fatal	2	1%
Injury (Severe)	15	8%
Injury (Other)	147	83%
Property Damage Only (PDO)	13	7%
Total	177	100%

Source: SWITRS

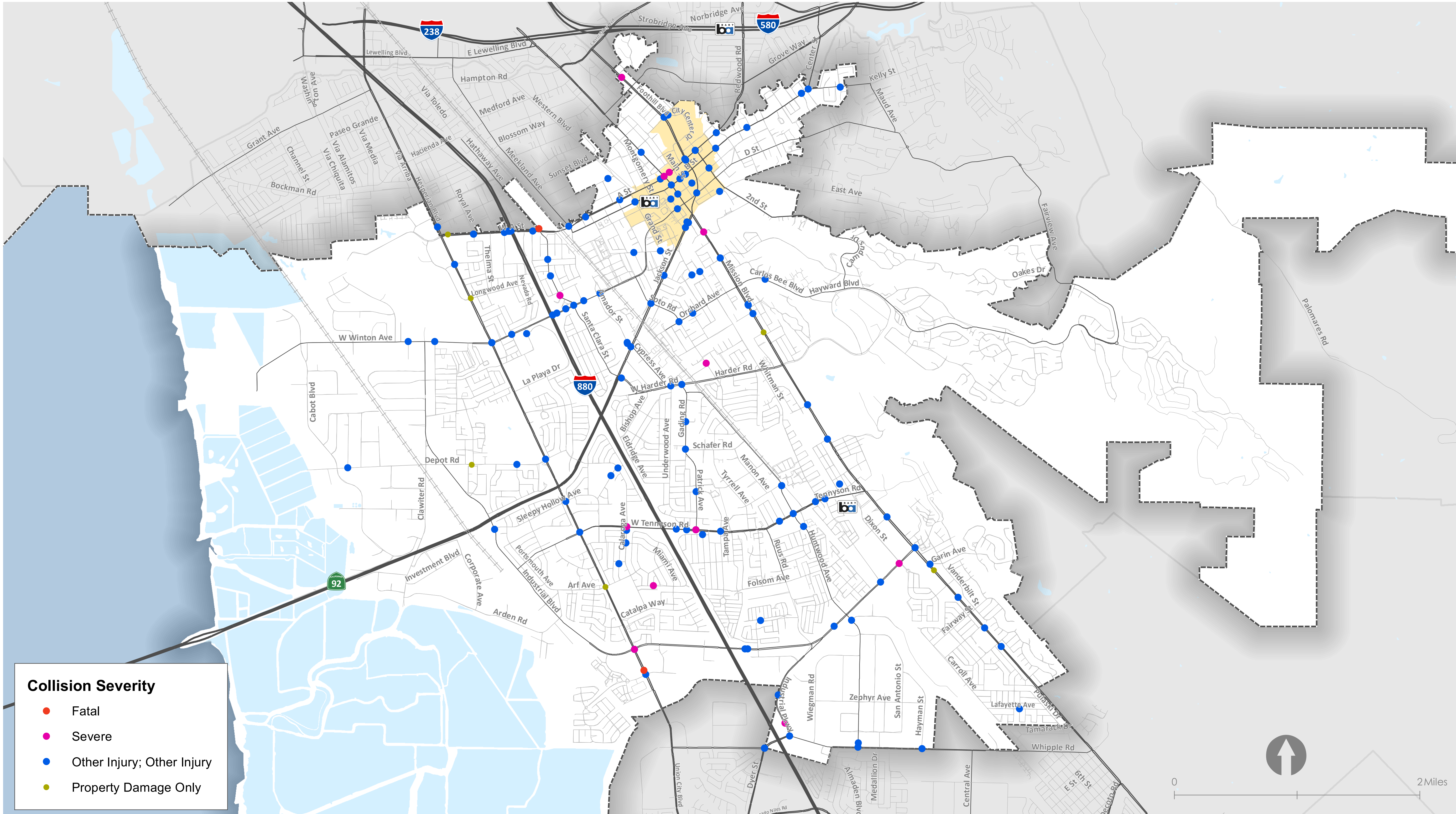

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Figure 32

Bicyclist Collisions 2012 - 2016
City of Hayward

Primary Collision Factors of Bicyclist Collisions

Figure 33 presents the six primary collision factors most commonly cited in bicyclist collisions. The most commonly reported primary collision factors among bicyclist collisions were:

- Wrong side of the road riding
- Traffic signals and signs
- Automobile right-of-way

The most common primary collision factors among collisions resulting in a fatal or severe injury were the following:

- Traffic signals and signs: 4 severe injury collisions
- Wrong side of the road: 1 fatal, 3 severe injury collisions
- Unsafe lane change: 1 fatal, 1 severe injury collision

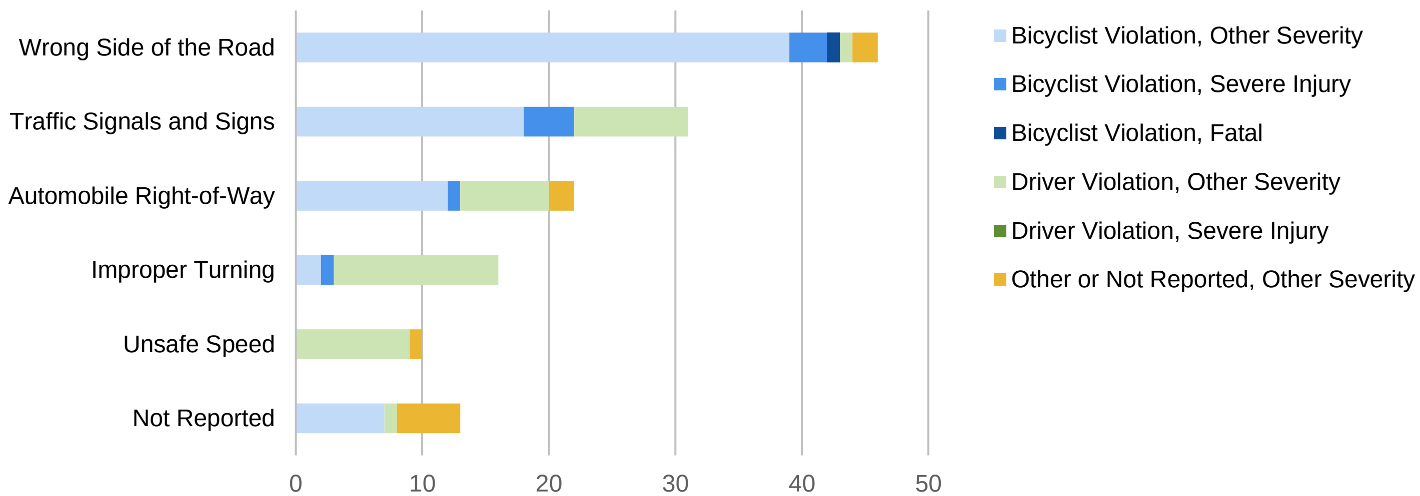

Figure 33. Top Six Primary Collision Factors in Bicyclist Collisions

Note: "Other Severity" includes collisions with severities reported as Injury (Other Visible), Injury (Complaint of Pain), and Property Damage Only

The top six primary collision factors are defined thusly:

- **Wrong Side of Road** refers to a collision in which a road user was on the wrong side of the road.
- **Traffic Signals and Signs** refers to a collision in which a road user failed to comply with a traffic control device (e.g., traffic signal, yield sign, or stop sign).
- **Automobile Right-of-Way** refers to a collision in which one road user failed to yield the right of way to another road user.
- **Improper Turning** refers to a collision in which a road user failed to account for a gap in traffic or failed to signal appropriately before turning.
- **Not Reported** refers to a collision in which a primary collision factor was not reported.
- **Unsafe Speed** refers to a collision in which a vehicle driver either exceeded the speed limit or drove too fast for given conditions in the reporting officer's assessment.

Pedestrian Collisions

In the five-year period from 2012 to 2016, total pedestrian collisions maintained a steady trend, as shown in **Table 13**.

Table 13. Pedestrian Collisions Year over Year, Hayward, 2012-2016

Year	2012	2013	2014	2015	2016
Reported Collision Count	63	58	51	61	59

Source: SWITRS

Further analysis includes trends among the following attributes:

- Collision severity
- Pedestrian location and actions preceding a collision

Collision Severity

As illustrated in **Table 14**, between 2012 and 2016, there were 292 reported collisions involving pedestrians in Hayward in the five years of analyzed data, including 13 fatal collisions and 34 collisions resulting in a severe injury**. Figure 34** presents a map of the reported collisions by severity level.

Table 14. Severity of Pedestrian Collisions, 2012-2016

Collision Severity	Collision Count	Collision Share
Fatal	13	4%
Injury (Severe)	34	12%
Injury (Other)	226	78%
PDO	19	7%
Total	292	100%

Source: SWITRS

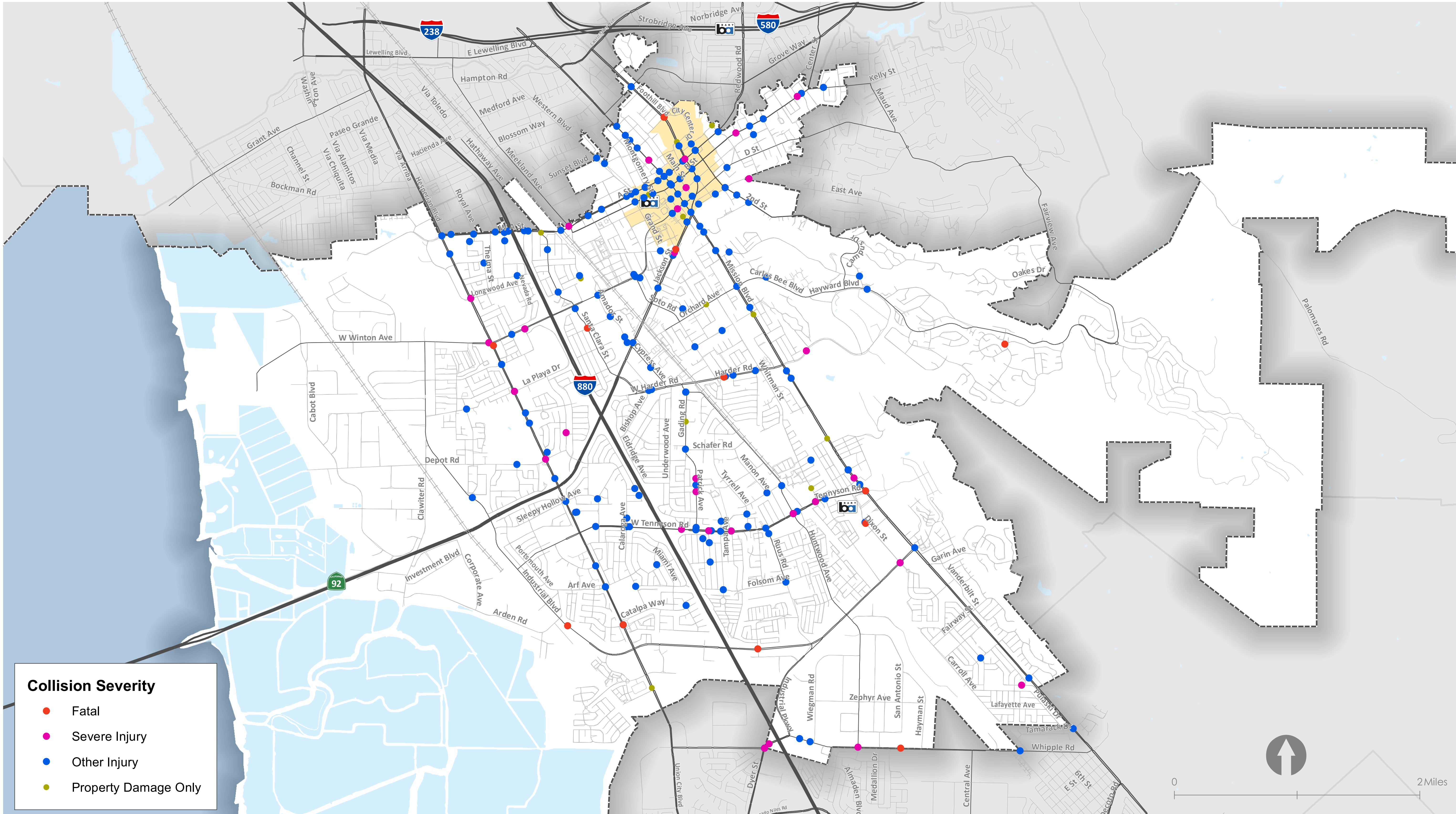

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Figure 34

Pedestrian Collisions 2012 - 2016
City of Hayward

Pedestrian Collision Locations

Figure 35 presents pedestrian collisions by location and severity. The most common location for pedestrian collisions was on a crosswalk at an intersection, which accounted for 51% of collisions. 25% of pedestrian collisions occurred outside of a crosswalk. This trend indicates that there may be locations in Hayward where pedestrians' desire lines do not match existing infrastructure, and better infrastructure provision would improve safety outcomes for pedestrians.

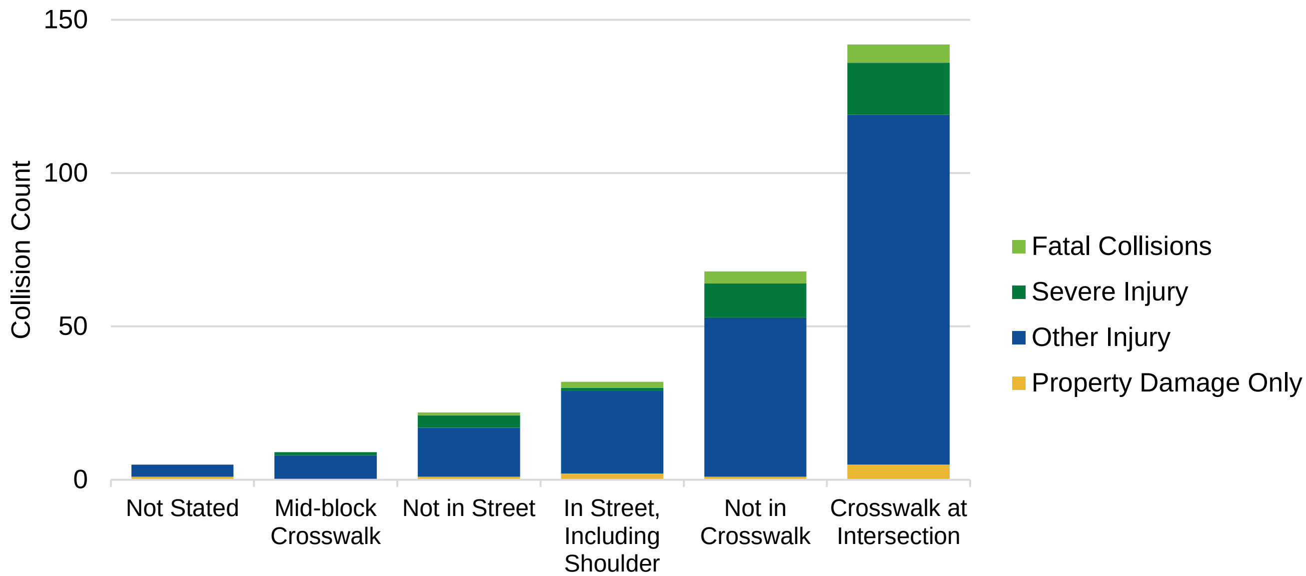

Figure 35. Location of Pedestrian Collisions, Hayward, 2012-2016

Source: SWITRS

HIGH INJURY CORRIDOR ANALYSIS

An analysis of the citywide roadway network was conducted to identify a set of "high injury corridors," which constitute the worst-performing street locations based on severity and frequency of collisions.

Data and Approach

The analysis used the most recently available collision data, representing 2012 to 2016, and weighted collisions by reported severity, using weights based on the average societal cost of the outcomes (property damage, injuries, or death) established by Caltrans. The weights generally reflect the order of magnitude difference between the societal costs of fatal and severe injury collisions versus non-severe injury collisions. For more information on the screening process, refer to **Appendix B**.

Screening Results

The top 10 Bicycle and Pedestrian High Injury Corridors identified by the high injury corridor analysis are presented in **Table 15** and **Table 16**, respectively. **Figure 36** provides a map of the High Injury Corridors.

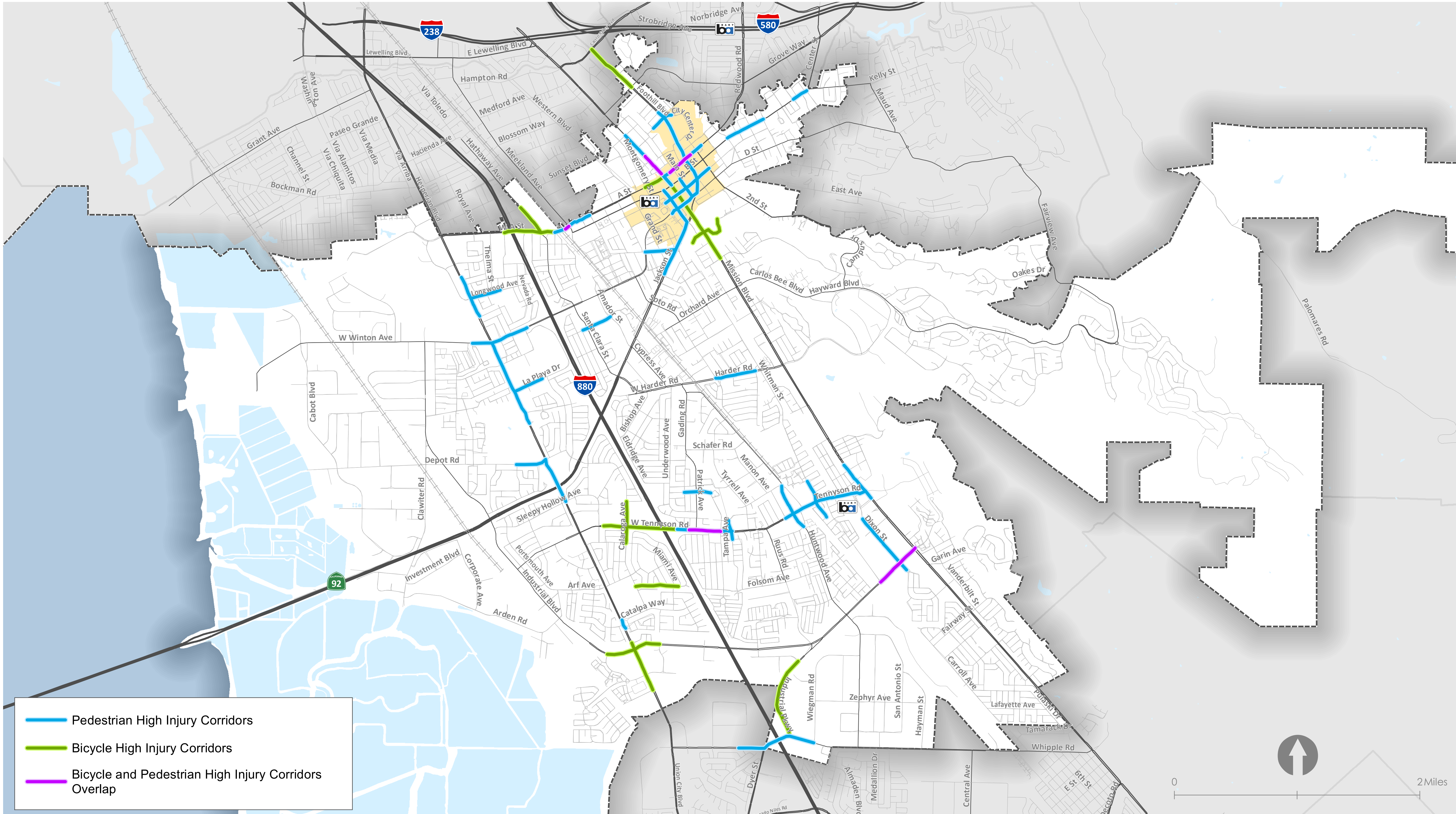

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Figure 36

Bicycle and Pedestrian High Injury Corridors
City of Hayward

Table 15. Top 10 Bicycle High Injury Corridors

Roadway	From	To
West Tennyson Road	East of Sleepy Hollow Avenue South	Tampa Avenue
A Street	Montgomery Avenue	2nd Street
Hesperian Boulevard	Technology Drive	Eden Park Place
Calaroga Avenue	Ashbury Lane	Bolero Avenue/ Miami Avenue
Mission Boulevard	Simon Street	Sycamore Avenue
Industrial Parkway West	Mission Boulevard	Pacific Street
West A Street	West of 880 Freeway	Meekland Avenue
Industrial Boulevard/ Industrial Parkway West	Marina Drive	Hall Road
Industrial Parkway Southwest	Addison Way	Whipple Road/ 880 Freeway Intersection
Fletcher Lane	Dead-end west of Mission Boulevard	West of Janssen Court

Table 16. Top 10 Pedestrian High Injury Corridors

Roadway	From	To
West Tennyson Road (Western Section)	Just east of 880 Freeway Interchange	Dickens Avenue
West Tennyson Road (Eastern Section)	Manon Avenue	Leidig Court/railroad crossing
Jackson Street	Park Street	Watkins Street, just west of Mission/Foothill Boulevards
Huntwood Avenue	Harris Road/Leidig Court	Panjon Street/Lustig Court
Meek Avenue	Alice Street	Jackson Street
Mission Boulevard	Sunset Boulevard	B Street
Whipple Road	Just west of 880 Freeway interchange	Wiegman Road
Foothill Boulevard	Rex Road	Mission Boulevard/Jackson Street
Hazel Avenue/City Center Drive	Rio Vista Street	Valencia Place
D Street	Atherton Street	Foothill Boulevard

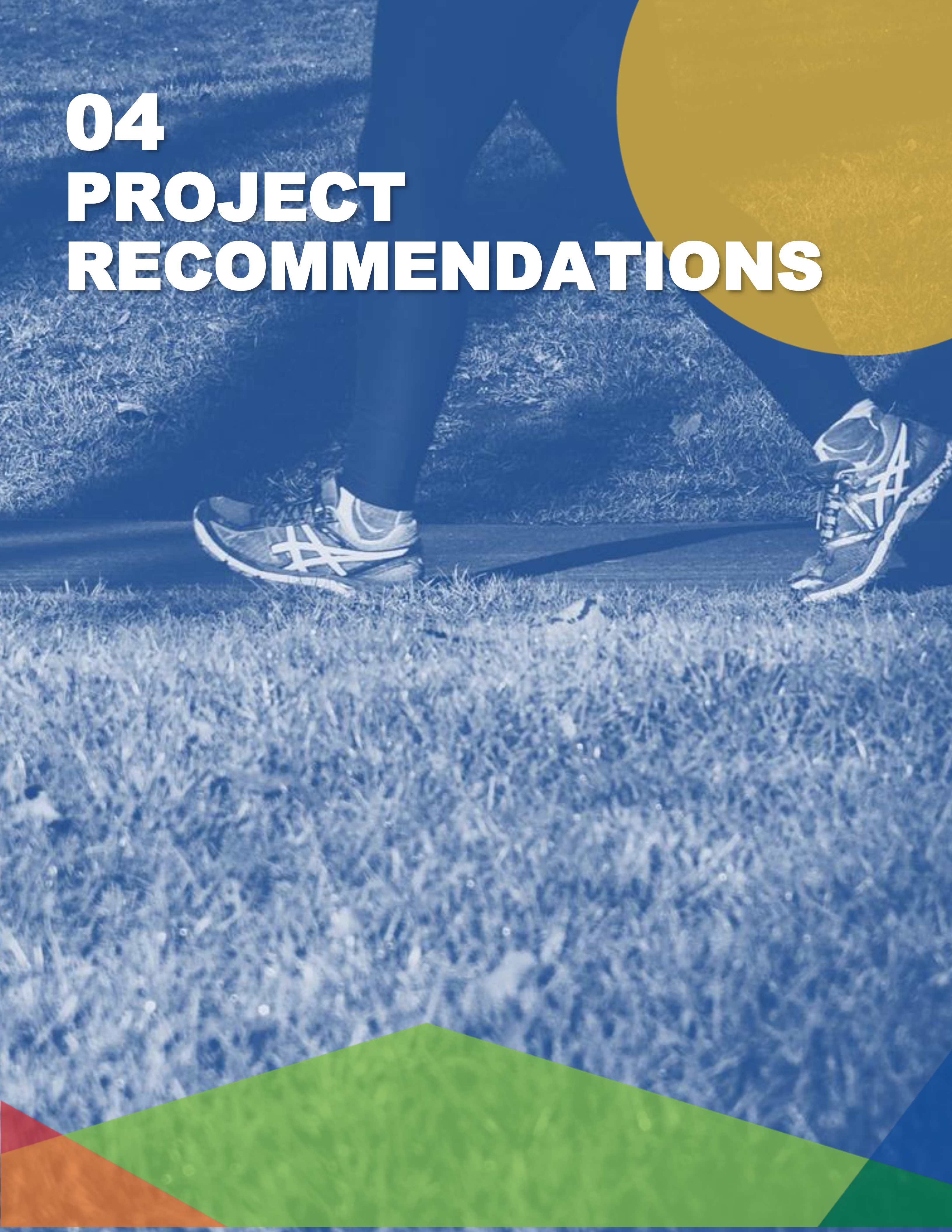
EXISTING CONDITIONS SUMMARY

The existing conditions analysis presented in this chapter provide an overview of the relative level of biking and walking activity in Hayward, including who is typically walking and biking more frequently:

- Low-income workers, high school and college students, young families and professionals, and Hispanic/Latinx residents are shown to walk and bike more relative to other groups within the City.
- High-income workers, people with no vehicles available at home, and men are shown to bike more relative to other Hayward residents.
- Citywide LTS analysis shows that arterial and collector streets represent a relatively small share of City centerline miles relative to local streets, but arterials and collectors are overwhelmingly high-stress streets to bike. A map of citywide LTS (**Figure 31**) illustrates the extent to which these major streets present barriers for people biking and walking and can be addressed with the development of the proposed networks.
- A citywide screening for high-injury locations also provides the intersections and roadway segments with the most extensive collision history, and where bicycle and pedestrian safety improvements will be critical to protect vulnerable users and promote walking and biking as viable travel modes.

Neighborhood sidewalk in Hayward, CA

04 PROJECT RECOMMENDATIONS



PROJECT RECOMMENDATIONS

This chapter discusses the overall bicycle and pedestrian network recommendations, as well as the prioritization framework and criteria used to develop them.

PROJECT PRIORITIZATION AND METHODOLOGY

A prioritization framework was used to identify candidate pedestrian and bicycle project locations. The prioritization criteria were developed in cooperation with the TAC and align with the Plan's goals.

FACTORS, EVALUATION CRITERIA, AND WEIGHTING

The evaluation methodology to develop the prioritization criteria was based on national best practices and input from the Plan's TAC. A detailed description of the methodology is included in the *Prioritization Framework* memo included in **Appendix C**. The prioritization factors and criteria are shown in **Figure 37**. The weights are intended to emphasize safety and connectivity. These weights were used to calculate priority scores for all road segments in the city to determine pedestrian and bicycle prioritization.

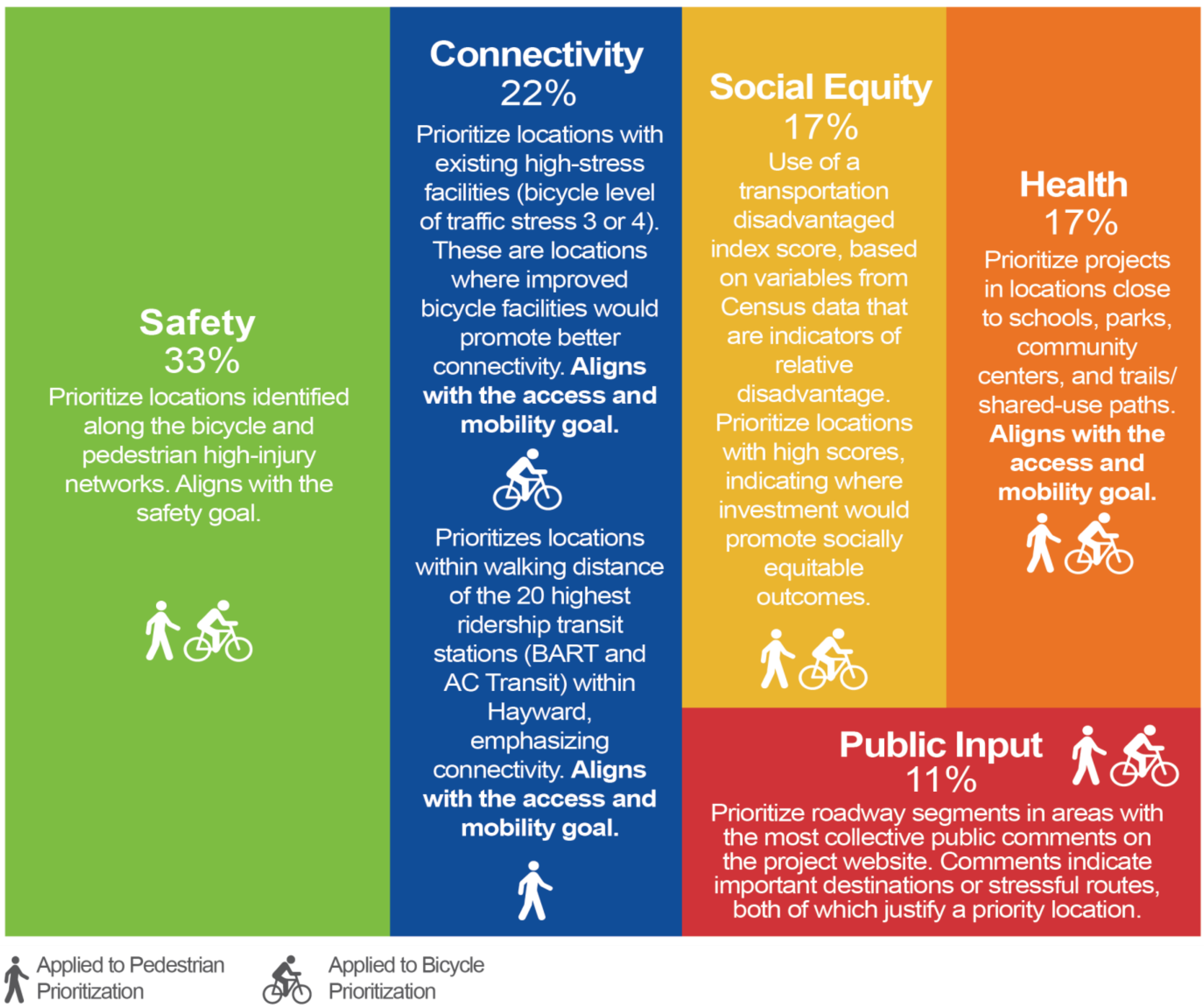


Figure 37. Prioritization Factors and Weights

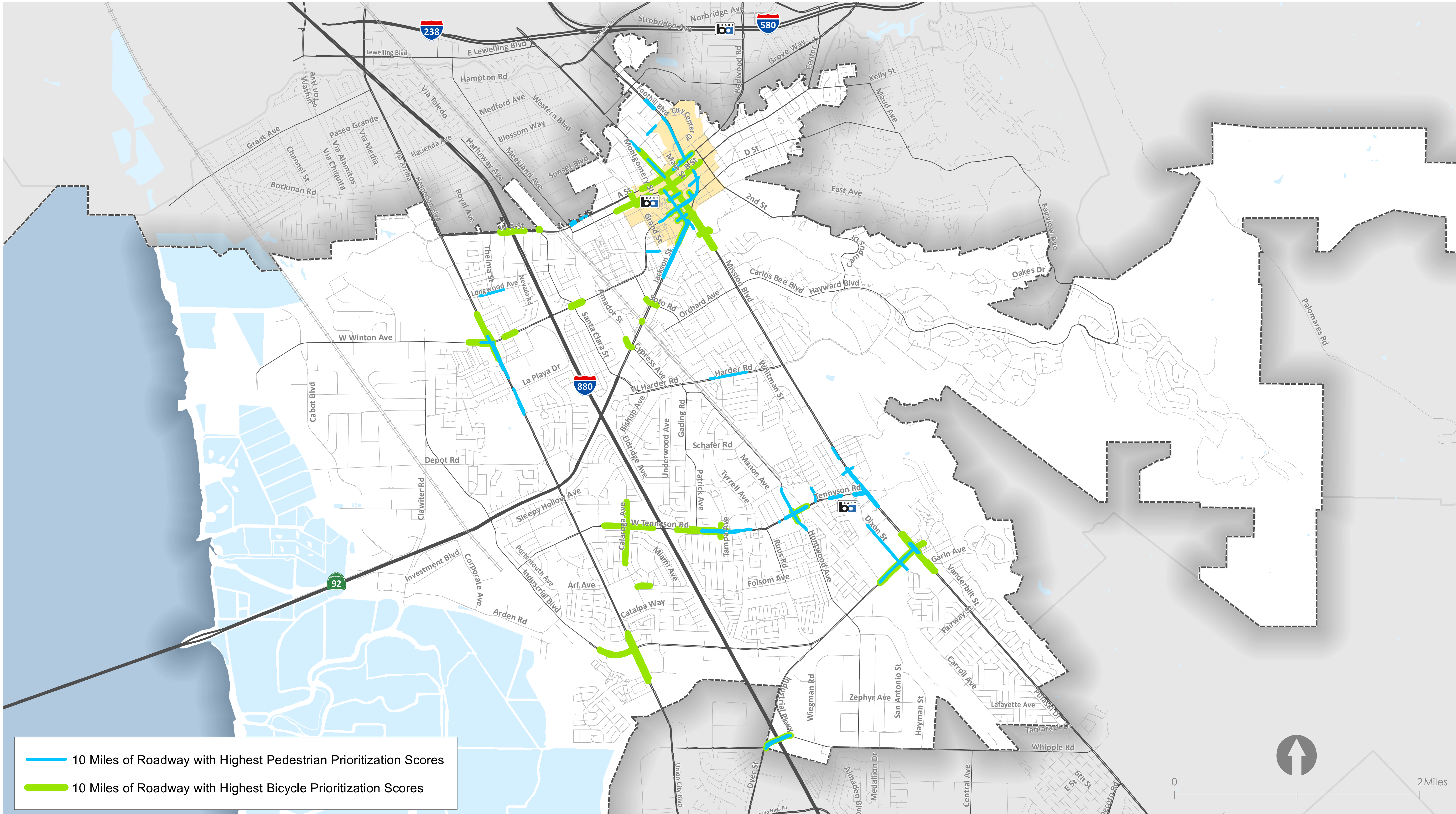


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Figure 38

Bicycle and Pedestrian Prioritization Screening Map: Top 10 Roadway Miles
City of Hayward

BICYCLE NETWORK DEVELOPMENT

The goal of the Plan is to identify a connected, low-stress citywide bicycle network for people of all ages and abilities. The network was developed in three phases:

- Phase I: Network Framework
- Phase II: Network Evaluation
- Phase III: Network Refinement.

The following sections describe the process and outputs of each phase.

PHASE I: NETWORK FRAMEWORK

Building a framework for the bicycle network begins by compiling a variety of sources - community feedback, projects that are already planned, a gap analysis, and an evaluation of key destinations and barriers, as displayed in **Figure 39**. Ultimately, the goal of a low-stress network is to expand Hayward's existing bikeway network so that more people feel comfortable and safe making trips via bike for commutes, errands, and recreation.

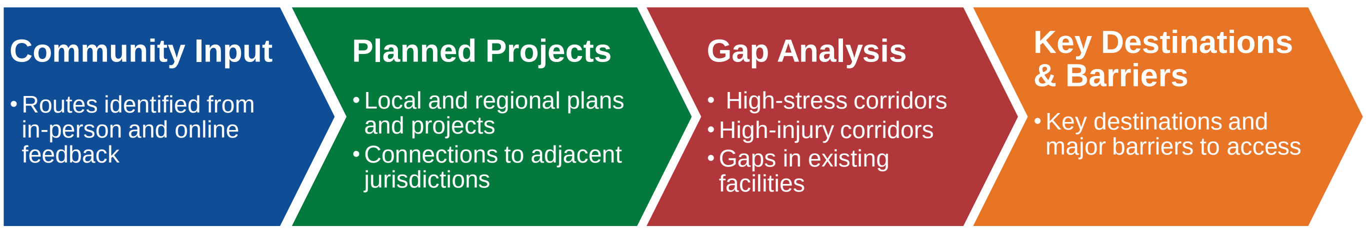

Figure 39. Network Framework Development Process

Each of these inputs were placed as layers into an online map, called the Network Framework map, to show the basic network structure for all corridors that would be included in Phase II.

PHASE II: NETWORK EVALUATION

Once the Network Framework map was created, facility types were assigned to each segment within the proposed network. Facility selection was determined by roadway operational characteristics, facility feasibility, and an assessment of alternative routes – the following sections describe these steps. The results of this phase were a proposed bicycle network map with designated facility types and a proposed bicycle project list.

Step 1: AASHTO Bikeway Selection Guide Screening

All corridors depicted on the proposed network framework were evaluated using the AASHTO *Guide for the Development of Bicycle Facilities 4th Edition* (Guide) to select initial low-stress bicycle facility recommendations. The Guide considers traffic volumes and prevailing vehicle speeds in determining appropriate facilities.

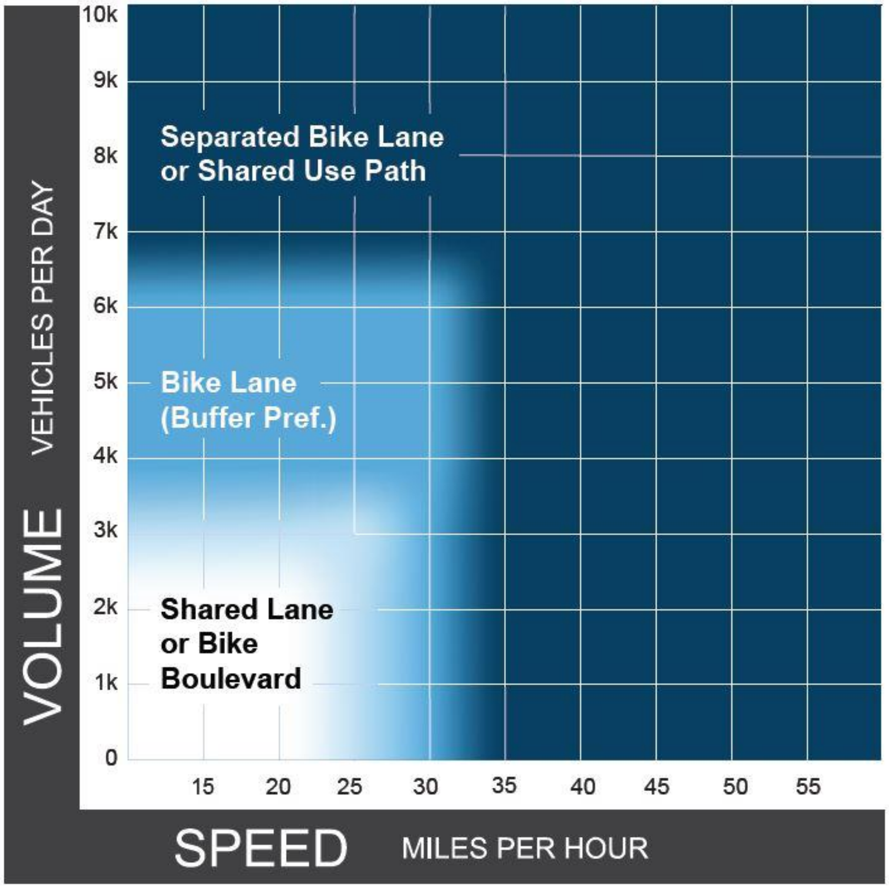

Figure 40. AASHTO Bikeway Facility Selection Chart

Source: AASHTO Guide for the Development of Bicycle Facilities 4th Edition

Step 2: Implementation and Feasibility Screening

Once the appropriate facility was determined for each segment in the network through the AASHTO screening, the feasibility of constructing these facilities was determined by analyzing roadway space reallocations, lane eliminations or reassignments, signal adjustments, land-use context, and other operational changes needed to implement such facilities.

Step 3: Alternative Route Assessment

After reviewing the draft implementation methods with the City, the project team evaluated alternative routes for draft recommendations that may be challenging to develop into all ages and abilities facilities. Potential parallel routes were identified that provide similar access to destinations and the preferred corridor.

Step 4: City Review of Administrative Draft Network Facility Map & Project List

City staff and TAC members then provided input on the initial draft network and identified any proposed facility recommendations that may not be financially or politically infeasible.

PHASE III: NETWORK REFINEMENT

Based on feedback from City staff and TAC members, the project team refined the initial map and project list to create the draft network maps for public review. Project prioritization, implementation phasing, and cost estimates were developed once the unconstrained network was finalized.

ALL AGES AND ABILITIES NETWORK

The vision for the Plan includes creating a safe, comfortable bicycle network that can be enjoyed by all residents, commuters, and visitors.

Figure 41 illustrates this all ages and abilities bicycle network. This network meets the criteria from the AASHTO Guide to focus on providing bikeways that will allow the largest segment of the population to feel comfortable while biking.

With the implementation of this network, every resident in Hayward will have access to low-stress, comfortable bikeways that connect to major destinations throughout the City. These facilities are also supported by connectivity and gap closure recommendations that may not meet the AASHTO criteria for all ages and abilities bikeways but are important for other safety or local access purposes.

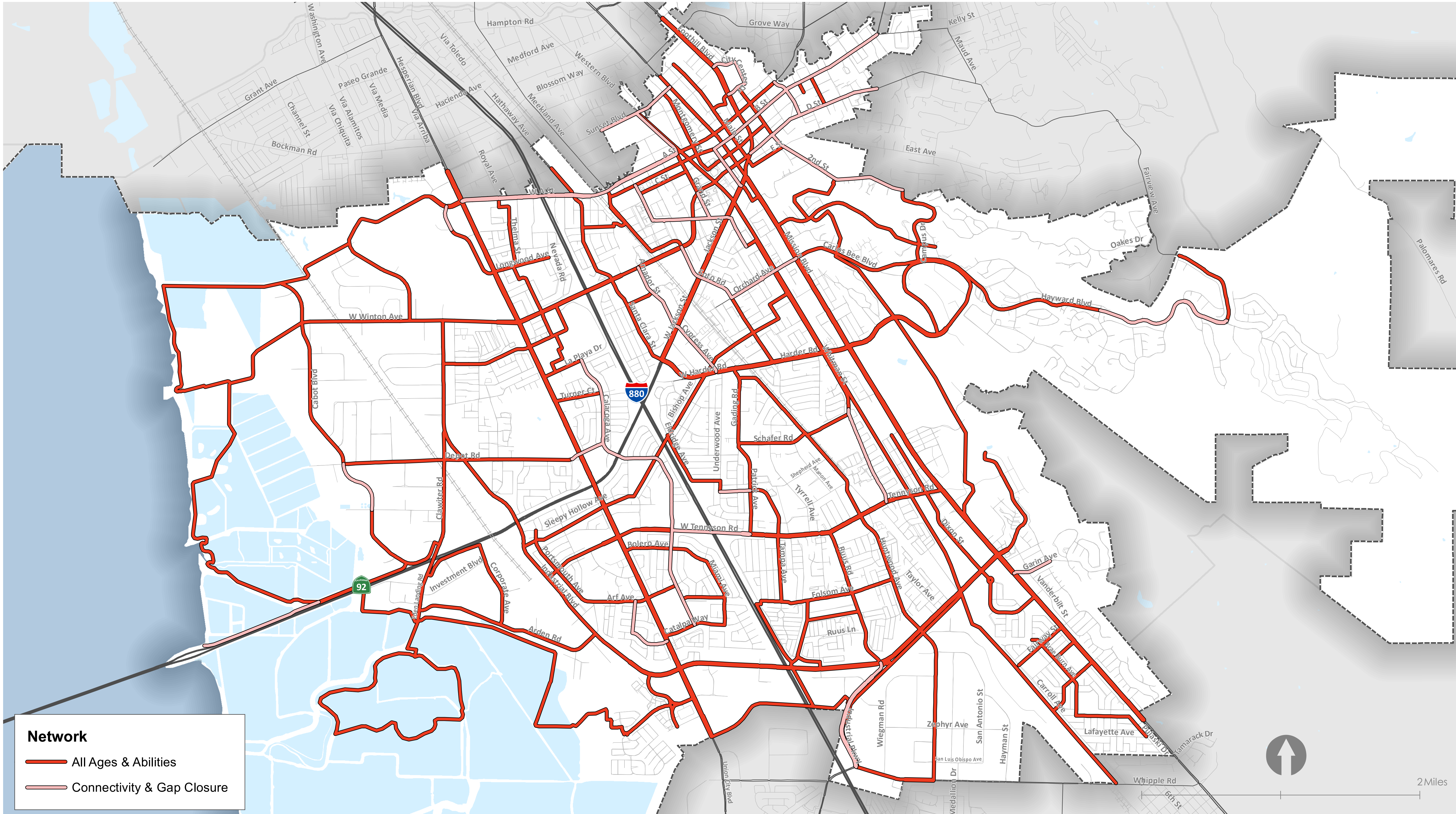

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Figure 41

All Ages and Abilities Network
City of Hayward

PROJECT RECOMMENDATIONS

BICYCLE NETWORK RECOMMENDATIONS

Figure 42 and **Figure 43** illustrate the existing and proposed facility recommendations. Once the network was developed, the project team used the prioritization methodology to rank each project corridor. The full project list can be found in **Appendix A**. In order to create a complete network, the City of Hayward will focus on the following implementation themes:

Separated Bikeways

The network is fundamentally based on a select number of separated bikeways that create complete east-west or north-south connections across the City, such as Mission Boulevard, West Winton Avenue, A Street, Hesperian Boulevard, Tennyson Road, and Industrial Parkway. Separated bikeways can be implemented as one-way facilities on both sides of the street or as two-way facilities on one side of the street. These facilities are the most commonly preferred by Interested but Concerned cyclists on higher vehicle volume streets and/or where vehicle speeds are higher. With limited consistent access on local streets over major barriers, like Interstate 880 and railways, separated bikeways on major arterial streets provide the best opportunity for increasing east-west access.

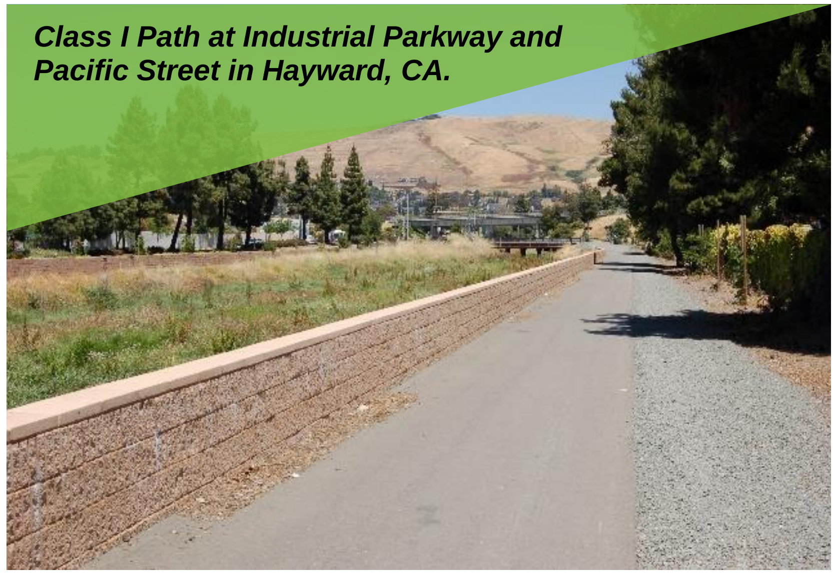

Separated bikeway in Downtown Oakland, CA.

Neighborhood Bikeways

Connections to neighborhoods can be created by constructing bike boulevards, bike lanes, and buffered lanes on low vehicle volume and low-speed streets. These locations often need less physical separation for bicyclists to feel comfortable navigating within neighborhoods. However, crossings of major arterials will require special attention to make connections more comfortable between neighborhoods. This is possible by continuing bike lanes through intersections, using proper detection at signalized crossings, installing PHBs or RRFBs to enhance uncontrolled crossings, and constructing protected intersections that are designed for major intersecting bikeways. See **Appendix D** for more information on these treatments.


Neighborhood bikeway on Fairway Street in Hayward, CA.

Trail Network Expansion



Class I Path at Industrial Parkway and Pacific Street in Hayward, CA.

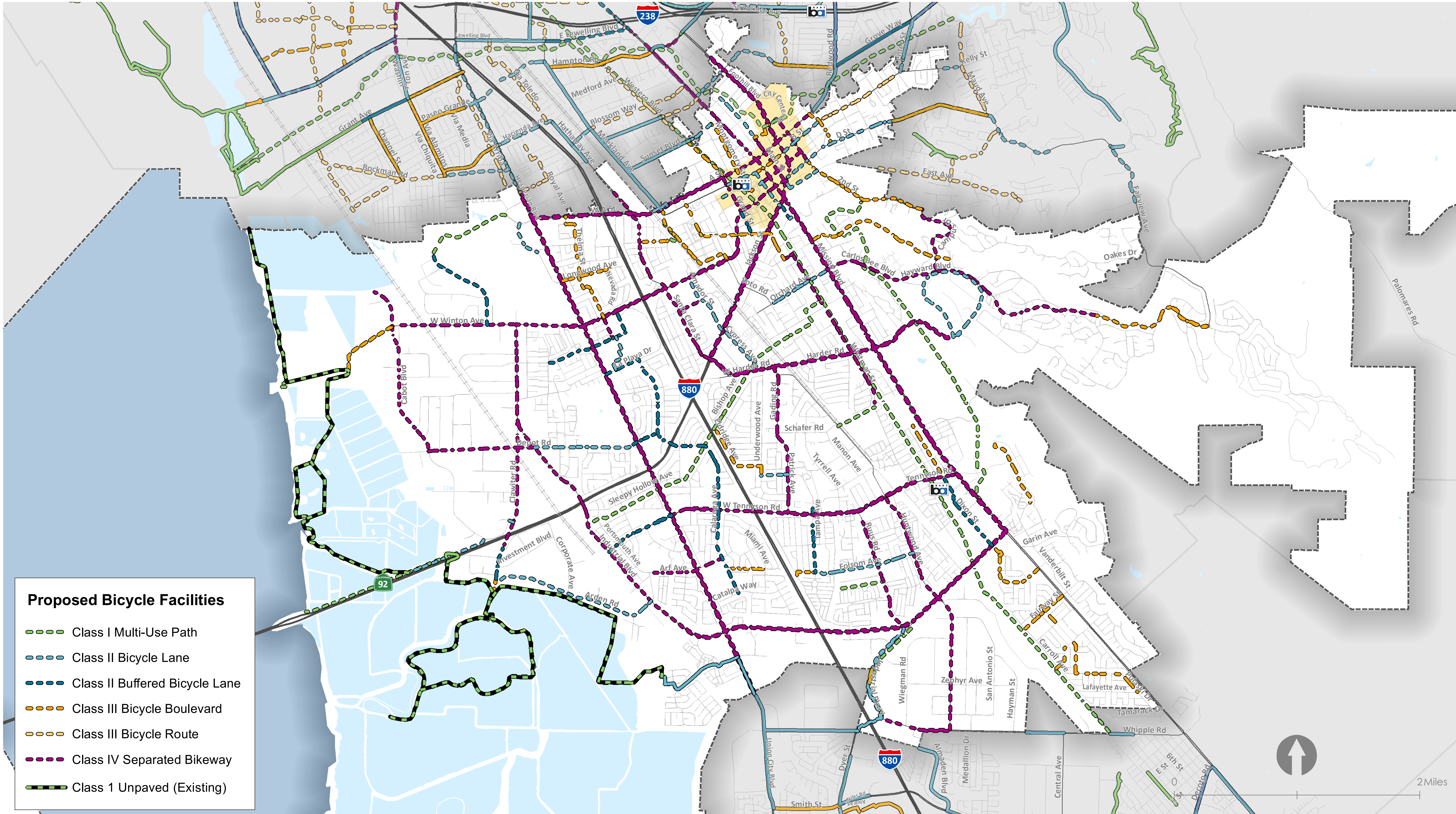
Hayward is fortunate to have a unique set of trail opportunities that can be connected across most of the city. For example, the San Francisco Bay Trail can be enhanced through improved connections from local neighborhoods and by completing the existing gap along Breakwater Avenue at the northern landing of the pedestrian and bicycle Highway 92 overcrossing. This trail gap along Breakwater divides the northern and southern portions of the Bay Trail. The Eden Greenway can be redeveloped for better bikeway travel at crossings and include a potential crossing over Interstate 880 to provide an off-street connection between east and west Hayward. The regional effort to develop the East Bay Greenway adjacent to the BART line in the Union Pacific Railroad corridor could provide connections from Fremont to downtown Oakland. Other regional efforts, like the San Lorenzo Creek Trail led by Alameda County, could tie into many of Hayward's existing and proposed on-street facilities. Plan recommendations on page 110 discuss collaborating with the East Bay Regional Parks District and other adjacent jurisdictions on this theme.

Connected Network

A key to maximizing the recommended network's benefit is planning for continuous facilities. Where recommendations continue to adjacent jurisdictions (including the County, neighboring cities, and special use districts), a continuous level of service can support biking and walking to make connections into and out of Hayward. Filling in the Bay Trail gap already discussed will support active use. Similarly, bicycle and pedestrian connections on the San Mateo-Hayward Bridge would unlock the potential for a direct active transportation connection between Alameda and San Mateo Counties. Freeway interchanges and water features within Hayward also represent existing barriers to a continuous and connected network. The Plan includes network recommendations to connect the gaps and discusses recommendations for accommodating pedestrians and bicyclists at interchanges on page 96.

Coordination with HARD System Plan

The Hayward Area Recreation & Park District (HARD) is building on these regional efforts—as well as the City of Hayward's and Alameda County's Bicycle and Pedestrian Master Plans—to craft a trail system plan for its jurisdiction, which includes all of Hayward as well as unincorporated communities to the north and east. The HARD Trails and Open Space Master Plan will define a connected trail system to help the District more fully meet the recreational needs of a growing a diversifying community, while also creating positive benefits for active transportation. HARD's trail system would include a full spectrum of trail types, from unpaved trails in open space areas to paved multi-use trails and on-street segments that leverage the bicycle and pedestrian networks described here.



HAYWARD BICYCLE & PEDESTRIAN MASTER PLAN

KITTELSON & ASSOCIATES

TOOLE DESIGN

Figure 42

Recommended Bicycle Network
City of Hayward

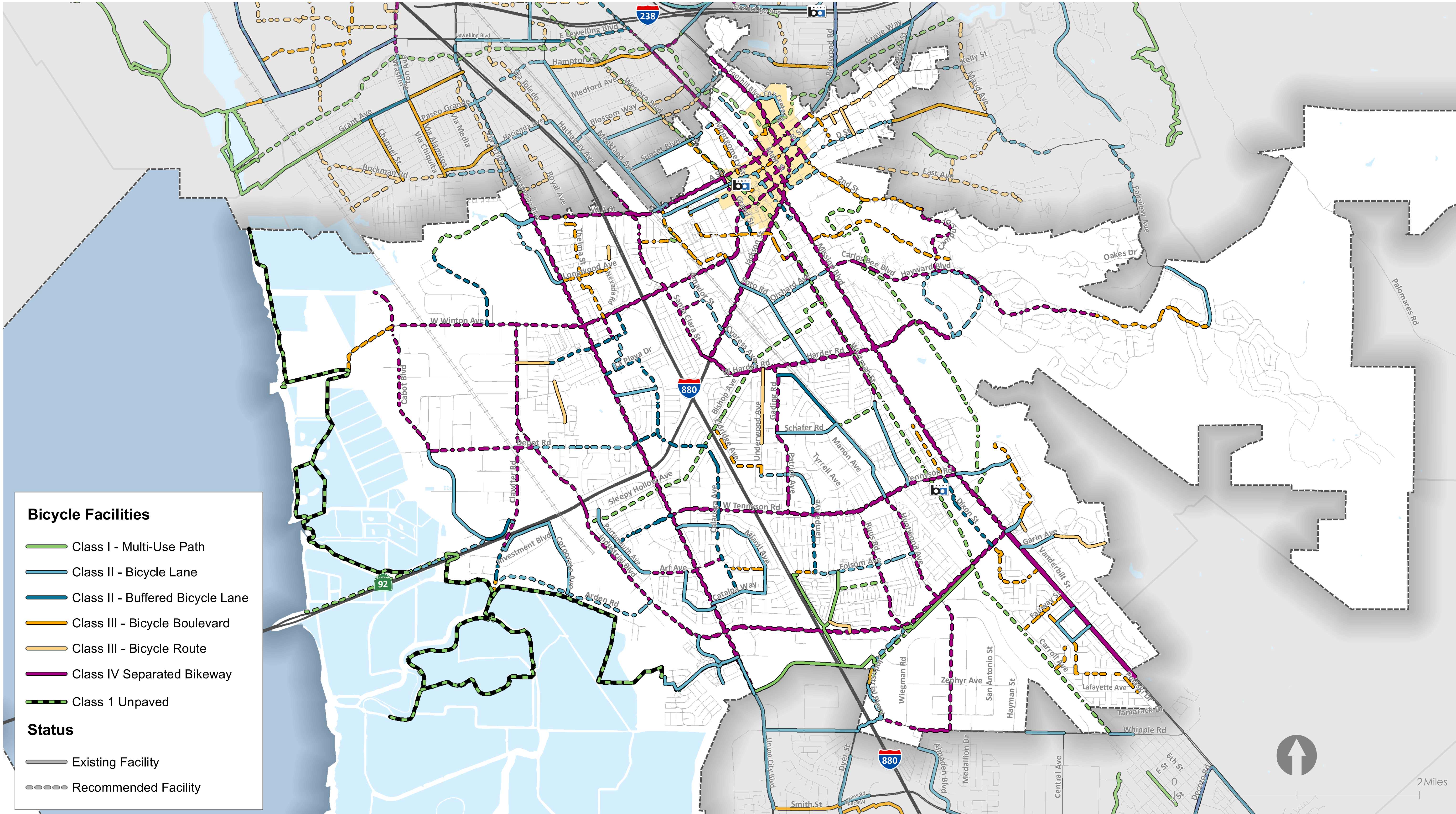


Figure 43

Existing and Recommended Bicycle Network
City of Hayward

HAYWARD BICYCLE & PEDESTRIAN MASTER PLAN | KITTELSON & ASSOCIATES | TOOLE DESIGN

PEDESTRIAN NETWORK RECOMMENDATIONS

The pedestrian network was developed in tandem with the recommended bicycle network using a complete streets approach. A suite of pedestrian treatments is recommended to be implemented along project corridors that constitute the recommended all ages and abilities bicycle network. In this way, when near-term or longer-term improvements are being identified, bicycle and pedestrian improvements can be planned for, designed, and implemented together.

Along the all ages and abilities network where improvements are proposed, pedestrian corridor recommendations were developed based on street typology for local/neighborhood, collector, and arterial streets. The recommendations vary depending on the street type, but all include intersection improvements such as additional ADA curb ramp improvements and high-visibility crosswalk treatments. A high-cost and low-cost improvement assumption was generated for each street type to account for varying levels of possible investments where the same magnitude of improvements may not be required or where pedestrian improvements were not identified during the project development and public engagement phase of the project.

Table 17 provides the recommended treatments to be implemented along project corridors, organized by roadway type for which they are recommended. For example, ADA curb ramps are recommended for all roadway types, but signal improvements are only recommended along collector roads in the high-cost scenario (and in both scenarios for arterial roads). The approach reflects that more infrastructure is needed to support a safe and comfortable walking environment along higher-volume and higher-speed roadways.

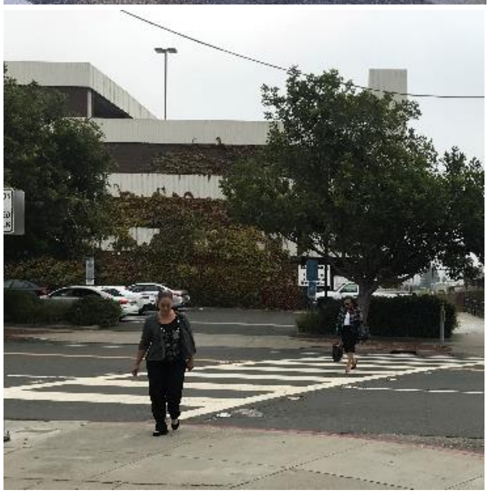
Table 17. Pedestrian Network Recommendations

<table>
<tr><th rowspan="2">Recommended Improvements</th><th colspan="3">Roadway Functional Class</th></tr>
<tr><th>Local/Neighborhood Street</th><th>Collector Street</th><th>Arterial Street</th></tr>
<tr><td>ADA Curb Ramps</td><td rowspan="2">Low Cost and High-Cost Scenario</td><td rowspan="4">Low Cost and High-Cost Scenario</td><td rowspan="6">Low Cost and High-Cost Scenario</td></tr>
<tr><td>High-Visibility Crosswalks</td></tr>
<tr><td>Midblock RRFBs</td><td rowspan="2">High-Cost Scenario</td></tr>
<tr><td>Curb extensions</td></tr>
<tr><td>Signal Improvements</td><td>-</td><td>High-Cost Scenario</td></tr>
<tr><td>Midblock Pedestrian Hybrid Beacons</td><td>-</td><td>-</td></tr>
</table>

Recommended treatments include the following:

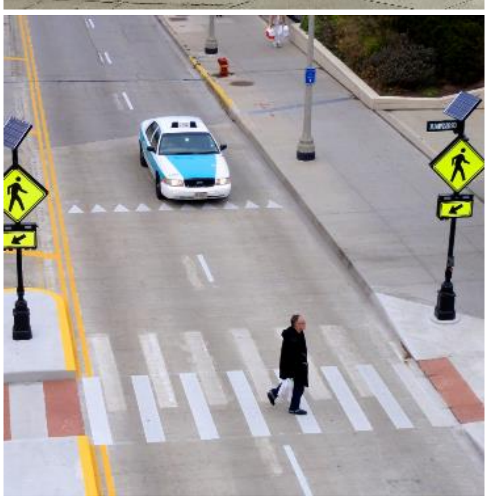
ADA curb ramps:

ADA-accessible curb ramps provide a transition between the sidewalk and the roadway and make crossings accessible to pedestrians with assistive devices and pedestrians who are blind or have low vision. See more in the infrastructure recommendations section of the Plan and in **Appendix D**. They are assumed to be installed as directional curb ramps on all intersection corners.



High-visibility crosswalks:

High-visibility crosswalks include markings that are parallel to a motor vehicle or bicycle's traveled way (referred to as *continental* markings). They are more visible to approaching road users relative to basic transverse markings. They are assumed to be installed on all marked crosswalks at every intersection on recommended corridors.



Rectangular rapid flashing beacons (RRFBs):

RRFBs provide a push-button activated warning light to drivers to promote yielding to help pedestrians cross. Where recommended, they are assumed to be installed with an average frequency of two per mile.

Image Source: FHWA

Curb extensions:

Curb extensions visually and physically narrow the roadway at intersection corners and other crossing locations. They shorten the crossing distance for pedestrians, reducing exposure to vehicle traffic. Where recommended, they are assumed to be installed at between 20% to 60% of intersections (more frequently along collectors than local roads, and more frequently along arterial than along collectors). A quick-build curb extension is possible using paint and soft-hit posts, which has less effect on roadway drainage. Page 39 of **Appendix D** includes a discussion of pop-up and quick-build facilities.

Image Source: NACTO

Signal improvements:

Signal improvements can promote an improved pedestrian environment by allocating more time to crossing, providing leading pedestrian intervals, or altering signal phasing to separate pedestrian and vehicle conflicts in time. Where recommended, signal improvements were assumed to be implemented with an average frequency of approximately three intersections per mile.

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Pedestrian hybrid beacons (PHBs):

PHBs are push-button activated traffic control devices that provide a red indication requiring drivers to stop. Where they are recommended, PHBs are assumed to be installed with an average frequency of one per mile.

Roadway reconfiguration projects also have safety benefits for pedestrians, reducing speeds and crossing distances. Roadway reconfiguration project implementation recommendations are discussed on page 113. For more information on these treatments, consult the infrastructure and Operations Section of the Plan and **Appendix D:** Engineering and Design Guidance Toolbox. **Figure 45** presents the recommended pedestrian network, organized by functional class to designate the recommended suite of improvements at each location. In addition to the recommended network, there are intersections in the City with more frequent and severe collisions relative to the rest of the City's network. These intersections are listed below along with their pedestrian collision history from 2012 to 2016.

These intersections should be considered for future pedestrian safety improvements:

- **West Tennyson Road and Huntwood Avenue**: eight pedestrian collisions (including three severe injury collisions)
- **Jackson Street and Silva Avenue / Meek Avenue**: five pedestrian collisions (including one severe injury and one fatal collision)
- **Foothill Boulevard and City Center Drive**: two pedestrian collisions (including one fatal and one severe injury collision)

As opportunities arise, the identification of safety projects at these intersections can improve safety outcomes for pedestrians.

TRANSIT SUPPORTIVE INFRASTRUCTURE

An essential part of complete streets design is infrastructure to support pedestrian connections to transit and bus stop designs that accommodate bikeway facilities. In collaboration with AC Transit, corridors with transit service were identified and sorted into high-, medium-, and low-cost corridors to identify recommended infrastructure. Based on the level of AC Transit priority and the recommended bikeway facility, bus stop typologies were identified from the AC Transit *Multimodal Corridor Design Guide*. Two bus stop typologies were applied to create recommended transit-supportive infrastructure, presented in **Figure 44**. Typology 1 is preferred for Class II Bike Lane applications and low-cost Class IV Separated Bikeway applications where transit may mix with the bikeway at bus stops. Bus stop typology 2 is generally preferred where the separation of transit and bicycle facilities is needed on higher frequency transit routes and where curb-separated Class IV facilities are desired. (Note that typology 2 may apply to both Class II and Class IV bike lanes). The improvements associated with these stop locations include a green thermoplastic paint for conflict areas and/or shared lanes, painted red curb, a transit shelter with benches, bike racks, restriping of high-visibility crosswalks, and pavement markings. The typology 2 improvements also include a floating bus boarding island, lean rail, and curb ramps with detectable warning surfaces.

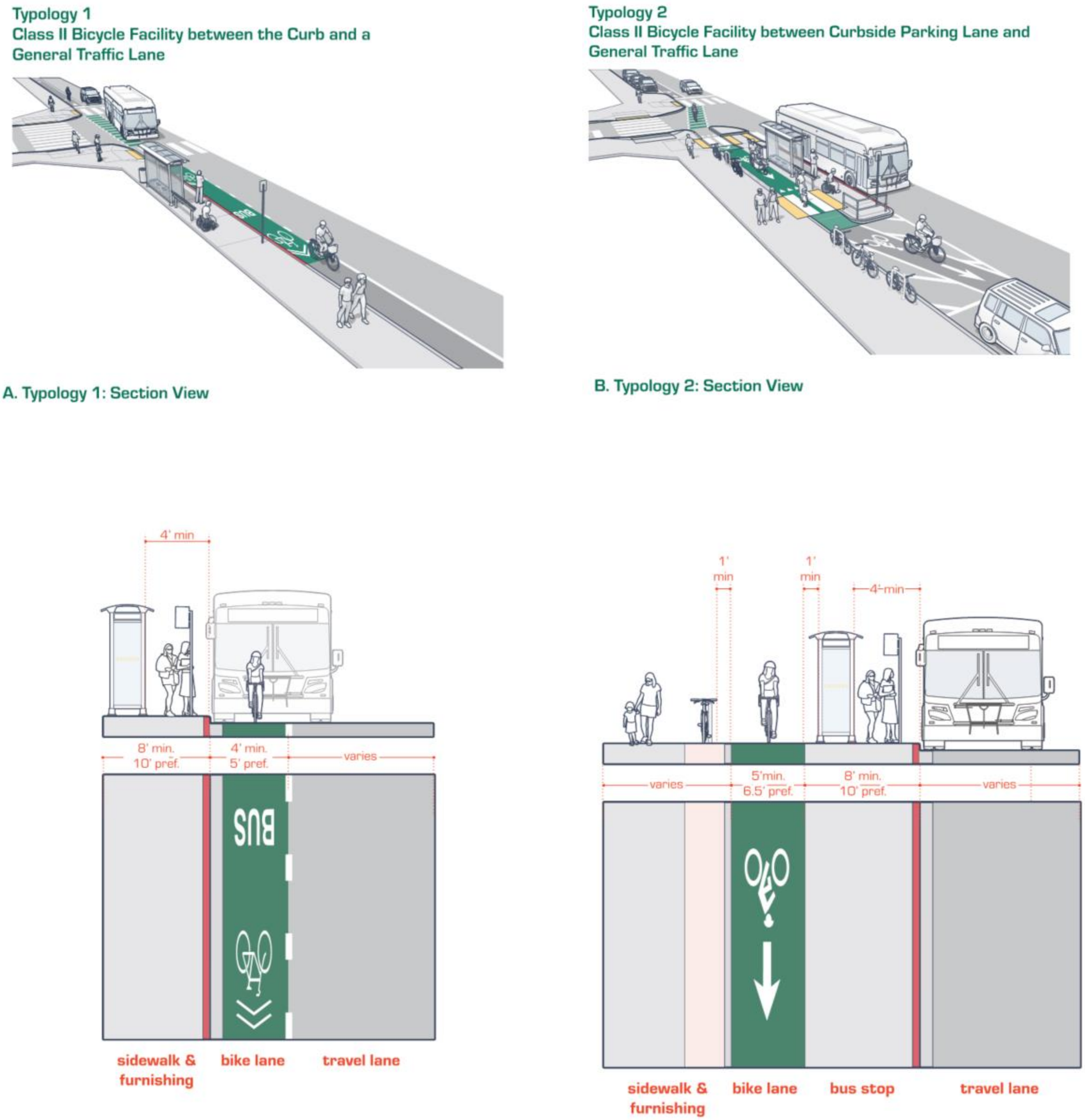
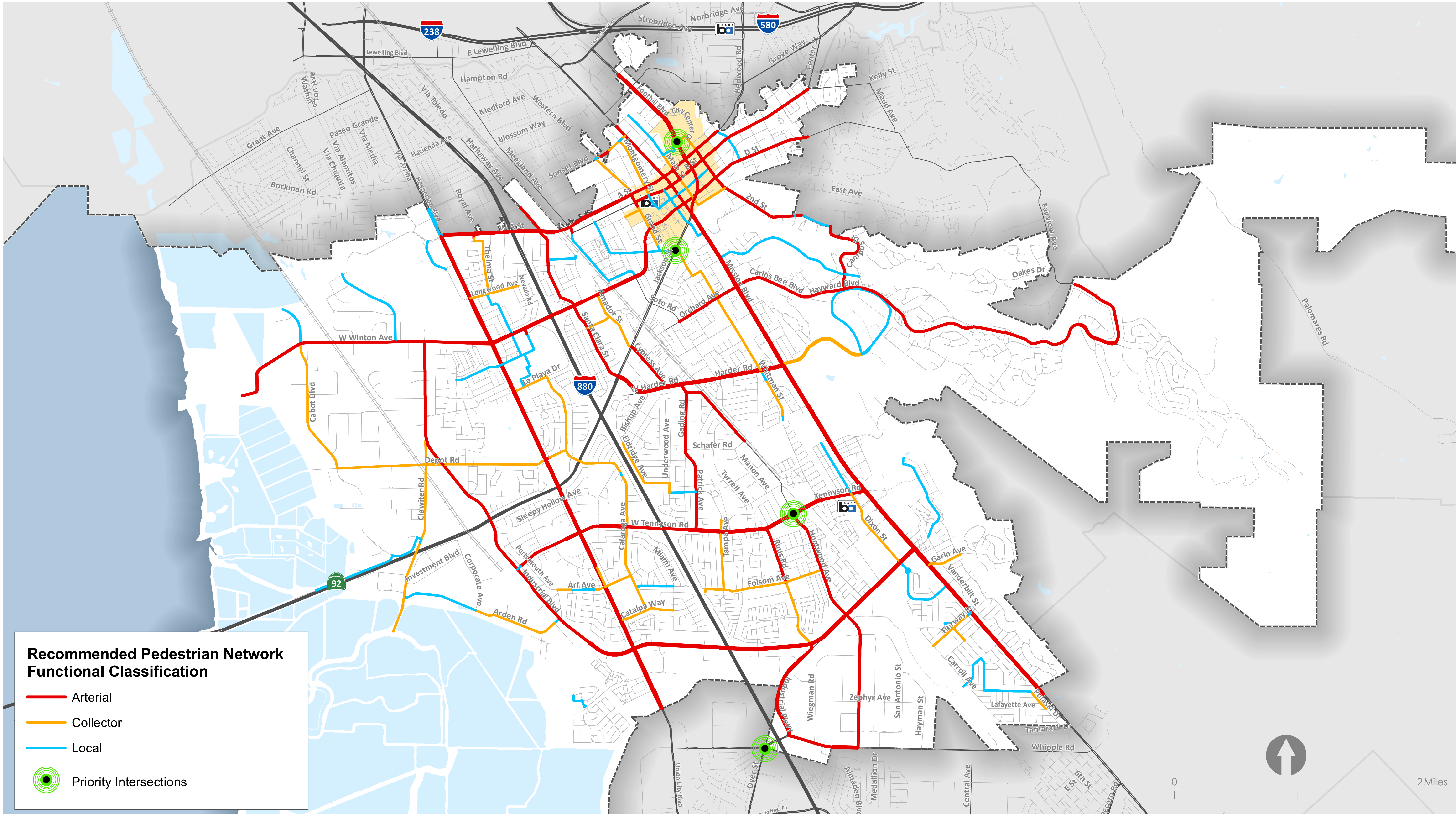


Figure 44: Bus Stop and Bicycle Facility Typologies Recommended

Image Source: AC Transit Multimodal Design Guide



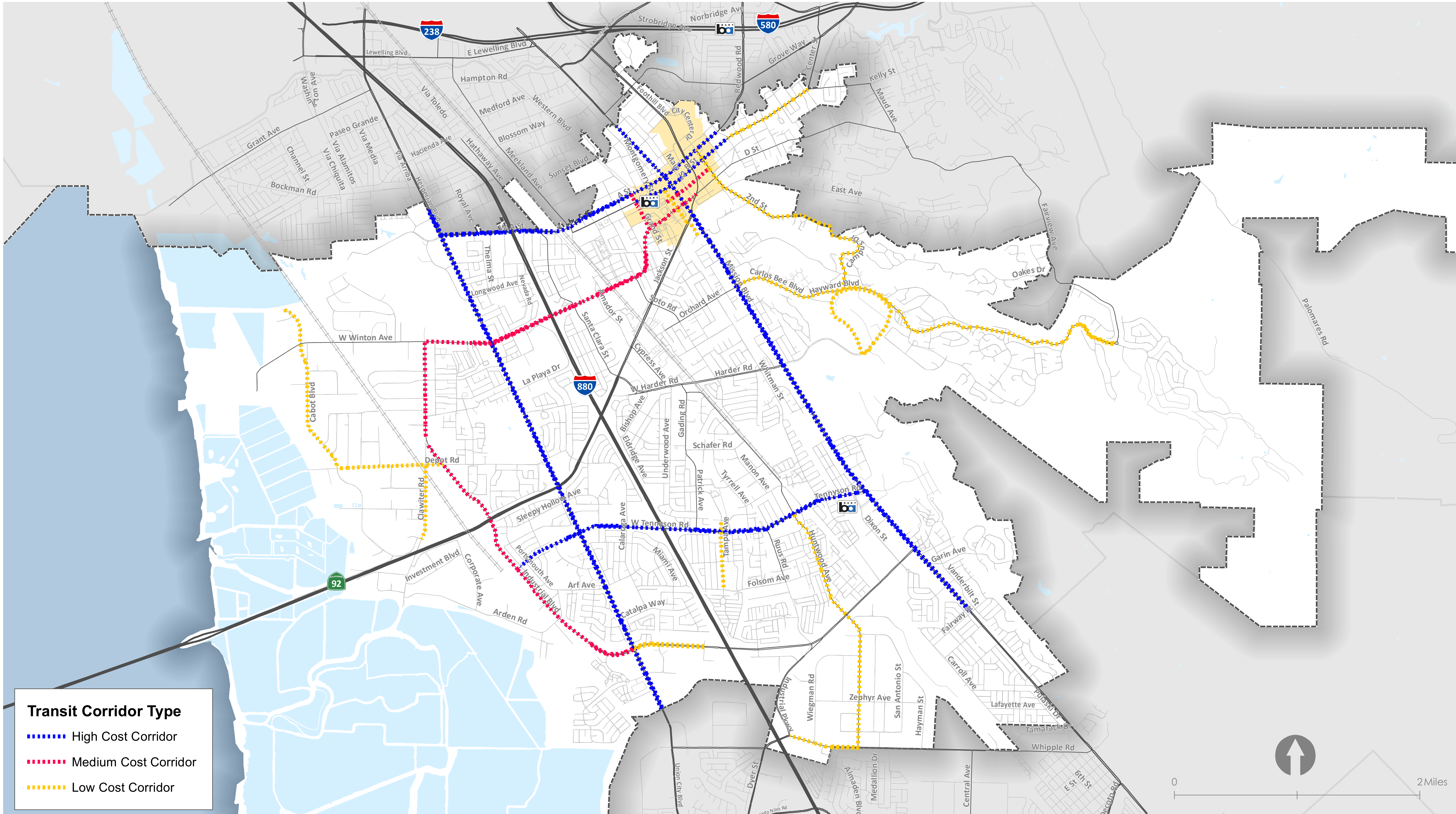
HAYWARD
BICYCLE & PEDESTRIAN
MASTER PLAN

KITTELSON & ASSOCIATES

TOOLE DESIGN

Figure 45

Recommended Pedestrian Network
City of Hayward



HAYWARD BICYCLE & PEDESTRIAN MASTER PLAN

KITTELSON & ASSOCIATES

TOOLE DESIGN

Figure 46

Proposed Transit Supportive Improvements
City of Hayward

05 PROGRAM AND POLICY RECOMMENDATIONS

PROGRAM AND POLICY RECOMMENDATIONS

As part of this Plan, the City has identified policies, programs, and practices to improve conditions for residents and visitors who walk and bike in Hayward. On September 7, 2018, City staff from multiple departments, including Public Works, Environmental Services, and Planning, participated in an interview to assess how the City is implementing existing policies, programs, and practices.

The interviews focused on five main categories of recommendations:

- Infrastructure and Operations
- Evaluation and Planning
- Funding
- Project Implementation
- Education and Enforcement

Recommendations are presented in more detail after the table.

Table 18. Summary of Plan Recommendations for Pedestrian-related Policies, Programs, and Practices

	Topic Area	Recommendations
Infrastructure and Operations	Attention to Crossings and Barriers	• Coordinate with Caltrans, Hayward Area Recreation District, Alameda County Flood Control, and other agencies to improve bicycle and pedestrian accommodations for bridges and underpasses • Develop controlled crossing design and standards • Accommodate bicycles and pedestrians at freeway interchanges • Coordinate early and often with Union Pacific Railroad to improve accommodations for bicycles and pedestrians at railroad crossings
	Bike Parking Requirements	• Develop bike corral guidance • Develop bike rack implementation program and map • Develop short-/long-term bicycle parking requirements and standards
	Intersections and Interchanges	• Add bike detection with signal modification and upgrades • Complete a citywide intersection study (Complete Streets Strategic Initiative Recommendation) • Develop signal timing standards and ensure consistent application for bicyclists • Develop standards for Leading Pedestrian Interval (LPI) applications • Develop standards for modifying signals for full accessibility
	Crosswalks and Traffic Control Devices	• Design standards and applications for PHBs and RRFBs • Develop a crosswalk installation policy and/or decision matrix including applications for midblock crossings • Inventory traffic control devices citywide

	Topic Area	Recommendations
Infrastructure and Operations Cont.	Design Guidance	• Develop ADA Design Guidance and improvement program • Apply principles for the Neighborhood Traffic Calming Program on all projects • Develop and adopt bicycle and pedestrian design standards • Develop landscape architecture and stormwater management design guidance
	Off-street Multi-Use Paths and Separated Facilities	• Develop language for implementing easements and private property paths • Collaborate with East Bay Regional Park District, Hayward Area Recreation District, Alameda County, Alameda County Transportation Commission, and other adjacent jurisdictions to coordinate maintenance efforts for off-street and Class IV facilities • Require developments in the Hayward Foothills to comply with SD-7 Foothill Trails requirements[2]
Evaluation and Planning	Collision Review and Reporting	• Conduct periodic review of bicycle and pedestrian collisions and trends • Coordinate a regular safety audit program of collision locations
	Bicycle and Pedestrian Volumes	• Create a data collection strategy for collecting bicycle and pedestrian volumes citywide
	Transit Coordination and Planning	• Coordinate with AC Transit on ADA improvements near transit stops • Evaluate rapid transit implementation on key corridors in conjunction with AC Transit's planning efforts
	Development Standards, Site Plan Review, and Traffic Impact Studies	• Update street frontage standards and form-based codes to ensure pedestrian amenities are included • Develop an Americans with Disabilities Act review checklist • Require multimodal traffic counts as part of Traffic Impact Assessments • Update impact evaluation criteria for bicyclists and pedestrians including a multimodal level of service standard (Complete Streets Strategic Initiative recommendation) • Develop a façade improvement program and business improvement districts • Promote park once and walk strategies in high-pedestrian activity areas

[2] SD7 Foothill Trails requirements refer to a special design overlay district with the purpose of ensuring development of a continuous trail as properties are developed. See https://www.hayward-ca.gov/sites/default/files/Ch-10_A-1_S-1.2600_special-design-overlay.pdf more details.

	Topic Area	Recommendations
	Roadway Reconfiguration	• Develop methodology for roadway reconfiguration feasibility studies • Adopt a resolution or ordinance supporting a roadway reconfiguration implementation policy to streamline implementation of roadway reconfiguration in paving projects (see recommended policy language on page 113)
Funding	Strategies for Funding	• Develop a list of potential grant and alternative funding strategies • Create a multimodal impact fee to fund bicycle and pedestrian improvements (SB 743 and Citywide Multimodal Improvement Study currently underway) • Calculate the VMT reduction potential of bicycle and pedestrian facilities and allow developers to reduce VMT impacts by implementing bicycle and pedestrian projects or including in multimodal impact fee • Add dedicated sidewalk funding to the Capital Improvement Program • Add priority complete streets projects to the Capital Improvement Program (Complete Streets Strategic Initiative recommendation)
	Staff	• Hire a dedicated bicycle and pedestrian staff person
Project Implementation	Construction Zones	• Create guidance for accommodating bicyclists and pedestrians in construction zones
	Coordination with Other City Efforts	• Coordinate the implementation of on-street bicycle facilities and curb ramp replacement with the pavement repair program • Form a Bicycle and Pedestrian Advisory Committee • Promote existing City of Hayward public comment mechanisms and strategies
	Intra- and Inter-Agency Coordination	• Coordinate and partner with advocacy groups, such as Bike East Bay • Coordinate with the Fire Department on design treatments • Partner with health agencies to promote the benefits of walking and biking
	Rapid and Interim Facilities	• Develop strategies for rapid network implementation and interim design treatments
Education and Enforcement	Supportive Amenities and Wayfinding	• Develop bikeshare and scooter share (micromobility) policy along with a framework for regulating operations • Create a sidewalk riding ordinance to detail where it is allowed and an e-bike ordinance • Promote a future citywide bike network and amenities map • Install bicycle and pedestrian wayfinding • Develop a Transportation Demand Management strategy to incorporate bicycle and pedestrian facilities or amenities

	Topic Area	Recommendations
	Safety and Education	• Coordinate with the Alameda County Safe Routes to School program and encourage all Hayward schools to participate • Conduct school safety walking audits and site evaluations for all Hayward schools • Conduct speed surveys in school zones and work to reduce speeds to less than or equal to 25 mph • Develop a Vision Zero program to address safety education along High Injury Network corridors
	Enforcement	• Encourage the Hayward Police Department to have officers attend bicycle safety courses, such as Bike East Bay's Urban Cycling 101, to promote empathy and understanding of cycling conditions • Implement a bike ticket diversion program

INFRASTRUCTURE AND OPERATIONS

ACCOMMODATING BICYCLES AND PEDESTRIANS AT INTERCHANGES

Interchanges are complex intersections that require special design considerations to ensure that pedestrians and bicyclists can move through the interchange safely. The following obstacles common to interchanges can create uncomfortable and unsafe environments for pedestrians and bicyclists:

- Crossings of free-flow motor vehicle movements
- Exposure to higher-speed traffic
- Weaving movements across a bicyclist's path of travel and other traffic
- Designs which require circuitous travel paths which may result in routing confusion
- Multi-stage crossings or transitions which can increase travel time or delay
- Long crossings which increase exposure, potentially trapping bicyclists where signal timing cannot accommodate bicyclists traveling on the roadway
- Bicycle facilities with constrained widths adjacent to higher-speed traffic
- Requiring bicyclists to operate with pedestrians in crosswalks and other shared facilities

Where interchanges accommodate high volumes of vehicles and allow motorists' operating speeds to exceed 25 to 30 mph, only experienced bicyclists may feel able or willing to navigate in shared lanes or bicycle lanes. Crossings of uncontrolled high-speed ramps, merging, and weaving areas can present safety problems for people biking, resulting in people avoiding the intersection. In locations where alternative routes are not available or practical, these locations become major barriers that can discourage biking and walking.

Interchange without bicycle infrastructure at Tennyson Road and Interstate 880.

A variety of crossing treatments can be used to enhance the comfort and safety of pedestrians and bicyclists at interchanges. Traffic signals with bicycle phases or timing to accommodate bicyclists, adjustments to signal phasing, PHBs, RRFBs, raised crosswalks, median refuge islands, advance yield/stop lines, and other pavement markings, such as extensions of bike lanes through intersections, can all be used at interchanges to improve crossings for pedestrians and bicyclists.

Key Design Principles:

- Minimize conflicts with motor vehicles to ensure pedestrians and bicyclists are safe. This includes the provision of safe, protected queuing areas.
- Minimize delay to encourage traffic control compliance
- Provide clearly designated crossing areas to encourage predictable movements. Use multistage crossings where necessary.

Recommendations

- Incorporate design guidance for pedestrian and bicycle accommodations as listed above at interchanges as part of the Bicycle and Pedestrian Master Plan Design Guide (**Appendix D)**. Interchange crossings along Interstate 880 were cited as major barriers by the public during the community engagement phase of the Bicycle and Pedestrian Master Plan development. The Design Guide includes elements that can be included to improve safety at interchanges. Facility recommendations should include how to accommodate adequate low-stress bicycle facilities and ensure pedestrian crossing ramps are visible to oncoming drivers.
- Coordinate directly with Caltrans to implement and Alameda CTC to fund or manage interchange projects. This includes providing comments and review of plans and projects.

Best Practice Examples and Resources

- Institute of Transportation Engineers, *Recommended Design Guidelines to Accommodate Pedestrians and Bicycles at Interchanges*, 2014
- Transportation Research Board, National Cooperative Highway Research Program (NCHRP) 07-25: *Guide for Pedestrian and Bicycle Safety at Alternative Intersections and Interchanges*, forthcoming.

BICYCLE PARKING REQUIREMENTS

Bicycle parking enhances the usefulness of bicycle networks by providing locations for the secure storage of bicycles during a trip. It is an easy and low-cost way to enhance a bike network. Bicycle parking requires far less space than automobile parking- in fact, ten bicycles can typically park in the area needed for a single car.

Bicycle parking consists of a rack that supports the bicycle upright and provides a secure place for locking. Bicycle racks should be permanently affixed to the ground surface. Movable bicycle racks are only appropriate for temporary use, such as at community events or valet bike parking. Bicycle racks should provide two points of support for bicycles to prevent locked bicycles from falling over.

Bicycle rack footings can be mounted in soil, concrete, or asphalt, or mounted to stable surfaces using anchors. There are two primary categories of bike parking: short-term and long-term parking. Each has its own unique purpose and design considerations.

Short-term Bike Parking

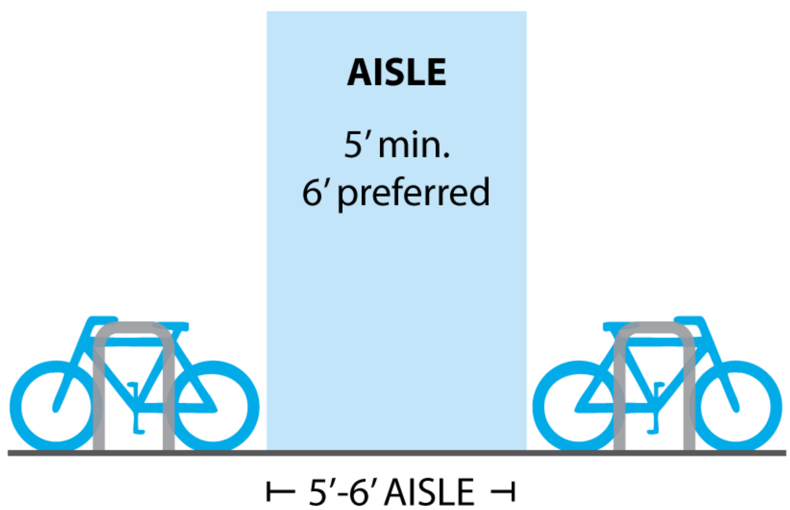
In general, short-term bike parking should be convenient and easy to use. It should be located as close as possible to the destination it is serving. Short-term parking is typically provided in the street or outside of the necessary clear through-zone on the sidewalk, either as a series of single racks or corrals.

Short-term bike parking is designed to meet the needs of bicyclists making short visits (a few hours at most); therefore, it should be easy to see and self-explanatory. The use of objects (e.g., parking meters, fences, signposts) as bicycle parking indicates a need for designated bike parking.

Example of a bike corral in a parking space.

Long-term Bike Parking

The most important characteristics of long-term bike parking are that it is secure and shelters bikes from the elements. Long-term parking will typically be used by bicyclists for all-day or overnight parking. Long-term bike parking is typically built for residents, employees, or transit users. There are a variety of ways to provide long-term bike parking, including space in a secure and enclosed parking garage, bike lockers, or in a room with secured access.



Preferred double loaded bike rack spacing.
Single tier/ Double loaded

Recommendations

- Adopt a bicycle parking policy and implementation plan for short-term and long-term bicycle parking options. The policy should address both private development and public right-of-way:
- *Considerations for Private Developments*: The policy should require bicycle parking with new development and in certain locations throughout the city.
- *Considerations for Public Right-of-Way:* As part of the implementation plan, new locations should be located throughout the city, and a corresponding map for existing bicycle parking options should be developed. Dedicated funding for bicycle parking should be added to the Capital Improvement Program to implement a certain number of bike racks and corrals per year.

Bike parking in an enclosed parking garage.

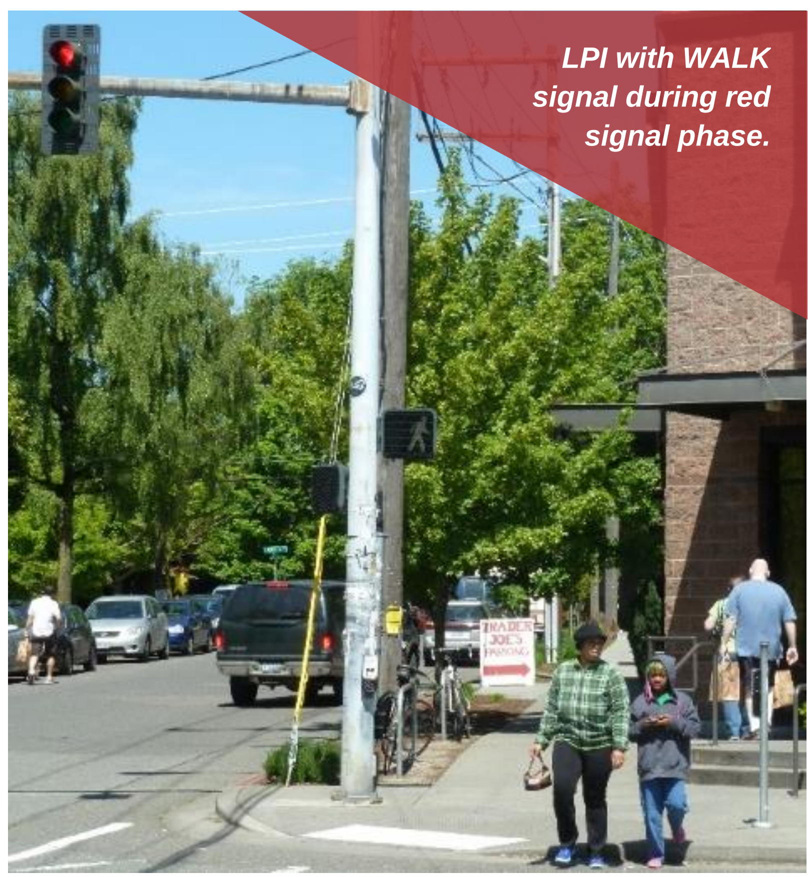
Best Practice Examples and Resources for Bicycle Parking

- Association of Pedestrian and Bicycle Professionals. Essentials of Bike Parking. 2015.

LEADING PEDESTRIAN INTERVAL APPLICATION GUIDANCE

Leading pedestrian intervals (LPIs) give pedestrians a head start when crossing at a signalized intersection. LPIs can be easily programmed into existing signals to give pedestrians the WALK signal a minimum of three to seven seconds before motorists are allowed to proceed through the intersection. This extra time provides pedestrians with an opportunity to establish their presence in the crosswalk before motorists start turning and provides additional crossing time for those who need it. This head start can increase the percentage of motorists who yield the right-of-way to pedestrians and can minimize conflicts between pedestrians crossing a roadway and turning vehicles. LPIs may be more effective when used

In general, LPIs can be implemented at signalized intersections with medium to high pedestrian and turning vehicle volumes. Locations with high volumes of elderly populations or people with mobility impairments, high collision history, and school crossings may also be appropriate locations for LPIs.



LPI with WALK signal during red signal phase.

Recommendations

- **Develop policy and guidance for implementing LPIs at signalized intersections.** The City does not currently have a consistent methodology for evaluating the application of LPI at signalized crossings throughout the city. This could also be included in a crosswalk policy for how to assess signalized intersection crossings enhancements. The City should then evaluate and inventory existing signalized intersections for installing LPIs, especially in the downtown area.

Best Practice Examples and Resources

- NACTO, *Urban Streets Design Guide*
- Transportation Research Board, NCHRP 15-63: *Guidance to Improve Pedestrian and Bicycle Safety at Intersections* (Under Development)

GUIDANCE FOR MODIFYING SIGNALS FOR FULL ACCESSIBILITY

Accessible signals and intersections include accessible pedestrian signals and compliant curb ramps. Accessible pedestrian signals (APS) are devices that communicate information about pedestrian timing (e.g., WALK and DON'T WALK intervals) in nonvisual formats such as audible tones, verbal messages, and/or vibrating or tactile surfaces. APS helps people with visual and/or hearing disabilities understand where pedestrian pushbuttons are located, where it is safe to cross the street, and when it is safe to cross the street. Section 504 of the Rehabilitation Act requires newly constructed and reconstructed public facilities to be accessible to all members of the public. APS should be installed wherever pedestrian signals are installed. Standards for APS signals and accessible curb ramps are defined by Caltrans and dictate where push buttons should be placed, including placement in relation to curb ramps and their maximum height above the sidewalk surface. Accessible curb ramps must follow specific width and slope requirements and have detectable warning strips.

Recommendations

- Develop standards for modifying signals for full accessibility. Title II of the Americans with Disabilities Act (ADA) requires that state and local governments ensure that people with disabilities have access to pedestrian routes in the public right-of-way. This includes signalized street crossings. The City currently does not have standards to ensure that new and reconstructed intersections with pedestrian signals are modified for full accessibility. The City also does not have a formal process for modifying existing signals not slated for reconstruction for full accessibility. The City may wish to use the intersection prioritization tool developed and provided in Appendix D of National Cooperative Highway Research Program (NCHRP) Web-Only Document 117A: *Accessible Pedestrian Signals: A Guide to Best Practices* (2010) to help determine which intersections should be prioritized for accessibility modifications.

Best Practice Examples and Resources

- California Department of Transportation. *Permanent Pedestrian Facilities ADA Compliance Handbook*. http://www.dot.ca.gov/construction/docs/Permanent_Pedestrian_Facilities_ADA_Compliance_Handbook.pdf
- Washington State Department of Transportation. Field Guide for Accessible Public Rights of Way. http://www.wsdot.wa.gov/publications/fulltext/Roadside/ADA_Field_Guide.pdf
- National Academies of Sciences, Engineering, and Medicine. Accessible Pedestrian Signals: A Guide to Best Practices. http://www.trb.org/Publications/Blurbs/164696.aspx

Accessible pedestrian signal push button with informational sign.

Source: Montgomery County Department of General Services

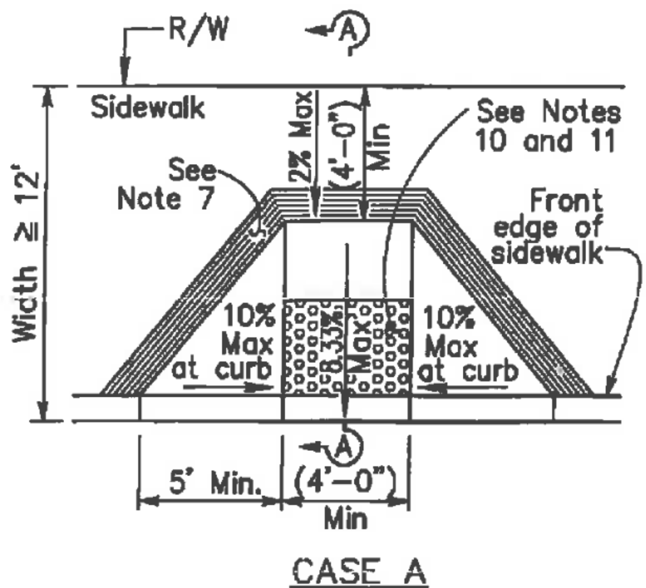


Figure 47. Curb Ramp Design Specifications

Note: The City provides other curb ramp design options if dstance from curb to back of walk is shorter. Source: City of Hayward Standard Details, https://www.hayward-ca.gov/documents/hayward-standard-details

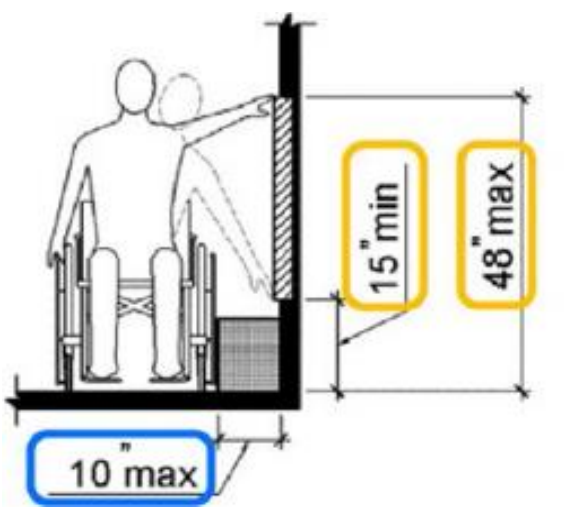


Figure 48. Pedestrian Push Button Height Specifications

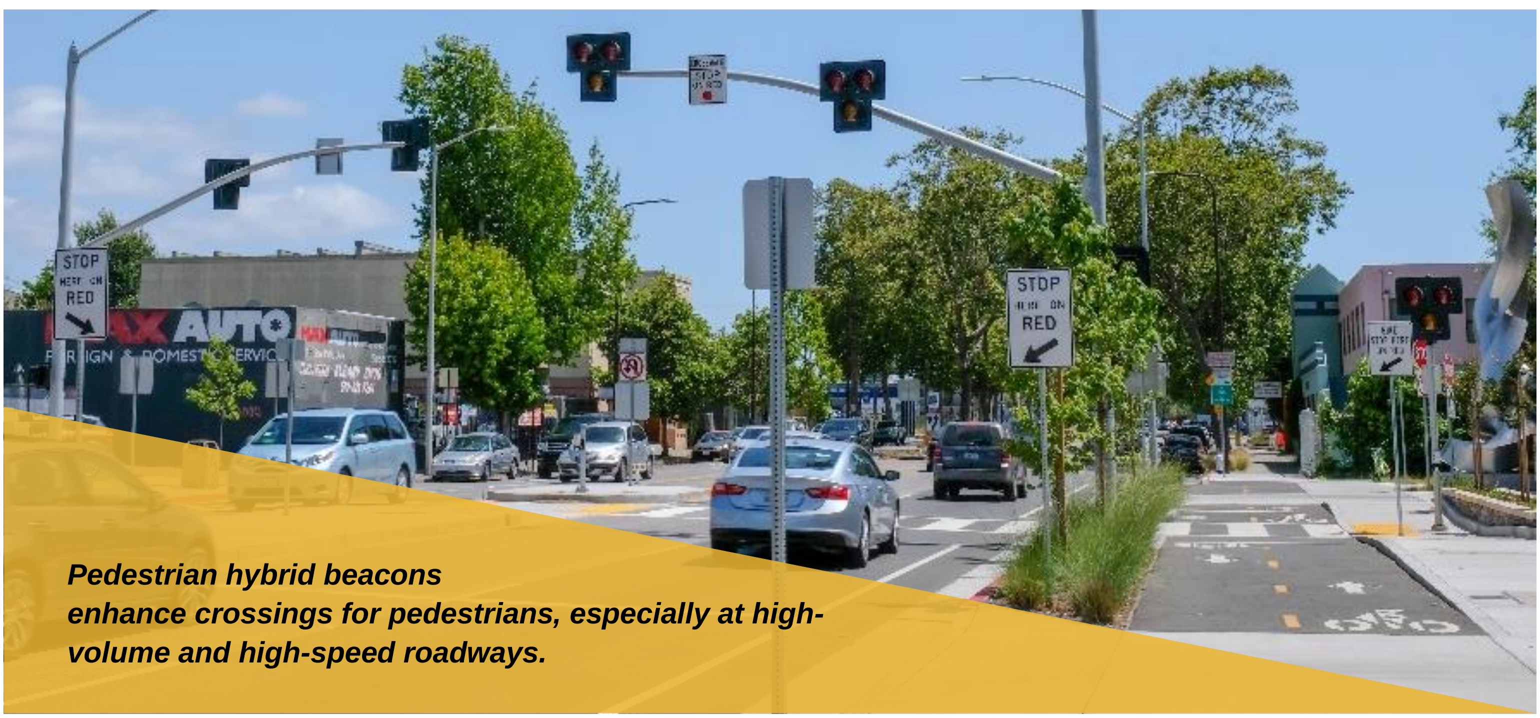
Source: Caltrans

DESIGN STANDARDS AND APPLICATIONS FOR PEDESTRIAN HYBRID BEACONS (PHB) AND RECTANGULAR RAPID FLASHING BEACONS (RRFB)

At some uncontrolled crossings, particularly those with more than two lanes, it can be challenging to get drivers to yield to pedestrians and bicyclists attempting to cross the street. Vehicle speeds and poor visibility combine to create challenging conditions in which drivers are compelled to yield. Pedestrian- or bicyclist-activated beacons, including the PHB and RRFB, are intended to allow pedestrians and bicyclists to stop traffic to cross high-volume arterial streets. RRFBs have been known to increase the rate of drivers yielding to pedestrians and bicyclists, while PHBs require drivers to come to a complete stop like at a traditional signal. These types of traffic control devices may be used when a full traffic signal may not be appropriate or warranted per the California Manual on Uniform Traffic Control Devices (CA-MUTCD).

While these types of devices were originally intended for pedestrians, they can be used for bicyclists as well, either by directing bicyclists to use the devices with signs or outfitting the traffic control devices with bicycle detection and bicycle signal heads. The provision of bicycle signal heads would require permission to experiment from the Federal Highway Administration (FHWA).

See **Appendix D** for more details on PHB and RRFB suitability.



Pedestrian hybrid beacons enhance crossings for pedestrians, especially at high-volume and high-speed roadways.

Design Considerations:

- RRFBs are considerably less expensive to install than PHBs. RRFBs can also be installed with solar power panels to eliminate the need for an external power source.
- RRFB and PHBs 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.
- RRFBs and PHBs should be used in conjunction with advance stop bars and signs and high-visibility crosswalk markings.
- RRFBs and PHBs are usually implemented at high-volume pedestrian crossings but may also be considered for priority bicycle route crossings or locations where bike facilities cross roads.
- PHBs are typically installed on multilane roadways in urban and suburban environments with posted speeds of 25 to 40 mph and low to medium vehicle volumes, while RRFBs are typically installed on two-lane roadways.

Recommendations

- **Adopt design standards and application guidance for traffic control devices such as PHBs and RRFBs.** As part of the Bicycle and Pedestrian Master Plan Design Guide, include and adopt standards for PHB and RRFP applications. The standards for applications can also be included in a custom crosswalk policy and decision matrix tool.

Best Practice Examples and Resources

- Transportation Research Board, NCHRP 15-63: Guidance to Improve Pedestrian and Bicycle Safety at Intersections (Under Development)

CROSSWALK INSTALLATION, REMOVAL, AND ENHANCEMENT POLICIES

Pedestrian crossings are a natural point of conflict with motor vehicles, and most pedestrian collisions occur at an intersection or midblock crossings. Furthermore, the lack of appropriate crossings can deter some people from walking due to safety concerns or inconvenience.

The provision of safe and comfortable crossings is especially important on multilane roads with moderate to high traffic volume and speeds. In such contexts, the needs of pedestrians are sometimes overlooked relative to motor vehicle flow. Establishing safe crossings on multilane streets results in a safer transportation system that also supports the goals of pedestrian access and connectivity. The City does not have a formal crosswalk policy to determine where crosswalks should be marked or what crosswalk enhancement treatments should be applied.

Recommendations

- **Develop a pedestrian crosswalk policy and enhancement guidelines.** Guidelines that establish criteria for implementation (or removal) of crosswalks would provide a transparent and predictable process for where crosswalks can and should be installed, as well as the appropriate treatments for different street contexts. A significant body of research exists to support the development of criteria (see Resources below).

Best Practice Examples and Resources

- City of Portland. Crosswalk Guidelines. https://www.portlandoregon.gov/transportation/article/594882 (accessed April 5, 2019)
- City of Sacramento. Pedestrian Crossing Guidelines. 2014. https://www. cityofsacramento. org/-/media/Corporate/Files/Public-Works/Publications/Transportation/Bicycle-Pedestrian/Ped-Safety. pdf?la=en
- City of Oakland Pedestrian Master Plan, “Oakland Walks!” Crosswalk Policy and Selection Matrix (Appendix A2) https://www.oaklandca.gov/resources/pedestrian-plan-update
- FHWA. Safety Effects of Marked versus Unmarked Crosswalks: Executive Summary and Recommended Guidelines. 2002. https://www.fhwa.dot.gov/publications/research/safety/04100/04100.pdf
- FHWA. Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations, 2017. https://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/guide_to_improve_uncontrolled_crossings.pdf
- NCHRP Report 562: Improving Pedestrian Safety at Unsignalized Crossings. 2006. https://nacto.org/wp-content/uploads/2010/08/NCHRP-562-Improving-Pedestrian-Safety-at-Unsignalized-Crossings.pdf
- UC Berkeley Traffic Safety Center. Driver/Pedestrian Understanding and Behavior at Marked and Unmarked Crosswalks. 2007. http://repositories. cdlib. org/its/tsc/UCB-TSC-RR-2007-4

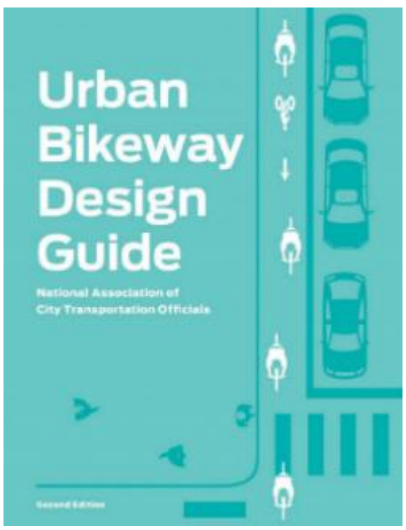
Rectangular rapid flashing beacon at pedestrian and bicycle crossing in Seattle, WA.

DEVELOP AND ADOPT BICYCLE AND PEDESTRIAN DESIGN STANDARDS INCORPORATING NATIONAL BEST PRACTICE GUIDES

As part of the Bicycle and Pedestrian Master Plan, a Bicycle and Pedestrian Engineering and Design Guide was developed and should be adopted as part of the final Plan. It is included in **Appendix D**. The Design Guide includes recommendations from national best practice documents and customizes design standards to meet the needs of Hayward facilities. The Design Guide should be considered when implementing any bicycle and pedestrian facilities. Best practice design guides developed by outside sources should continually be referenced for updated information as newer versions are released and used in conjunction with the Hayward Bicycle and Pedestrian Design Guide.

Bikeway Design Best Practice Resources

The following manuals provide detailed information on bicycle facility and roadway design and should be referenced early in the design process:

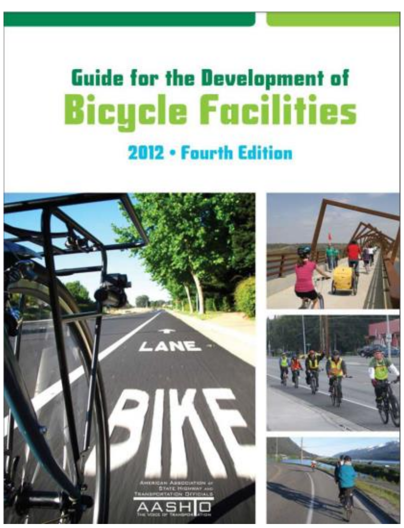


Urban Bikeway Design Guide

National Association of City Transportation Officials (NACTO) | 2014

NACTO is comprised of the transportation departments of many major and mid-sized US cities. This is an alternative to other available design guides from NACTO and contains more guidance on innovative bikeway designs than any other source. Guidelines found in the Urban Bikeway Design Guide sometimes provide additional bikeway design options than those found in the AASHTO guide (described below), although they are mostly in agreement.

The *Urban Bikeway Design Guide* may be viewed for free at: https://nacto.org/publication/urban-bikeway-design-guide/.



Guide for the Development of Bicycle Facilities

AASHTO | 2012

AASHTO is a nonprofit, nonpartisan body representing state transportation departments. AASHTO's *Guide for the Development of Bicycle Facilities* is a widely used bikeway planning and design tool. This guidebook was last published in 2012. It does not contain guidance on some bicycle facility types and treatments that are widely in use by transportation agencies such as protected bike lanes. A revision that will include the latest in bicycle facility design and contextual guidance is in process and anticipated to be published in 2020.

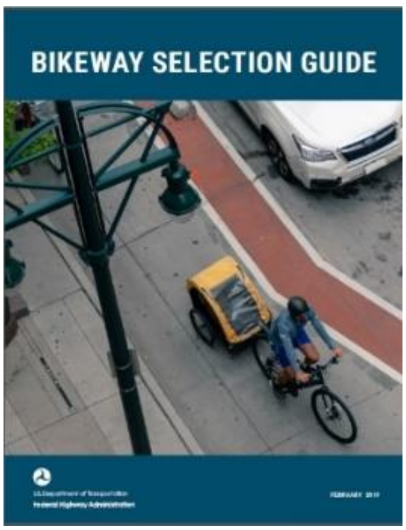
The 2012 version is available for purchase at: http://transportation.org.

California Manual on Uniform Traffic Control Devices

California Department of Transportation | 2018

The *California Manual on Uniform Traffic Control Devices* (CA-MUTCD) defines the standards used by road managers in California to install and maintain traffic control devices on all public streets, highways, and bikeways. The CA-MUTCD was last published by the California Department of Transportation in 2018. It includes the 2014 edition with four rounds of revisions. Its main contributions to bikeway design are the provision of signage and striping standards.

The CA-MUTCD is available for free download at:
https://dot.ca.gov/programs/traffic-operations/camutcd



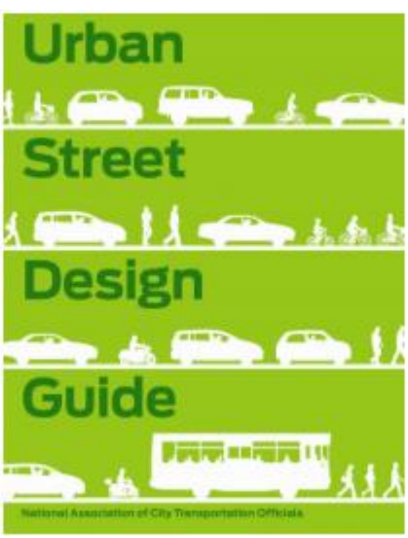
Bikeway Selection Guide

FHWA | 2019

The *Bikeway Selection Guide* provides guidance for selecting bicycle facilities based on existing roadway context and intended design users. It provides step-by-step information for planners and engineers seeking to implement the appropriate bikeway for a specific context.
The *Bikeway Selection Guide* is available for free download at:
https://safety.fhwa.dot.gov/ped_bike/tools_solve/docs/fhwasa18077.pdf

Pedestrian Design Best Practice Resources

The following manuals provide detailed information on pedestrian, transit access, and amenities/pedestrian zone design considerations and should be referenced early in the design process:



Urban Street Design Guide

NACTO | 2013

NACTO is comprised of the transportation departments of many major and mid-sized US cities. NACTO members collaborated to create a shared best practice called the *Urban Street Design Guide*, first published in 2011. The guide provides a blueprint for designing 21st-century streets and unveils the toolbox and the tactics cities use to make streets safer, more livable, and more economically vibrant. The guide includes many pedestrian-focused elements, such as interim design strategies and intersection design controls.

The *Urban Street Design Guide* may be viewed for free at:
https://nacto.org/publication/urban-street-design-guide/.

Transit Street Design Guide

NACTO | 2016

The *Transit Street Design Guide* provides design guidance to develop transit facilities on city streets, to prioritize transit, improve transit service quality, and support other goals related to transit. However, the guide does provide elements for considering pedestrian access to transit facilities and design considerations for transit stops, which are directly related to the pedestrian realm.

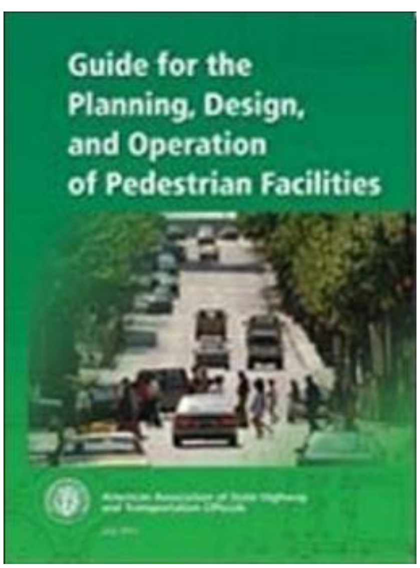
The *Transit Street Design Guide* may be viewed or downloaded for free at: https://nacto.org/publication/transit-street-design-guide/.

Urban Street Stormwater Guide

NACTO | 2016

The *Urban Street Stormwater Guide* illustrates a vision of how cities can utilize streets to address resiliency and climate change while creating public spaces that are truly public and nurturing streets that deliver social and economic value, and while protecting resources and reconnecting natural ecological processes. The *Urban Street Stormwater Guide* provides Cities with national best practices for sustainable stormwater management in the public right-of-way, including core principles about the purpose of streets, strategies for building inter-departmental partnerships around sustainable infrastructure, technical design details for siting and building bioretention facilities, and a visual language for communicating the benefits of such projects. Stormwater considerations are especially relevant when implementing pedestrian, bicycle, and transit improvements at the edge of the curb with impacts to flowlines.

The *Urban Street Stormwater Guide* may be viewed or downloaded for free at: https://nacto.org/publication/urban-street-stormwater-guide/.



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

AASHTO | 2004

The purpose of the *Guide for the Planning, Design, and Operation of Pedestrian Facilities* is to provide guidance on the planning, design, and operation of pedestrian facilities along streets and highways. Specifically, the guide focuses on identifying effective measures for accommodating pedestrians on public rights-of-way. Appropriate methods for accommodating pedestrians, which vary among roadway and facility types, are described in this guide.

The *Guide for the Planning, Design, and Operation of Pedestrian Facilities* may be purchased at: https://store.transportation.org/Item/CollectionDetail?ID=131

Recommendations

- Adopt the Hayward Bicycle and Pedestrian Engineering and Design Guide (see **Appendix D**) as part of the final Bicycle and Pedestrian Master Plan. By adopting specific bicycle and pedestrian design guidance, the City will have standards to refer to when communicating required elements of projects with developers and stakeholders and have a treatment toolbox to use when communicating with the public. Additionally, the City should incorporate best practice design guidance from newer versions as they are released. Active transportation design guidance is constantly evolving and improving. Almost every year, new detailed guidance is published to help Cities improve the walking and biking environment. This guidance is often published by Caltrans, FHWA, AASHTO, or NACTO. The City should stay up to date on the latest guidance and consider processes for integrating new guidance into its standards as the information becomes available.

Best Practice Examples and Resources

- AC Transit Multimodal Corridor Design Guidelines, 2019. http://www.actransit.org/ac-transit-multimodal-corridor-design-guidelines/
- City of Fort Collins. Streetscape Standards. 2013. http://www. fcgov. com/planning/pdf/streetscape-doc. pdf?1363368935
- City of Seattle, StreetsIllustrated, Street Type Standards (accessed June 5, 2018).
- City of San Diego Street Design Manual, March 2017. https://www.sandiego.gov/sites/default/files/street_design_manual_march_2017-final.pdf
- NACTO Urban Street Design Guide. http://nacto. org/publication/urban-street-design-guide/
- CA MUTCD, Revision 4. 2014. http://www. dot. ca. gov/trafficops/camutcd/
- FHWA. Achieving Multimodal Networks: Applying Design Flexibility and Reducing Conflicts, 2016.
- FHWA Safe Transportation for Every Pedestrian (STEP), 2018. https://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/step.cfm
- FHWA Pedestrian Safety Guide and Countermeasure Selection System (PEDSAFE). http://www.pedbikesafe.org/pedsafe/
- Crime Prevention Through Environmental Design (CPTED). http://www.cpted.net/
- NACTO Blueprint for Autonomous Urbanism. 2017. https://nacto.org/wp-content/uploads/2017/11/BAU_Mod1_raster-sm.pdf

EASEMENTS AND PRIVATE PROPERTY PATHS

Trails provide a low-stress, off-street facility for people who walk and bike. Trails in Hayward consist of dirt, unpaved facilities (such as those in the Hayward Hills, like the Hayward Plunge Trail) and paved, Class I multi-use paths (such as the trail parallel to Industrial Parkway). While the Plan will include specific Class I multi-use path design guidance and a detailed map of where proposed trail recommendations are located, there is a larger need to highlight the role that smaller trails can connect communities. New development should include trail-oriented principles to provide active transportation and greenway connections separate from motor vehicle access points.

The regional East Bay Greenway is a project to construct a 16-mile bicycle and pedestrian facility following the BART alignment through Oakland, San Leandro, Hayward, Ashland, and Cherryland. As the East Bay Greenway continues to take shape and jurisdictions work to connect Hayward to Oakland, new land-use opportunities will develop to create trail-oriented developments. These will be great opportunities to provide housing and retail that centers on trails rather than around roadways while providing access to both Hayward BART stations. According to the Urban Land Institute, new trails can catalyze real estate development, encourage healthier lifestyles, increase property values, and maximize surrounding investments in active transportation facilities.

Recommendations

- **Develop language for implementing easements and private property paths.** Future developments should identify how trails can be implemented to build connections with existing neighborhoods and across barriers. The City should consider how easements can be developed for the use of paths on private property as part of the development review process. Future development sites, especially along Mission Boulevard, should be evaluated to include or contribute to new grade-separated crossings that better link communities over the BART tracks and to Mission Boulevard.

Best Practice Examples and Resources

- FHWA Recreational Trails Program. https://www.fhwa.dot.gov/environment/recreational_trails/guidance/manuals.cfm
- Rails to Trails Conservancy Trail-Building Toolbox. https://www.railstotrails.org/build-trails/trail-building-toolbox/
- Urban Land Institute: Active Transportation and Real Estate: The Next Frontier. Washington, D.C.: The Urban Land Institute, 2016. https://americas.uli.org/research/centers-initiatives/building-healthy-places-initiative/active-transportation-real-estate/

Trail-Oriented Development Easement in Bethesda, Maryland.

Source: ULI Active Transportation and Real Estate.

COLLABORATE WITH EAST BAY REGIONAL PARK DISTRICT AND OTHER ADJACENT JURISDICTIONS TO COORDINATE MAINTENANCE EFFORTS FOR OFF-STREET AND CLASS IV SEPARATED BIKEWAY FACILITIES

Facility maintenance is an important component of bikeway planning. Off-street and Class IV bike facilities can be more likely to accumulate debris in all seasons because car tires do not help to sweep them and because the physical barriers can limit nominal clearance that would otherwise be achieved by precipitation and wind.

While riding in these types of facilities, bicyclists may have limited opportunities to avoid obstacles such as debris, obstructions, slippery surfaces, and pavement damage because they are confined by physical barriers. This makes maintenance of off-street and Class IV bike facilities particularly important. Seasonal maintenance of these facilities may be especially important in the fall when leaves are falling, or after particularly bad windstorms. Tree roots growing under the pavement may also require maintenance to preserve a comfortably smooth pathway. When deciding which facilities to maintain first, priority should be given to bikeways that have the highest ridership and those that provide access to schools, business districts, major employers, major transit centers, and other important destinations.

Example of a smaller street sweeper for separated bikeways and trails next to a standard size street sweeper.

Source: Jonathan Maus/ BikePortland

Off-street trails in particular can be obstructed by large trash piles and other debris from other trail users and nearby homeless encampments. These hazards can significantly impact ridership and can go unaddressed for long periods of time if no agency conducts regular maintenance on the trails.

Class IV bike lanes often cannot be swept in the same manner as other vehicular lanes and may (depending on facility width) require specialized (smaller) maintenance equipment. The maintenance of Class IV bike facilities could be improved by developing partnerships between surrounding communities; Alameda County Public Works Agency and/or Alameda County Transportation Commission (Alameda CTC) could help facilitate maintenance of these facilities in conjunction with the Cities of San Leandro, Fremont, and Union City.

Recommendations

- Work with adjacent jurisdictions, Alameda County Public Works Agency, Alameda CTC, East Bay Regional Park District, and Hayward Area Recreational District to create a collaborative maintenance plan for separated bikeway facilities. This could include a cost-sharing strategy for purchasing smaller street sweepers that can be operated on a rotating basis. This would need to include establishing consistent minimum design standards to accommodate such vehicles. Additionally, establish a funding stream and maintenance agreements for future off-street trail facilities.

Best Practice Examples and Resources

- People for Bikes Tech Talk: The Best Street Sweepers for Clearing Protected Bike Lanes, 2014. https://peopleforbikes.org/blog/tech-talk-the-best-street-sweepers-for-clearing-protected-bike-lanes/
- The League of American Cyclists How Communities are Paying to Maintain Trails, Bike Lanes, and Sidewalks, 2014. https://bikeleague.org/sites/default/files/AA_MaintenanceReport.pdf

EVALUATION AND PLANNING

AMERICANS WITH DISABILITIES ACT COMPLIANCE

Facilities in the public right-of-way are required to be accessible through Section 504 of the Rehabilitation Act of 1973 and Title II of the Americans with Disabilities Act. The Americans with Disabilities Act (ADA) requirements apply to permanent and temporary facilities, including routes, curb ramps, and other pedestrian features. Property owners, developers, landscape architects, architects, engineers, planners, and construction professionals in Hayward should all be familiar with, or have access to, ADA standards and guidelines to ensure that facilities in the public right-of-way are accessible to people in Hayward of all ages and abilities. The list should include the presence of facilities (e.g., curb ramps and accessible pedestrian signals); confirm whether sidewalks and other pedestrian routes and curb ramps meet surface material, slope, and width standards; and confirm whether pedestrian signals meet accessibility requirements.

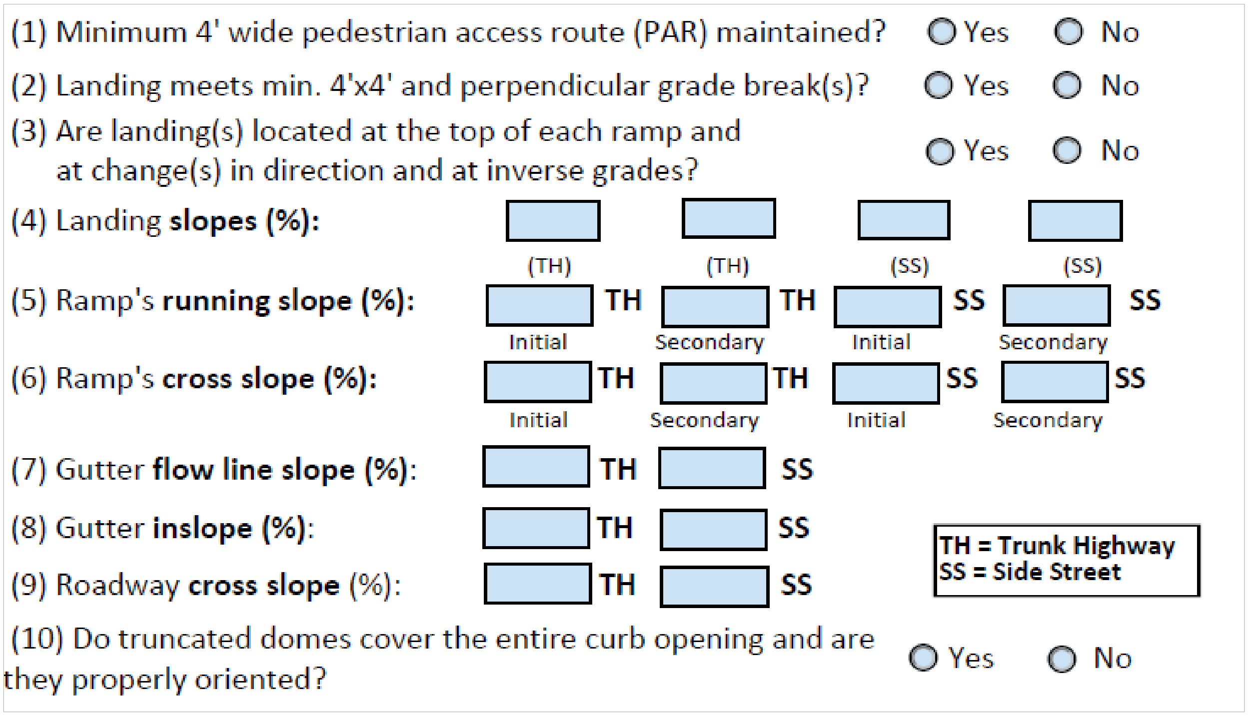

(1) Minimum 4' wide pedestrian access route (PAR) maintained? Yes No
(2) Landing meets min. 4'x4' and perpendicular grade break(s)? Yes No
(3) Are landing(s) located at the top of each ramp and at change(s) in direction and at inverse grades? Yes No
(4) Landing **slopes (%):** (TH) (TH) (SS) (SS)
(5) Ramp's **running slope (%):** Initial TH Secondary TH Initial SS Secondary SS
(6) Ramp's **cross slope (%):** Initial TH Secondary TH Initial SS Secondary SS
(7) Gutter **flow line slope (%)**: TH SS
(8) Gutter **inslope (%)**: TH SS
(9) Roadway **cross slope** (%): TH SS
TH = Trunk Highway
SS = Side Street
(10) Do truncated domes cover the entire curb opening and are they properly oriented? Yes No

Figure 49. Section of Curb Ramp Compliance Checklist.

Source: Minnesota Department of Transportation

Recommendations

- **Develop an Americans with Disabilities Act Review Checklist.** The City should develop a checklist, which can be used to ensure that all new projects are compliant with ADA standards. This list can also be used in conjunction with an inventory process to track progress towards updating existing facilities to meet the ADA standards. This list should be presented in an easy-to-read format so that City staff, contract professionals, and others can understand and use the checklist.

Best Practice Examples and Resources

- **Institute for Human Centered Design. ADA Checklist for Existing Facilities.** https://www.adachecklist.org/doc/fullchecklist/ada-checklist.pdf
- **Minnesota Department of Transportation. Curb ramp Compliance Checklist.** https://www.hennepin.us/-/media/hennepinus/residents/transportation/documents/MnDOT---Curb-Ramp---ADA-Compliance-Checklist.pdf?la=en&hash=D53B1B9C11B2F5E9CF98D36943D549C8202AD3AF
- **Minnesota Department of Transportation. Accessible Pedestrian Signal Checklist.** https://www.hennepin.us/-/media/hennepinus/residents/transportation/documents/MnDOT---Accessible-Pedestrian-Signals---ADA-Compliance-Checklist.pdf?la=en&hash=5D0EAF0672025CCF9A4C95072E8C9E8485A6B071 and https://www.hennepin.us/-/media/hennepinus/residents/transportation/documents/MnDOT--ADA-Compliance-Checklist-Powerpoint-Presentation.pdf?la=en&hash=20326970D851007222C71CECFADA162BD586E910

ROADWAY RECONFIGURATION CHECKLIST & PAVING PROJECT COORDINATION

The City of Hayward implements roadway reconfigurations to integrate pedestrian, bicyles, and transit facilities; succesffully address challenging gaps in the transportation network; eliminate all traffic-related severe injuries and fatalities; and reduce vehicle speeds to the desired posted speed. A roadway reconfiguration removes vehicle travel lanes, typically reallocating the space for other modes and uses. Studies show that roadway reconfiguration projects have benefits such as reducing vehicle speeds; decreasing pedestrian scrossing distance and exposure; increasing dedicated space for bicyclist; and reducing the number and severity of collisions.

Incorporating roadway reconfigurations into resurfacing efforts can significantly reduce costs associated with the treatment. Internal planning and design costs are the only expenses incurred when roadway reconfiguration is implemented during a pavement project. Consequently, some state and local agencies have incorporated roadway reconfigurations into their routine review of all roads scheduled for repaving. Planning and clear processes are needed when determinint whether bicycle and pedestrian facilities are included as part of resurfacing projects. The project timeline must allow for design work and appropriate public outreach.

A roadway reconfiguration checklist would establish criteria to be considered prior to design to incorporate roadway reconfigurations into routine review of streets scheduled for repaving. A roadway reconfiguration feasibility study or checklist would also provide documentation to support the review and approval process for roadway reconfigurations.

Recommendations

- The City should develop a roadway reconfiguration checklist to ensure that all streets scheduled for repaving are reviewed for possible implementation of a roadway reconfiguration. The checklist should be completed for each roadway segment proposed for paving.
- Adopt a resolution or ordinance supporting a roadway reconfiguration policy to streamline implementation of roadway reconfigurations. All streets scheduled for repaving shall be reviewed for possible implementation of a roadway reconfiguration. Roadway reconfigurations meeting the criteria established in the checklist may be incorporated into resurfacing efforts and implemented without the need for City Council review and approval.

Best Practice Examples and Resources

- Federal Highway Administration (FHWA) Road Diet Informational Guide. https://safety.fhwa.dot.gov/road_diets/guidance/info_guide/rdig.pdf
- Federal Highway Administration. March 2016. Incorporating On-Road Bicycle Networks into Resurfacing Projects. https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/resurfacing/resurfacing_workbook.pdf
- Florida Department of Transportation. August 2020. Lane Repurposing Guidebook. https://fdotwww.blob.core.windows.net/sitefinity/docs/default-source/planning/systems/programs/sm/laneelimination/lane-repurposing-guidebook-2020.pdf?sfvrsn=c908af89_2
- City of Oakland Checklist for Complete Streets / Paving Project Coordination. https://safety.fhwa.dot.gov/road_diets/guidance/docs/oakland_chklist.pdf

- International Technology Scanning Program. August 2010. Public Policies for Pedestrian and Bicyclist Safety and Mobility. http://www.pedbikeinfo.org/cms/downloads/PBSPolicyReview.pdf

FUNDING

LEVERAGE POTENTIAL GRANT AND ALTERNATIVE FUNDING STRATEGIES

Active transportation projects can be funded in a variety of ways. Cities that have well-established active transportation networks use a wide variety of funding sources from all different levels of government and the private sector. There is not one standard source which communities can draw from.

Active transportation projects in Hayward are funded through a combination of ballot measure monies (Measure B and BB), the general fund, resurfacing projects, and grants. The City routinely uses local funds to provide matches for grant-funded projects. The Capital Improvement Program includes a Street Repair category that allots funding for ADA improvements to curb ramps. Staff seek Active Transportation Program grants and other State sources to fund smaller projects. Other potential funding sources could include gas taxes and local bond measures.

The State of California has dedicated funding through SB 1 and grant funding sources like the Active Transportation, Sustainable Communities, and Urban Greening Programs. Many of these sources can be reviewed for project applicability using Alameda CTC's 2019 Countywide Active Transportation Plan. It also generates funding for pedestrian and bicycle projects through bond proceeds, general fund, local planning assistance grants, vehicle registration fees, vehicle transfer fees, and a state gas tax. Federal funding sources include the Congestion Mitigation and Air Quality Improvement Program, Highway Safety Improvement Program, Surface Transportation Program, and Transportation Alternatives Program. A list of sources is provided in **Figure 50** and is detailed further in **Appendix G**.

Funding Sources for Protected Bikeways		
Federal	**State**	**Local/Regional**
• Better Utilizing Investments to Leverage Development (BUILD) Grants • Congestion Mitigation and Air Quality (CMAQ) Improvement Program • Surface Transportation Block Grant (STBG) Program • Land and Water Conservation Fund (LWCF) • Rivers, Trails, and Conservation Assistance Program	• Active Transportation Program (ATP) grants • Sustainable Communities Grants • Strategic Partnership Grants • Adaptation Planning Grants • State Highway Operation and Protection Program (SHOPP) • Highway Safety Improvement Program (HSIP) • Systemic Safety Analysis Report Program (SSARP) • Transit and Intercity Rail Capital Program (TIRCP) • State Transportation Improvement Program (STIP) • Trade Corridor Enhancement Program (TCEP) • State-Local Partnership Program (LPP) • Office of Traffic Safety (OTS Grants • Recreational Trails Program (RTP)	• One Bay Area Grants (OBAG) • Transportation Development Act (TDA) Article 3 • Regional Measure 1, 2, 3 and Future Regional Measures • Regional Active Transportation Program • Transportation Fund for Clean Air (TFCA) • Bicycle Rack Voucher Program (BRVP) • Measure WW Urban Creek Grant • Measure FF • Local BART Sales Tax • Measure RR

Funding Sources for Protected Bikeways		
• Community Development Block Grants	• Affordable Housing and Sustainable Communities (AHSC) Program • Transformative Climate Communities (TCC) Program • Environmental Enhancement and Mitigation (EEM) Grant Program • Urban Greening Grant Program • Environmental Justice (EJ) Small Grants Program • Stormwater Management Program • AB 2766 Subvention Program • Coastal Conservancy	• Measure B • Measure BB • Lifeline Transportation Program (LTP) • Vehicle Registration Fees • Developer Impact Fees • Business Improvement District funds • General Obligation Bonds • Tax Increment Financing (TIF) in new development areas • Voter-approved sales taxes or other levies • User fees • Parking meter revenues

Figure 50. How Hayward Can Pay for On-Street Bicycle Infrastructure

Source: League of American Bicyclists, calbike.org

Recommendations

- **Dedicate Funding Sources.** Dedicate a share of the Capital Improvement Program and General Fund money for stand-alone bicycle and pedestrian infrastructure projects and establish annual funding minimums or targets for bicycle and pedestrian facility improvements.
- **Apply for Grant Opportunities** Although grant funding is increasingly limited; the City should continue to apply for local, state, and federal grants to support bicycle and pedestrian network improvements and programming. Utilize the extensive list of funding grant funding sources presented in the Funding Sources section beginning on page 130 (and further detailed in **Appendix G**) and provided by the Alameda CTC in the Countywide Active Transportation Plan (published in 2019 and available at https://www.alamedactc.org/planning/countywide-bicycle-and-pedestrian-plans/).

Best Practice Examples and Resources

- Alameda County Transportation Commission Countywide Active Transportation Plan (published in 2019). https://www.alamedactc.org/planning/countywide-bicycle-and-pedestrian-plans/
- Funding Navigation for California Communities. https://www.fundingresource.org/active-transportation/
- City of Pasadena Department of Transportation. California Office of Traffic Safety Grant for the Safer Streets Pasadena – School Area Safety Program. https://www.cityofpasadena.net/transportation/traffic-engineering-safety/#pedestrians
- Advocacy Advance. Highway Safety Improvement Program. https://safety.fhwa.dot.gov/hsip/resources/fhwasa15012/
- League of American Bicyclists. https://www.bikeleague.org/
- California Office of Traffic Safety Pedestrian and Bicycle Safety Grants. https://www.ots.ca.gov/grants/pedestrian-and-bicycle-safety/

PEDESTRIAN AND BICYCLE COORDINATOR

A Pedestrian and Bicycle Coordinator can be a valuable asset to communities striving to increase biking and walking in their communities. A person in this role could help coordinate efforts between different departments to ensure that the City is able to take advantage of every opportunity to improve bicycle and pedestrian infrastructure. Pedestrian and Bicycle Coordinators can help Cities use resources more efficiently and be the designated person on staff who remains up-to-date and aware of upcoming opportunities.

A Pedestrian and Bicycle Coordinator can facilitate the following key tasks:

- Manage implementation and updates for the City's Bicycle and Pedestrian Master Plan
- Provide technical support to Cities during project planning, scoping, and design phases
- Track city and county benefits of plan implementation and trends in bicycle and pedestrian commuting through the use of census data, travel surveys, and volunteer-led bicycle and pedestrian counts
- Evaluate and prioritize potential projects for funding
- Apply for and manage grants
- Coordinate City active transportation programs
- Disperse best practices knowledge to other City Departments

Recommendations

- **Hire a Pedestrian and Bicycle Coordinator.** The 2014 Hayward Pedestrian Safety Assessment recommended assigning an existing staff person as a Pedestrian and Bicycle Coordinator. However, current best practices suggest that one full-time staff person should be hired to meet the guidance of one pedestrian/bicycle coordinator per 100,000 population. With a population of 160,000 people, Hayward would need one full time and one part-time staff, or 1.6 full-time equivalent positions dedicated to the pedestrian and bicycle program.

Accommodating Bicyclists and Pedestrians in Construction Zones

Pedestrian and bicyclist safety is important in and around construction zones in Hayward. Construction zones and other traffic control changes, which require temporary lane or sidewalk closures or detours, should be designed to accommodate pedestrian and bicycle travel. Specific accommodations for pedestrians and bicyclists are needed because these populations travel at slower speeds than motor vehicles and are more exposed to the physical impacts of construction zones. Characteristics of construction zones that can affect these vulnerable road users more than motorists include lack of through-access, excessive noise, dirt, construction material storage, fumes, and physical lack of protection from construction activities and debris.

Pedestrian construction zone accommodations in downtown Hayward.

Accommodations for pedestrians should integrate ADA standards and ensure that the same level of accessibility and detectability that was present under existing conditions is provided in the temporary accommodation. Similarly, bicycle construction zone accommodations should strive to maintain the same level of separation between bicyclists and other road users as was present under existing conditions. Key aspects of proper accommodations for pedestrians and bicyclists include the use of signs in advance of work zones to provide proper warning about changes in conditions, providing ADA accommodations, and minimizing detour lengths.

Recommendations

- **Develop a Pedestrian and Bicycle Construction Zone Accommodations Guide.** Guidelines that establish clear criteria and standards for pedestrian and bicycle construction zone accommodations would provide a useful resource for City Staff, developers, construction managers, and their employees. Cities across the country are increasingly providing these guidelines to ensure that pedestrians and bicyclists are protected and accommodated to the same extent that a vehicle would be. The guide will serve as an opportunity for the City to define standards and ensure that those working in the City clearly understand local and state guidance for construction zones. The guide is included in **Appendix E**.

Best Practice Examples and Resources

- Portland Bureau of Transportation, *Traffic Design Manual, Volume 2: Temporary Traffic Control*, 2017.

  https://content.govdelivery.com/accounts/ORPORTLAND/bulletins/1b5312b

- Seattle Department of Transportation, *Traffic Control Manual for In-Street Work*, 2018.

  https://www.seattle.gov/Documents/Departments/SDOT/About/DocumentLibrary/TrafficControlManual/2018_Traffic_Control_Manual.pdf

- Vermont Agency of Transportation, *Vermont Bicycle and Pedestrian Work Zone Traffic Control Guide*, 2018.

  http://vtrans.vermont.gov/sites/aot/files/documents/VTrans%20PedBike%20WZ%20Guide%20-%20July%202018.pdf

- California Department of Transportation*, California Manual on Uniform Traffic Control Devices*, 2014, revision 4.
- California Department of Transportation*, Temporary Pedestrian Facilities Handbook*, 2014. http://www.dot.ca.gov/hq/construc/safety/Temporary_Pedestrian_Facilities_Handbook.pdf
- Rapid Network Implementation and Repaving Strategies

Rapid Network Implementation Projects

The primary goal of rapid network implementation projects is to build out a low-stress bikeway network using lower-cost installation options. Facilities such as Class IV Separated Bikeways can be implemented rapidly at low-cost with parking-protected bikeways or with striping and bollards. The graphic in **Figure 51** shows how Class IV facilities evolve over time, starting with low-cost materials and ending with full concrete separation over time. This provides jurisdictions with the rapid implementation opportunity for more miles of bikeway while locating funding for more permanent streetscape design elements over time.

Recommendations

- **Develop strategies for rapid network implementation and interim design treatments.** Use the All Ages and Abilities bikeway recommendations developed as part of the Plan to evaluate which facilities can be implemented with primarily signing and striping to create a simplified citywide connected bicycle network. The Engineering & Design Guidance (included as **Appendix D**) also provides strategies for temporary facility implementation. Identify a funding source or apply for grant funding with the network as a complete or partial package of low-cost facilities. By grouping projects together, the City has a greater opportunity to be awarded funding by closing gaps and cost-effective projects, especially in identified disadvantaged communities.

Best Practice Examples and Resources

- City of Bellevue, WA Rapid Implementation Program. https://transportation.bellevuewa.gov/planning/pedestrian-and-bicycle-planning/pedestrian-bicycle-implementation-initiative/rapid-implementation-plan
- People for Bikes Quick Builds for Better Streets. https://b.3cdn.net/bikes/675cdae66d727f8833_kzm6ikutu.pdf
- City of San Jose Better Bikeway SJ. https://nacto.org/wp-content/uploads/2018/07/Better-Bikeway-San-Jose.pdf
- People for Bikes Big Jump Project. https://peopleforbikes.org/placesforbikes/the-big-jump-project/
- Bike Houston Build 50 Challenge. https://bikehouston.org/2018/04/20/the-build-50-challenge/
- City of Oakland 2019 Three-Year Paving Plan. https://www.oaklandca.gov/projects/2019-paving-plan

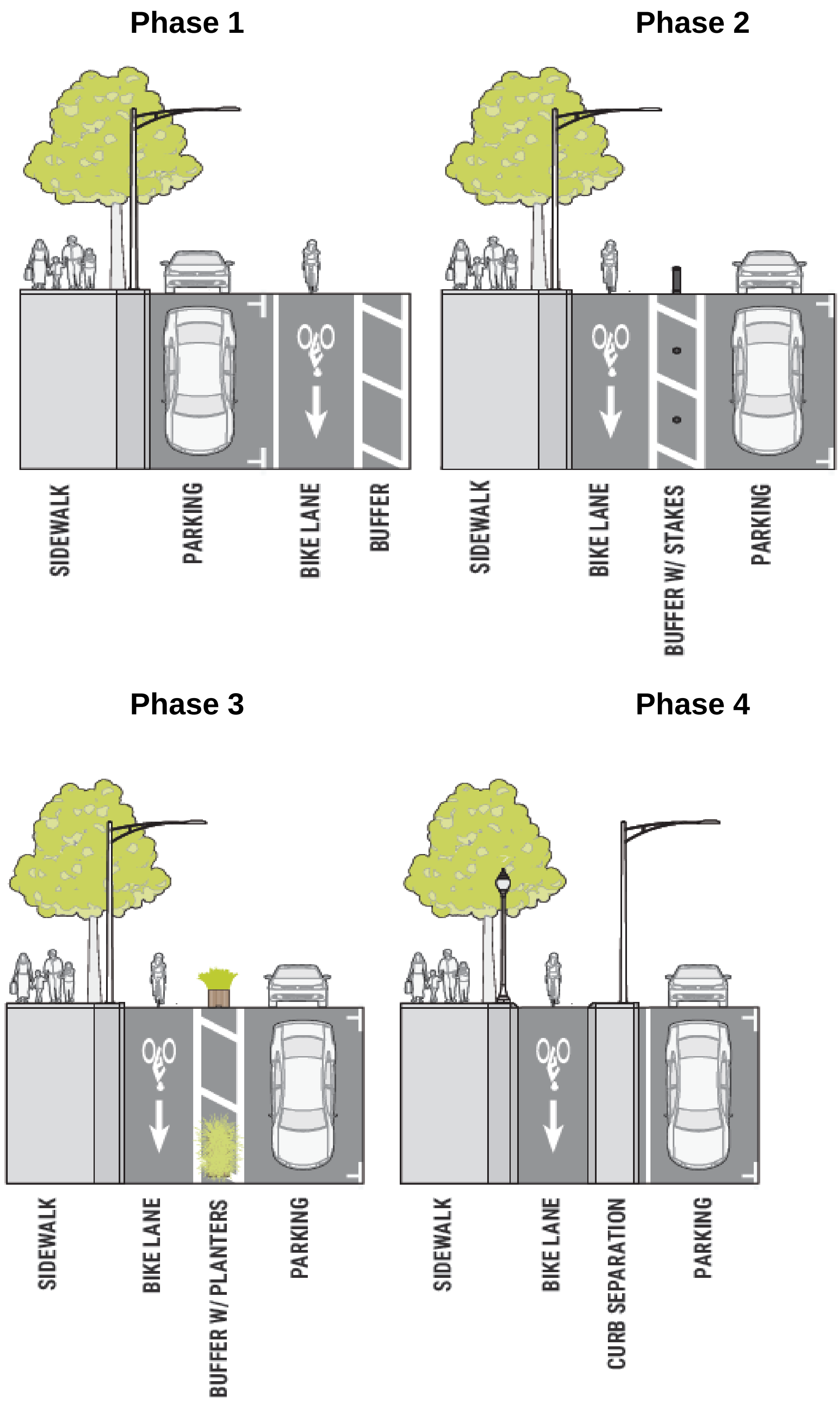


Figure 51. Evolution of a Class IV Separated Bikeway

EDUCATION AND ENFORCEMENT

COORDINATE WITH THE ALAMEDA COUNTY SAFE ROUTES TO SCHOOL PROGRAM AND ENCOURAGE ALL HAYWARD SCHOOLS TO PARTICIPATE

The Alameda County Safe Routes to Schools (SR2S) Program, administered by Alameda CTC, promotes and teaches safe walking, biking, carpooling, and transit use as viable, safe modes of transportation for students and families to travel to/from school. Over 200 public elementary, middle, and high schools in the county are currently enrolled in the program. In 2016, the Commission adopted a set of goals that refocused the program on activities that affect behavior change, increase mode shift, and reinforce the program's commitment to increased safety.

To enroll, schools must submit a simple form available on the Alameda County Safe Routes to Schools website at alamedacountysr2s.org. In addition, program staff works closely with local jurisdiction staff to coordinate and leverage local Safe Routes resources, and leadership from Alameda CTC has made the implementation of SR2S easier.

Recommendations

- **Coordinate with the Alameda County Safe Routes to School and encourage all Hayward Schools to participate.** The Alameda County Safe Routes to School Program is available to all schools throughout the County. Many Hayward Schools already participate in the programmatic elements while fewer have had individual site assessments conducted. The City should continue to encourage schools to participate in the program and provide or augment resources. City Staff should also take an active role in assisting with programmatic elements and conducting site audits for all Hayward Schools.

Best Practice Examples and Resources

- Alameda County Safe Routes to School. http://alamedacountysr2s.org/
- Safe Routes to School National Partnership. https://www.saferoutespartnership.org/

IMPLEMENT A BIKE TICKET DIVERSION PROGRAM

Bike East Bay, in partnership with the California Bicycle Coalition, helped pass the Bicycle Traffic School Bill (AB 902) in 2015. This allows people ticketed for a vehicle code violation while biking in California to attend a class and have the fine reduced or removed. In order to participate in the program, cities must opt-in to the program and local law enforcement must approve the materials for programs to be officially sanctioned. However, the League of American Bicyclists does have certified instructors and materials to help establish formal programs.

Recommendations

- **Implement a Bike Ticket diversion Program.** Work with Bike East Bay and other advocacy organizations to create a formal Bicycle Traffic School and Ticket Diversion Program. These types of programs can even be designed to reduce traffic fines.

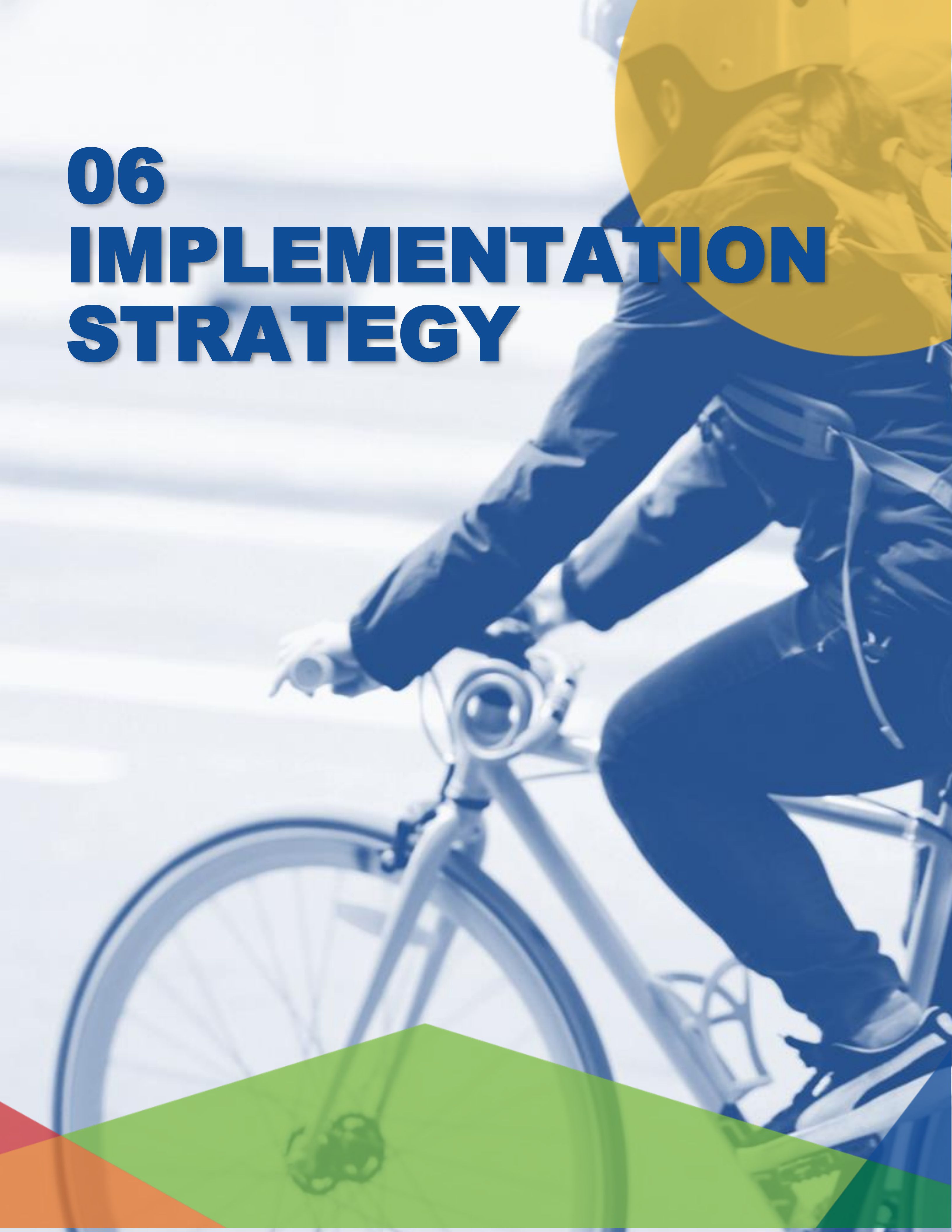
Best Practice Examples and Resources

- Alameda County Safe Routes to School. http://alamedacountysr2s.org/
- Safe Routes to School National Partnership. https://www.saferoutespartnership.org/

Bicyclist receiving a citation.

Source: Bike East Bay

06 IMPLEMENTATION STRATEGY



IMPLEMENTATION STRATEGY

The Plan's infrastructure and programmatic recommendations provide strategies and actions to assist Hayward in becoming a world-class biking and walking city. Based on financial realities, implementation of the proposed bicycle network and programs will occur over time, dependent on available funding sources. This chapter provides an overview of potential costs, prioritizes projects based on implementation timelines, and identifies funding sources to move investments forward.

COST ESTIMATES

The total cost of all the projects identified in the Plan is between approximately $97-114 million and represents complete corridor costs, including bicycle, pedestrian, and transit infrastructure improvements. Costs for the individual corridors can be found in the full project list in **Appendix A**. Once the corridors and project lists were organized based on proposed bicycle facility types, per-mile pedestrian and transit cost assumptions were determined.

The planning-level cost estimates can vary greatly depending on the type of facility, existing conditions, right-of-way acquisition, and desired aesthetic improvements, such as landscaping or hardscaping. The City will need to develop detailed estimates during the preliminary engineering stage to calculate more accurate project costs due to varying costs of obtaining right-of-way, construction, drainage, and grading. The methodology and assumptions used for estimating project costs are detailed in **Appendix F.**

Cost estimates for the support programs are not provided as the costs to implement these programs can vary greatly. The City should outline the necessary element of each program and establish a cost prior to implementing the programs.

TOTAL BICYCLE FACILITY COSTS

The total planning-level costs for recommended facilities are presented in **Table 19**. A range for the cost estimates is provided to account for potential low-cost and high-cost implementation scenarios for Class IV Separated Bikeways that will need to be determined on a corridor by corridor basis.

Table 19. Recommended Bicycle Investments by Facility Type

Facility Type	Approximate Cost of Proposed Projects
Class I Multi-Use Path	$17,319,156
Class II Bicycle Lanes (without buffer)	$663,796
Class II Bicycle Lanes (with buffer)	$550,304
Class III Bike Routes (signing and striping only)	$6,552
Class III Bike Boulevards / Bike Routes (signing, striping, and traffic calming)	$709,365
Class IV Separated Bike Lanes	
• Low cost (signing, striping, and temporary vertical barriers)	$6,634,320
• High cost (Concrete and landscape barriers)	$24,069,155
Total Cost for All Bicycle Facilities	**$25.9 million - $43.3 million**

TOTAL PEDESTRIAN FACILITY COSTS

To encourage the implementation of complete streets, pedestrian and bicycle investments are equally important and should be implemented concurrently for efficiency. Therefore, the cost estimate methodology includes an assumed set of pedestrian improvements per mile by street typology (local, collector, or arterial roadway) for both controlled and uncontrolled crossing improvements. Sidewalk gap improvements will need to be determined on a project by project basis.

The total cost of pedestrian investments citywide is presented in **Table 20**, and individual costs by corridor are located in the project list in **Appendix A**.

Table 20. Recommended Citywide Corridor Pedestrian Investments

Facility Type		Facilities Identified	Approximate Cost
High-Cost Corridors	Arterial (15.1 miles)	• A Street, Skywest to 4th • D Street, 2nd to City Limits • Hesperian Boulevard, Eden Shores to City Limits and La Playa to Skywest • Industrial Parkway, Hesperian to Mission • Mission Boulevard, Industrial to City Limits • Patrick Avenue, Gading to St Bede • Tennyson Road, Industrial to Mission • Winton Avenue, Cabot to Hesperian and Southland to Soto • Winton Avenue/D Street, Soto to 2nd	$36,020,000
	Collector (1.5 miles)	• Amador Street, Elmhurst to Amador Village Ct • C Street, Eden Housing Development to Grand • Cathy Way, Hesperian to Calaroga • Depot Road, Cabot to Hesperian • Garin Avenue, Mission to Larrabee • Grand Street, A to Meek • Main Street, A to D	$2,205,000
	Local (1 mile)	• Alquire Parkway, Vanderbilt to Bristol • C Street, Atherson to Foothill • Main Street, A to Rose • Watkins Street, D to Fletcher	$859,000
Low-Cost Corridors	Arterial (6.8 miles)	• 2nd Street, A to Campus • Campus Drive, 2nd to Hayward • Clawiter Road, Eden Landing to Winton • Fairview Avenue, Hayward to Woodstock • Harder Road, Santa Clara to Westview • Hathaway Avenue, A to City Limits • Huntwood Avenue • Industrial Boulevard, Clawiter to Hesperian • Carlos Bee Boulevard / Hayward Boulevard, Fairview to Soto • Ruus Road, Thiel to Folsom • Santa Clara Street, A to Harder • Whipple Road, Dyer to Industrial Parkway	$12,978,000

Facility Type		Facilities Identified	Approximate Cost
	Collector (7.4 miles)	• 2nd Street, A to City Center • Arden Road / Bumberg Avenue, Corporate to Industrial • Arf Avenue, Baumberg to Hesperian • Brae Burn Avenue, Gresel to Fairway • Cabot Boulevard, Depot to Winton • Calaroga Avenue, Catalpha to Tennyson • Catalpa Way, Hesperian to Miami • City Center Drive, 2nd to Foothill • Clawiter Road, Eden Landing to Winton • Dixon Street, Industrial Parkway to Tennyson • Elmhurst Street, Amador to Santa Clara • Elridge Avenue, Regal to Underwoo • Fairway Street, Carroll to Brae Burn • Folsom Avenue, Huntwood to Tampa • La Playa Drive, Hesperian to Calaroga • Montgomery Avenue, B to City Limits • Ruus Road, Industrial to Thiel • Silva Avenue / Sycamore Avenue, Whitman to Meek • Tampa Avenue, Folsom to Gomer • Underwood Avenue, Gomer to Elridge • Western Boulevard, A to City Limits • Whitman Street, Raymond to Harder	$6,153,000
	Local (5 miles)	• 4th Street, D to A • Breakwater Avenue, Clawiter to roadway limit • City Center Drive, 2nd to City Limits • Corsair Boulevard, Winton to Clubhouse • Gomer Street, Underwood to Tampa • Meek Avenue, Jackson to Grand • Skywest Drive, Sueirro to A • Southland Place, Southland to Winton	$2,976,000
Total Cost for All Pedestrian Facilities			**$61,191,000**

TOTAL TRANSIT FACILITY COSTS

Transit improvement assumptions for this project were developed in conjunction with AC Transit. Per-mile high-, medium-, and low-cost improvement assumptions were generated for project segments running along AC Transit bus routes. Each transit cost assumption was generated to account for bus stop and stop area designs that promote pedestrian access and bicyclist safety.

The facilities identified as high-cost corridors include those for which future bus rapid transit (BRT) implementation has been identified. The medium-cost corridors include improvements that can net marginal gains for transit service (e.g., boarding islands or transit signal priority). Lastly, the low-cost corridors are assumed to include modifications like bus relocation or improvement or roadway restriping. **Table 21** provides a per-mile cost range for each type of corridor as well as a total cost range to implement all of the assumed transit improvements as part of a complete streets package.

Table 21: Transit Facility Cost Estimates

Facility Type	Facilities Identified	Improvements Assumed	Approximate Cost
High-Cost Transit Corridors	• Hesperian Boulevard • Mission Boulevard, Fairway to City Limits • A Street, Skywest to 4th • B Street, Grand to 4th • Tennyson Boulevard, Industrial to Mission	Bus stop typology 1 treatments (see **Figure 44** on page 89) at 1/3-mile stop spacing	$786,000 per mile
Medium-Cost Transit Corridors	• C Street, Atherton to 2nd • Winton Avenue/D Street • Eden Landing Rd/Clawiter Rd, Industrial to Winton • Grand Street • Industrial Boulevard, Hesperian to Clawiter	Alternating bus stop typology 1 and 2 bus stop treatments (see **Figure 44** on page 89) at 1,000-foot spacing	$380,000 - $1.3 million per mile
Low-Cost Transit Corridors	• Watkins Street, Fletcher to B • Industrial Parkway, Hesperian to Hopkins • B Street, 4th to Center • Huntwood Avenue, Whipple to Tennyson • Tampa Avenue, Folsom to Glad Tidings • Orchard Ave/Hayward Blvd, Mission to Fairview • Whitesell Street, Depot to City Limit • Eden Landing Road, Breakwater to Depot • 2nd Street, A to Campus Dr • Campus Drive, Hayward to 2nd • Loop Road	Typically bus stop typology 1 bus stop treatments (see **Figure 44** on page 89) at 1,000-foot spacing	$380,000 per mile
Total Cost for All Transit Corridors	-	-	**$9.6 million**

Transit improvements should be reassessed prior to implementation or release of potential bids to confirm the exact number of treatments. The costs presented here are designed to help give a conservative estimate of potential pedestrian and transit improvements costs on a large scale.

NEAR-TERM INVESTMENTS

To implement projects rapidly, the City's near-term investments should focus on closing gaps in the existing network and providing access to transit and schools within the next five years. The near-term implementation action plan does not include complex or controversial corridors that would take longer to implement. Individual corridor projects may not provide easy and convenient access to priority destinations; therefore, to build out smaller portions of a connected and comfortable citywide network, localized projects have also been determined.

However, it is important to begin assessing more difficult corridors in the near-term so that projects can be implemented in the long-term. All near-term implementation projects are selected from the highest citywide priority projects but may include portions of other corridors to complete the connected network.

To account for the short-term feasibility of prioritized projects, the near-term action plan investments (see **Table 22)** are generally divided into two categories:

1. *Projects that can be easily and quickly implemented*. These projects are typically restricted to improvements from signing and striping.
2. *Studies for planned long-term projects.* These types of projects often involve large corridor studies or new trail opportunities.

Table 22. Near-Term Implementation Action Plan

Project/ Package	Corridor(s)	Corridor Prioritization Score(s)	Project ID Segment(s)	Cost*	Potential Funding Source
Rapid Implementation Network Projects					
Downtown Micro-Network Project Package	Winton Avenue/ D Street	67	105 (C-G)	$604,098	Measure BB, BART Measure RR Local Assistance Grants, OBAG
	Main Street	62	158 (A, B)	$63,125	
	B Street	66	102 (B-F)	$47,394	
	C Street	63	103 (B)	$5,889	
	Grand Street	69	151 (A, B)	$47,080	
West Side Micro-Network Project Package	Depot Road/Cathy Way	54	113 (A-C)	$142,355	Caltrans ATP Grant, Measure BB, OBAG
	Clawiter Road (Winton Avenue to Industrial Boulevard)	36	131 (F)	$81,312	
	Industrial Boulevard	49	116 (A)	$299,379	
Central Hayward Spine Micro-Network Project Package	Amador Street/Cypress Avenue	61	142 (A- C)	$43,790	Caltrans ATP Grant, Measure BB, OBAG
	Gading Road/Patrick Avenue	55	143 (A)	$125,664	
	Harder Road	45	112 (A)	$411,936	
	Huntwood Avenue	53	149 (A, B, D)	$257,848	
South Hayward Crosstown Connector	Tennyson Road	72	115 (A-D)	$1,486,035 (High-cost Class IV)	Measure BB, BART Measure RR Local Assistance Grants, OBAG

Project/ Package	Corridor(s)	Corridor Prioritization Score(s)	Project ID Segment(s)	Cost*	Potential Funding Source
Studies					
E 14th St/Mission Boulevard and Fremont Boulevard Multimodal Corridor Study	Mission Boulevard	68	165 (A-C)	On-going Alameda CTC Study	Measure BB
Castro Valley Local Area Traffic Circulation Improvements	Foothill Boulevard	69	183 (A)	On-going Alameda CTC Study	Measure BB
Eden Greenway Connectivity Feasibility Study	Eden Greenway Path	100	178 (A-F)	$300,000 (Planning & Preliminary Concepts)	Caltrans Sustainable Communities Grant, Caltrans ATP Grant
South Hayward Trail Expansion Feasibility Study	Ward Creek Trail Extension	100	147 (A), 190 (A), 191 (A)	$150,000 (Planning & Preliminary Concepts)	Caltrans Sustainable Communities Grant, Caltrans ATP Grant
	Ruus Park Access Pathway	100	193 (A)		
	Ruus Park Access Pathway Extension	100	194 (A)		
	Industrial Parkway Trail Extension	100	192 (A)		
Hesperian Boulevard Complete Streets Study	Hesperian Boulevard	60	140 (A-C)	$300,000 (Planning & Preliminary Concepts)	Measure BB, Caltrans Sustainable Communities Grant

**Note: Costs may represent rapid implementation bikeway costs that focus primarily on signing and striping. Additional pedestrian corridor improvements could be included but would need to be factored into the cost on top of those shown in this table. Costs do not include right-of-way acquisition.*

LONG-TERM INVESTMENTS

Long-term investments focus primarily on large arterial projects where costs are anticipated to be higher, and schedules are anticipated to be longer compared to near-term investments. Additionally, studies conducted in the near-term are implemented in the long-term. Lower priority projects included to fill gaps in connectivity should be implemented within five to ten years from the adoption of the Plan.

Table 23. Long-term Implementation Action Plan

Project	Corridor(s)	Corridor Prioritization Score(s)	Project ID Segment(s)	Cost*	Potential Funding Source
Mission Boulevard	Mission Boulevard	68	165 (A-C)	$4,040,990	Measure BB
Foothill Boulevard	Foothill Boulevard	69	183 (A)	$858,176	Measure BB
Eden Greenway Path	Eden Greenway Path	100	178 (A-F)	$1,010,352 + Grade Separated + At-Grade Crossing Costs	Caltrans ATP Grant, Urban Greening Grant
South Hayward Trails	Ward Creek Trail Extension	100	147 (A), 190 (A), 191 (A)	$1,342,092 + Grade Separated + At-Grade Crossing Costs	Caltrans ATP Grant, Urban Greening Grant
	Ruus Park Access Pathway	100	193 (A)		
	Ruus Park Access Pathway Extension	100	194 (A)		
	Industrial Parkway Trail Extension	100	192 (A)		
Hesperian Boulevard	Hesperian Boulevard	60	140 (A-C)	$3,429,047	Measure BB, OBAG, Caltrans ATP
East Bay Greenway	East Bay Greenway	100	182 (A, B)	$4,986,576	Measure BB, Caltrans ATP, Urban Green Grant
West A Street/ A Street	West A Street/ A Street	75	101 (A-D)	$1,459,143	Measure BB, Caltrans ATP, OBAG
San Francisco Bay Trail	San Francisco Bay Trail	100	175 (A-C)	$2,333,.820	Measure BB, Caltrans ATP, Urban Green Grant
Industrial Parkway West	Industrial Parkway West	68	117 (A, B, D)	$1,992,680	Measure BB, OBAG
Santa Clara Street	Santa Clara Street/Hathaway Avenue	38	141 (A, B)	$211,680	Measure BB, OBAG

Project	Corridor(s)	Corridor Prioritization Score(s)	Project ID Segment(s)	Cost*	Potential Funding Source
Eden Landing Road/Clawiter Road	Eden Landing Road/Clawiter Road	36	131 (A-E)	$147,163	Measure BB, OBAG
Arden Road	Arden Road/ Baumberg Avenue	35	133 (A)	$63,420	Measure BB, OBAG

**Note: Costs represent bikeway costs only and include high-cost Class IV implementation options for major arterials with concrete buffers with landscaping. Additional pedestrian corridor improvements could be included but would need to be factored into the costs on top of those shown in this table. Costs do not include right-of-way acquisition.*

FUNDING SOURCES

Table 23 is a summary of possible funding sources available for bicycle and pedestrian projects, policies, and programs and identifies potential project applicability. More details are provided on each of these funding sources in **Appendix G**.

Table 24. Funding Sources and Applicability by Project Type

	Primary (P) or Accessory (A) Focus	Off-street Bicycle Facilities (Class I)	On-street Bicycle Facilities	Bike Parking	Transit-supportive Improvements	Traffic Calming	Roundabouts	Pedestrian Crossing Enhancements	Design/Stormwater Infrastructure	Complete Streets / Corridor Studies	Programs Implementation	Maintenance and Operations	Agency
Federal Programs													
Better Utilizing Investments to Leverage Development (BUILD) Grant (Formerly TIGER)	A	●	●		●		●	●	●				US DOT
Congestion Management & Air Quality (CMAQ)	P	●	●	●	●	●	●	●	●		●		FHWA
Surface Transportation Block Grant (STBG) Program	P	●	●		●		●	●				●	FHWA

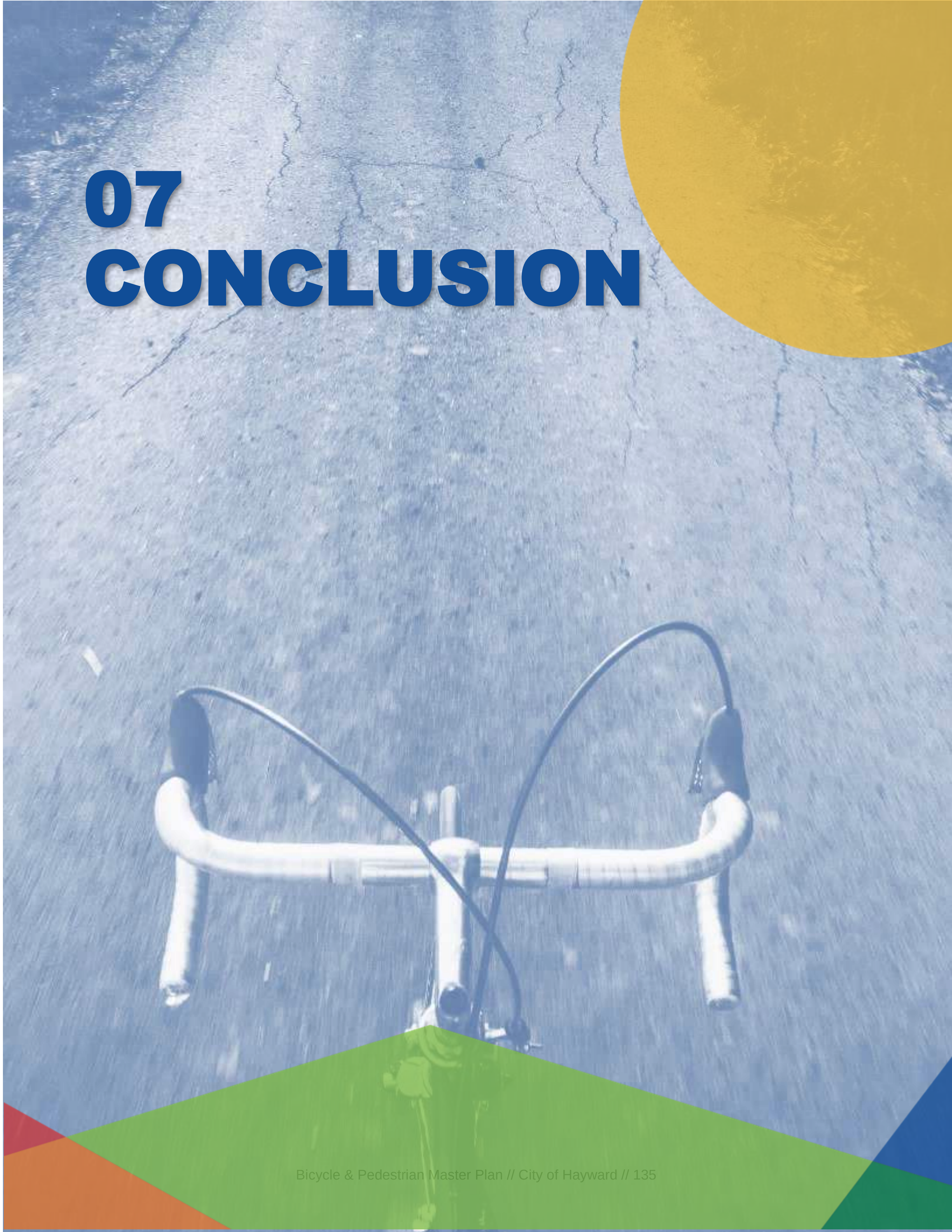
	Primary (P) or Accessory (A) Focus	Off-street Bicycle Facilities (Class I)	On-street Bicycle Facilities	Bike Parking	Transit-supportive Improvements	Traffic Calming	Roundabouts	Pedestrian Crossing Enhancements	Design/Stormwater Infrastructure	Complete Streets / Corridor Studies	Programs Implementation	Maintenance and Operations	Agency
Land and Water Conservation Fund (LWCF)	P	●							●				NPS
Rivers, Trails, and Conservation Assistance Program	P	●							●		●		NPS
Community Development Block Grant Program	A	●	●		●			●					HUD
State Programs													
Active Transportation Program (ATP) Grant	P	●	●	●	●	●	●	●	●	●	●		Caltrans
Sustainable Communities Grant	P									●			Caltrans
Strategic Partnerships Grant	P									●			Caltrans
Adaptation Planning Grant	P									●			Caltrans
State Highway Operation and Protection Program (SHOPP)	A		●									●	Caltrans
Highway Safety Improvement Program (HSIP) Grant	P		●					●				●	Caltrans
Systemic Safety Analysis Report Program (SSARP)	P									●			Caltrans
Transit and Intercity Rail Capital Program (TIRCP)	A			●	●								CTC
State Transportation Improvement Program (STIP)	A		●		●		●						CTC
Trade Corridor Enhancement Program (TCEP)	A	●	●		●			●					CTC

	Primary (P) or Accessory (A) Focus	Off-street Bicycle Facilities (Class I)	On-street Bicycle Facilities	Bike Parking	Transit-supportive Improvements	Traffic Calming	Roundabouts	Pedestrian Crossing Enhancements	Design/Stormwater Infrastructure	Complete Streets / Corridor Studies	Programs Implementation	Maintenance and Operations	Agency
State-Local Partnership Program (LPP)	P		●		●			●				●	CTC
Office of Traffic Safety Grants	P										●		OTS
Recreational Trails Program (RTP)	P	●											CA Department of Parks and Recreation
Affordable Housing and Sustainable Communities (AHSC) Program	P	●	●	●	●	●	●	●	●		●		CA Strategic Growth Council
Transformative Climate Communities (TCC) Program	P	●	●	●	●	●	●	●	●	●			CA Strategic Growth Council
Environmental Enhancement and Mitigation (EEM) Grant Program	A	●							●				CA Natural Resources Agency
Urban Greening Grant Program	P	●	●			●			●				CA Natural Resources Agency
Environmental Justice (EJ) Small Grants Program	A										●		CA Environmental Protection Agency
Stormwater Management Program	A	●	●						●				State Water Resources Control Board
AB 2766 Subvention Program	P	●	●	●		●		●					California Air Resources Board
Coastal Conservancy Grants	A	●							●				Coastal Conservancy
Regional Programs													
OBAG	P	●	●	●	●	●	●	●	●	●	●	●	MTC

	Primary (P) or Accessory (A) Focus	Off-street Bicycle Facilities (Class I)	On-street Bicycle Facilities	Bike Parking	Transit-supportive Improvements	Traffic Calming	Roundabouts	Pedestrian Crossing Enhancements	Design/Stormwater Infrastructure	Complete Streets / Corridor Studies	Programs Implementation	Maintenance and Operations	Agency
TDA Article 3	P	●	●	●	●	●	●	●	●	●	●		MTC
Regional Measure 1, 2, 3, and Future Regional Measures	A	●	●	●	●		●						MTC
Regional Active Transportation Program	P	●	●	●	●	●	●	●	●	●	●		MTC
Transportation Fund for Clean Air (TFCA)	P	●	●	●	●						●		BAAQMD
Bicycle Rack Voucher Program	P			●									BAAQMD
Measure WW Urban Creek Grant	P	●							●				EBRPD
Measure FF	P	●							●				EBRPD
Local BART Sales Tax	A				●								BART
Measure RR	P	●	●	●	●								BART
Measure B	P	●	●	●	●	●	●	●	●	●	●	●	ACTC
Measure BB	P	●	●	●	●	●	●	●	●	●	●	●	ACTC
Lifeline Transportation Program (LTP)	P				●					●			ACTC
Local Programs													
Vehicle Registration Fees	P	●	●	●	●	●	●	●				●	Local Jurisdictions
Developer Fees/ Transportation Impact Fees	P						Varies						Local Jurisdictions

Gateway Treatment (signage) and High Visibility Pedestrian Crossing Treatment in Hayward, CA.

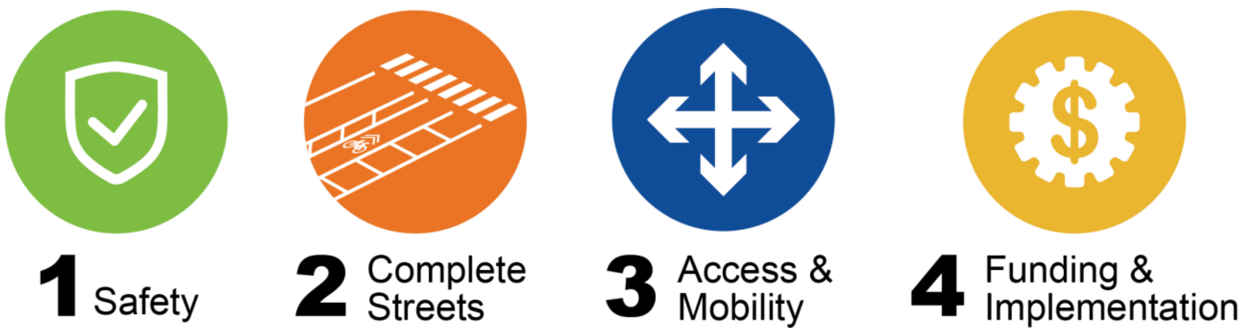
07 CONCLUSION



CONCLUSION

Walking and biking allow residents and visitors of Hayward to travel throughout the City in a way that promotes sustainable, healthy, and vibrant communities. The Plan promotes these transportation systems and establishes the City's vision and comprehensive approach to improving walking and biking in Hayward. The goal is a universally accessible, safe, convenient, and integrated system that promotes walking and biking as a convenient alternative to motor vehicles for residents, visitors, shoppers, and commuters.

The Plan's performance measures allow for the ongoing tracking of progress towards implementation of the following four goals:



The Plan provides for both near-term and long-term investment infrastructure solutions to support the Plan's vision and goals, as well as programmatic, education, and enforcement recommendations. Leveraging the revenue sources will help to realize solutions. Together, these components create a comprehensive approach that will guide, prioritize, and implement a network of quality bicycle and pedestrian facilities to improve mobility, connectivity, and public health throughout Hayward.

APPENDIX A

BIKE NETWORK PROJECT LIST

City of Hayward
Prioritized Project List and Cost Estimates

			Recommended Project Extents					AASHTO All Ages and Abilities Facility Recommendation			Implementation Considerations				Proposed Facility Recommendations			Cost Estimates					
Project ID	Priority Score	Priority	Corridor Name	From	To	Existing- Extents	Existing- Class	ADT Model Output	Posted Speed	AASHTO Recommendation	Truck Route	Transit Route	Parking Removal	Lane Removal	Draft Recommendation	Network	Near-Term Recommendations	Pedestrian Facility Cost	Transit Corridor Priority	Transit Corridor Cost	Bicycle Facility Cost	Class IV High Cost	Complete Corridor Cost_High
147A	100	High	Ward Creek Trail Extension	Pacheco Wy	Folsom Ave	Pacheco Wy to Folsom Ave	Class I Multi-Use Path			Class I Multi-Use Path	No	No			Class I Multi-Use Path	All Ages & Abilities		$0.00	None	$0.00	$202,536.00	$0.00	$202,536.00
175A	100	High	San Francisco Bay Trail	Eden Shores neighborhood	San Mateo Bridge Overcrossing		None			Class I Multi-Use Path	No	No			Class I Multi-Use Path	All Ages & Abilities		$0.00	None	$0.00	$1,006,860.00	$0.00	$1,006,860.00
175B	100	High	San Francisco Bay Trail	San Mateo Bridge Overcrossing	Winton Ave Connection		None			Class I Multi-Use Path	No	No			Class I Multi-Use Path	All Ages & Abilities		$0.00	None	$0.00	$1,028,976.00	$0.00	$1,028,976.00
175C	100	High	San Francisco Bay Trail	Winton Ave Connection	City limits (N)		None			Class I Multi-Use Path	No	No			Class I Multi-Use Path	All Ages & Abilities		$0.00	None	$0.00	$297,984.00	$0.00	$297,984.00
176A	100	High	San Francisco Bay Trail Mt. Eden Creek Loop	Eden Landing Rd	Eden Landing Rd		None			Class I Multi-Use Path	No	No			Class I Multi-Use Path	All Ages & Abilities		$0.00	None	$0.00	$1,092,996.00	$0.00	$1,092,996.00
178A	100	High	Eden Greenway Path	Industrial Blvd	Hesperian Blvd		None			Class I Multi-Use Path	No	No			Class I Multi-Use Path	All Ages & Abilities		$0.00	None	$0.00	$232,800.00	$0.00	$232,800.00
178B	100	High	Eden Greenway Path	Hesperian Blvd	Calaroga Ave		None			Class I Multi-Use Path	No	No			Class I Multi-Use Path	All Ages & Abilities		$0.00	None	$0.00	$194,388.00	$0.00	$194,388.00
178C	100	High	Eden Greenway Path	Calaroga Ave	Cascade St		None			Class I Multi-Use Path	No	No			Class I Multi-Use Path	All Ages & Abilities		$0.00	None	$0.00	$103,596.00	$0.00	$103,596.00
178D	100	High	Eden Greenway Path	Cascade St	Cypress Ave		None			Class I Multi-Use Path	No	No			Class I Multi-Use Path	All Ages & Abilities		$0.00	None	$0.00	$175,764.00	$0.00	$175,764.00
178E	100	High	Eden Greenway Path	Cypress Ave	Whitman St		None			Class I Multi-Use Path	No	No			Class I Multi-Use Path	All Ages & Abilities		$0.00	None	$0.00	$135,024.00	$0.00	$135,024.00
178F	100	High	Eden Greenway Path	Hesperian Blvd	Whitman St		None			Class I Multi-Use Path	No	No			Class I Multi-Use Path	All Ages & Abilities		$0.00	None	$0.00	$168,780.00	$0.00	$168,780.00
182A	100	High	East Bay Greenway	Whipple Rd	South Hayward BART		None			Class I Multi-Use Path	No	No			Class I Multi-Use Path	All Ages & Abilities		$0.00	None	$0.00	$2,123,136.00	$0.00	$2,123,136.00
182B	100	High	East Bay Greenway	South Hayward BART	Sunset Blvd		None			Class I Multi-Use Path	No	No			Class I Multi-Use Path	All Ages & Abilities		$0.00	None	$0.00	$2,863,440.00	$0.00	$2,863,440.00
188A	100	High	Tennyson High School Path	Huntwood Ave	Whitman St		None			Class I Multi-Use Path	No	No			Class I Multi-Use Path	All Ages & Abilities		$0.00	None	$0.00	$118,728.00	$0.00	$118,728.00
190A	100	High	Ward Creek Trail Extension	Hesperian Blvd	Industrial Pkwy W		None			Class I Multi-Use Path	No	No			Class I Multi-Use Path	All Ages & Abilities		$0.00	None	$0.00	$413,220.00	$0.00	$413,220.00
191A	100	High	Ward Creek Trail Extension	Ward Creek (S)	Pacheco Wy		None			Class I Multi-Use Path	No	No			Class I Multi-Use Path	All Ages & Abilities		$0.00	None	$0.00	$128,040.00	$0.00	$128,040.00
192A	100	High	Industrial Pkwy Trail Extension	Ruus Rd	Whipple Rd		None			Class I Multi-Use Path	No	No			Class I Multi-Use Path	All Ages & Abilities		$0.00	None	$0.00	$317,772.00	$0.00	$317,772.00
193A	100	High	Ruus Park Access Pathway	Pacheco Wy	Folsom Ave		Class I Multi-Use Path			Class I Multi-Use Path	No	No			Class I Multi-Use Path	All Ages & Abilities		$0.00	None	$0.00	$148,992.00	$0.00	$148,992.00
194A	100	High	Ruus Park Access Pathway Extension	Russ Park Pathway	Ruus Rd		None			Class I Multi-Use Path	No	No			Class I Multi-Use Path	All Ages & Abilities		$0.00	None	$0.00	$131,532.00	$0.00	$131,532.00
196A	100	High	Hayward Foothill Trail	2nd St	Mission Blvd		None			Class I Multi-Use Path	No	No			Class I Multi-Use Path	All Ages & Abilities		$0.00	None	$0.00	$4,074,000.00	$0.00	$4,074,000.00
159A	91	High	Watkins St	Fletcher Ln	Jackson St	Fletcher Ln to D St	Class II Bicycle Lane	5,700	20	Class II Buffered Bicycle Lane	No	No	No Change	Yes	Class II Buffered Bicycle Lane	All Ages & Abilities		$43,050.00	Low	$15,580.00	$9,512.00	$0.00	$68,142.00
159B	91	High	Watkins St	Jackson St	B St	Fletcher Ln to D St	Class II Bicycle Lane	11,100	20	Class IV Separated Bikeway	No	Yes	One Side	No Change	Class II Bicycle Lane	Connectivity & Gap Closure		$105,000.00	Low	$38,000.00	$15,100.00	$0.00	$158,100.00
189A	88	High	Florida St	Calaroga Ave	Maimi Ave		None	1,500	25	Class III Bicycle Boulevard	No	No	No Change	No Change	Class III Bicycle Boulevard	All Ages & Abilities		$97,650.00	None	$0.00	$12,183.00	$0.00	$109,833.00
101A	75	High	A St	Skywest Dr	Princeton St	Skywest Dr to Montgomery Ave	Class II Bicycle Lane	32,000	35	Class IV Separated Bikeway	Yes	Yes	Parking or Lane Removal	Parking or Lane Removal	Class IV Separated Bikeway	All Ages & Abilities	Class II Buffered Bicycle Lane	$1,619,520.00	High	$528,192.00	$225,792.00	$819,168.00	$2,966,880.00
101B	75	High	A St	Princeton St	Grand St	Skywest Dr to Montgomery Ave	Class II Bicycle Lane	15,850	30	Class IV Separated Bikeway	Yes	Yes	Parking or Lane Removal	Parking or Lane Removal	Class IV Separated Bikeway	All Ages & Abilities	Class II Buffered Bicycle Lane	$621,780.00	High	$202,788.00	$86,688.00	$314,502.00	$1,139,070.00
101C	75	High	A St	Grand St	Mission Blvd	Skywest Dr to Montgomery Ave	Class II Bicycle Lane	15,850	30	Class IV Separated Bikeway	Yes	Yes	Parking or Lane Removal	Parking or Lane Removal	Class IV Separated Bikeway	All Ages & Abilities		$224,130.00	High	$73,098.00	$31,248.00	$113,367.00	$410,595.00
101D	75	High	A St	Mission Blvd	4th St	Montgomery Ave to 4th St	Class III Bicycle Route	47,500	30	Class IV Separated Bikeway	Yes	Yes	One Side	No Change	Class IV Separated Bikeway	All Ages & Abilities		$419,340.00	High	$136,764.00	$58,464.00	$212,106.00	$768,210.00
127A	73	High	Garin Ave	Mission Blvd	Larrabee St	Mission Blvd to Larrabee St	Class II Bicycle Lane	7,700	30	Class IV Separated Bikeway	No	No	No Change	No Change	Class II Bicycle Lane	Connectivity & Gap Closure		$151,300.00	None	$0.00	$12,835.00	$0.00	$164,135.00
115A	72	High	Tennyson Rd	Industrial Blvd	Hesperian Blvd	Industrial Blvd to Calaroga Ave	Class II Bicycle Lane	3,900	25	Class II Bicycle Lane	Yes	Yes	No Change	Yes	Class II Buffered Bicycle Lane	All Ages & Abilities		$532,610.00	High	$173,706.00	$51,272.00	$0.00	$757,588.00
115B	72	High	Tennyson Rd	Hesperian Blvd	Calaroga Ave	Industrial Blvd to Calaroga Ave	Class II Bicycle Lane	17,600	30	Class IV Separated Bikeway	Yes	Yes	Parking or Lane Removal	Parking or Lane Removal	Class IV Separated Bikeway	All Ages & Abilities		$460,310.00	High	$150,126.00	$64,176.00	$232,829.00	$843,265.00
115C	72	High	Tennyson Rd	Calaroga Ave	Patrick Ave	Calaroga Ave to Tampa Ave	Class III Bicycle Route	26,700	30	Class IV Separated Bikeway	Yes	Yes	No Change	No Change	Class IV Separated Bikeway	All Ages & Abilities	Class II Bicycle Lane	$465,130.00	High	$151,698.00	$64,848.00	$235,267.00	$852,095.00
115D	72	High	Tennyson Rd	Patrick Ave	Mission Blvd	Tampa Ave to Mission Blvd	Class II Bicycle Lane	19,000	35	Class IV Separated Bikeway	Yes	Yes	Parking or Lane Removal	Parking or Lane Removal	Class IV Separated Bikeway	All Ages & Abilities		$1,911,130.00	High	$623,298.00	$266,448.00	$966,667.00	$3,501,095.00
124A	72	High	Bolero Ave	Hesperian Blvd	Calaroga Ave	Hesperian Blvd to Calaroga Ave	Class II Bicycle Lane	1,500	25	Class III Bicycle Boulevard	No	Yes	No Change	No Change	Existing/No New Recommendation	All Ages & Abilities		$0.00	None	$0.00	$0.00	$0.00	$0.00
151A	69	High	Grand St	Meek Ave	D St	Meek Ave to D St	Class III Bicycle Route	9,500	25	Class IV Separated Bikeway	No	No	No Change	Yes	Class II Buffered Bicycle Lane	Connectivity & Gap Closure		$108,580.00	None	$0.00	$14,152.00	$0.00	$122,732.00
151B	69	High	Grand St	D St	A St	D St to A St	Class III Bicycle Route	9,500	25	Class IV Separated Bikeway	No	No	No Change	Yes	Class IV Separated Bikeway	All Ages & Abilities		$174,440.00	Med	$37,240.00	$32,928.00	$119,462.00	$331,142.00
183A	69	High	Foothill Blvd	Santa Clara St	City limits (N)		None	33,600	30	Class IV Separated Bikeway	No	No	Parking or Lane Removal	Parking or Lane Removal	Class IV Separated Bikeway	All Ages & Abilities		$1,696,640.00	None	$0.00	$236,544.00	$858,176.00	$2,554,816.00
117A	68	High	Industrial Pkwy/ Alquire Rd	Hesperian Blvd	Hopkins St	Hesperian Blvd to Ruus Rd	Class III Bicycle Route	14,000	45	Class IV Separated Bikeway	Yes	Yes	No Change	Yes	Class IV Separated Bikeway	All Ages & Abilities		$860,370.00	Low	$135,660.00	$119,952.00	$435,183.00	$1,431,213.00
117B	68	High	Industrial Pkwy/ Alquire Rd	Hopkins St	Mission Blvd	Ruus Rd to Mission Blvd	Class I Multi-Use Path	22,500	45	Class IV Separated Bikeway	Yes	Yes	Parking or Lane Removal	Parking or Lane Removal	Class IV Separated Bikeway	All Ages & Abilities		$3,017,320.00	None	$0.00	$420,672.00	$1,526,188.00	$4,543,508.00
117C	68	High	Industrial Pkwy/ Alquire Rd	Mission Blvd	Vanderbilt St	Mission Blvd to Vanderbilt St	Class II Bicycle Lane	1,200	30	Class II Bicycle Lane	No	No	No Change	No Change	Existing/No New Recommendation	All Ages & Abilities		$0.00	None	$0.00	$0.00	$0.00	$0.00
117D	68	High	Industrial Pkwy/ Alquire Rd	Vanderbilt St	Cantera Dr	Vanderbilt St to Bristol Dr	Class II Bicycle Lane	1,200	30	Class II Bicycle Lane	No	No	No Change	No Change	Class III Bicycle Boulevard	All Ages & Abilities		$250,950.00	None	$0.00	$31,309.00	$0.00	$282,259.00
165A	68	High	Mission Blvd	City limits (S)	Fairway St	city limits to Industrial Pkwy	Class I Multi-Use Path	39,000	40	Class IV Separated Bikeway	Yes	Yes	No Change	No Change	Class I Multi-Use Path	All Ages & Abilities		$1,335,140.00	None	$0.00	$644,856.00	$0.00	$1,979,996.00
165B	68	High	Mission Blvd	Fairway St	A St			33,000	40	Class IV Separated Bikeway	Yes	Yes	Parking or Lane Removal	Parking or Lane Removal	Class IV Separated Bikeway	All Ages & Abilities		$6,299,740.00	High	$2,054,604.00	$878,304.00	$3,186,466.00	$11,540,810.00
165C	68	High	Mission Blvd	A St	City limits (N)		None	8,600	25	Class IV Separated Bikeway	Yes	Yes	No Change	No Change	Class IV Separated Bikeway	All Ages & Abilities		$414,520.00	High	$135,192.00	$57,792.00	$209,668.00	$759,380.00
105A	67	High	Winton Ave/ D St	San Francisco Bay Trail	Bay Trail Parking Lot	Depot Rd to Unnamed Rd	Class III Bicycle Route	1,500	25	Class III Bicycle Boulevard	Yes	Yes	No Change	No Change	Class I Multi-Use Path	All Ages & Abilities		$0.00	None	$0.00	$146,664.00	$0.00	$146,664.00
105B	67	High	Winton Ave/ D St	Bay Trail Parking Lot	Cabot Blvd	Unnamed Rd to Cabot Blvd	Class II Bicycle Lane	1,500	25	Class III Bicycle Boulevard	Yes	Yes	No Change	No Change	Class III Bicycle Boulevard	All Ages & Abilities		$944,720.00	None	$0.00	$51,352.00	$0.00	$996,072.00
105C	67	High	Winton Ave/ D St	Cabot Blvd	Clawiter Rd	Cabot Blvd to Clawiter Rd	Class III Bicycle Route	12,900	35	Class IV Separated Bikeway	Yes	Yes	No Change	Yes	Class IV Separated Bikeway	All Ages & Abilities		$744,690.00	None	$0.00	$103,824.00	$376,671.00	$1,121,361.00
105D	67	High	Winton Ave/ D St	Clawiter Rd	Hesperian Blvd	Clawiter Rd to Hesperian Blvd	Class II Bicycle Lane	28,200	30	Class IV Separated Bikeway	Yes	Yes	No Change	No Change	Class IV Separated Bikeway	All Ages & Abilities		$522,970.00	Med	$82,460.00	$72,912.00	$264,523.00	$869,953.00
105E	67	High	Winton Ave/ D St	Hesperian Blvd	Soto Rd	Southland Dr to Soto Rd	Class III Bicycle Route	29,000	30	Class IV Separated Bikeway	Yes	Yes	No Change	No Change	Class IV Separated Bikeway	All Ages & Abilities		$1,848,470.00	Med	$291,460.00	$257,712.00	$934,973.00	$3,074,903.00
105F	67	High	Winton Ave/ D St	Soto Rd	Foothill Blvd	Soto Rd to 2nd St	Class II Bicycle Lane	17,000	25	Class IV Separated Bikeway	Yes	Yes	No Change	Yes	Class IV Separated Bikeway	All Ages & Abilities		$872,420.00	Med	$137,560.00	$121,632.00	$441,278.00	$1,451,258.00
105G	67	High	Winton Ave/ D St	Foothill Blvd	City limits €	2nd St to City limits	Class III Bicycle Route	7,700	25	Class IV Separated Bikeway	Yes	Yes	One Side	No Change	Class II Bicycle Lane	Connectivity & Gap Closure		$766,380.00	None	$0.00	$48,018.00	$0.00	$814,398.00
102A	66	High	B St	MLK Dr	Grand St	MLK Dr to Grand St	Class II Bicycle Lane	3,001	20	Class II Bicycle Lane	No	Yes	No Change	No Change	Existing/No New Recommendation	All Ages & Abilities		$0.00	None	$0.00	$0.00	$0.00	$0.00
102B	66	High	B St	Grand St	Watkins St		None	3,001	20	Class II Bicycle Lane	No	Yes	One Side	No Change	Class II Bicycle Lane	All Ages & Abilities		$187,980.00	High	$61,308.00	$11,778.00	$0.00	$261,066.00
102C	66	High	B St	Watkins St	Mission Blvd		None	4,700	30	Class II Buffered Bicycle Lane	No	Yes	No Change	No Change	Class III Bicycle Boulevard	Connectivity & Gap Closure		$53,020.00	High	$17,292.00	$2,882.00	$0.00	$73,194.00
102D	66	High	B St	Mission Blvd	Foothill Blvd		None	19,200	25	Class IV Separated Bikeway	No	Yes	No Change	No Change	Class III Bicycle Boulevard	Connectivity & Gap Closure		$156,650.00	High	$51,090.00	$8,515.00	$0.00	$216,255.00
102E	66	High	B St	Foothill Blvd	4th St		None	33,000	30	Class IV Separated Bikeway	No	Yes	One Side	No Change	Class II Bicycle Lane	Connectivity & Gap Closure		$281,970.00	High	$91,962.00	$17,667.00	$0.00	$391,599.00
102F	66	High	B St	4th St	Center St		None	33,000	30	Class IV Separated Bikeway	No	Yes	No Change	No Change	Class III Bicycle Route	Connectivity & Gap Closure		$563,940.00	Low	$88,920.00	$6,552.00	$0.00	$659,412.00
103A	63	High	C St	Filbert St	Alice St	Filbert St to Eden Housing Development	Class II Bicycle Lane	3,001	20	Class II Bicycle Lane	No	No	No Change	No Change	Existing/No New Recommendation	All Ages & Abilities		$0.00	None	$0.00	$0.00	$0.00	$0.00
103B	63	High	C St	Alice St	Grand St	Eden Housing Development to Grand St	Class III Bicycle Route	2,100	20	Class III Bicycle Boulevard	No	No	No Change	No Change	Class II Bicycle Lane	All Ages & Abilities		$69,420.00	None	$0.00	$5,889.00	$0.00	$75,309.00
104A	63	High	C St	Atherson St	Watkins St	Atherson St to Foothill Blvd	Class III Bicycle Route	400	15	Class III Bicycle Boulevard	No	Yes	No Change	No Change	Class II Bicycle Lane	All Ages & Abilities		$16,800.00	Med	$6,080.00	$2,416.00	$0.00	$25,296.00
104B	63	High	C St	Watkins St	Foothill Blvd	Atherson St to Foothill Blvd	Class III Bicycle Route	12,000	30	Class IV Separated Bikeway	No	No	One Side	No Change	Class IV Separated Bikeway	All Ages & Abilities		$86,100.00	Med	$31,160.00	$27,552.00	$99,958.00	$217,218.00
104C	63	High	C St	Foothill Blvd	2nd St			29,700	30	Class IV Separated Bikeway	No	No	One Side	No Change	Class IV Separated Bikeway	All Ages & Abilities		$43,050.00	Med	$15,580.00	$13,776.00	$49,979.00	$108,609.00
158A	62	High	Main St	D St	McKeever Ave	D St to A St	None	5,700	20	Class II Buffered Bicycle Lane	No	No	No Change	No Change	Class IV Separated Bikeway	All Ages & Abilities		$229,620.00	None	$0.00	$43,344.00	$157,251.00	$386,871.00
158B	62	High	Main St	McKeever Ave	Rose St	A St to Rose St	Class III Bicycle Route	2,900	30	Class II Bicycle Lane	No	No	One Side	No Change	Class II Bicycle Lane	All Ages & Abilities		$137,550.00	None	$0.00	$19,781.00	$0.00	$157,331.00
142A	61	High	Amador St/Cypress Ave	Elmhurst St	Winton Ave	Elmhurst St to Amador Village Ct	Class III Bicycle Route	15,200	25	Class IV Separated Bikeway	No	Yes	No Change	Yes	Class II Bicycle Lane	Connectivity & Gap Closure		$110,360.00	None	$0.00	$9,362.00	$0.00	$119,722.00
142B	61	High	Amador St/Cypress Ave	Jackson St	Elmhurst St			15,200	25	Class IV Separated Bikeway	No	Yes	One Side	No Change	Class II Bicycle Lane	Connectivity & Gap Closure		$170,880.00	None	$0.00	$14,496.00	$0.00	$185,376.00
142C	61	High	Amador St/Cypress Ave	Harder Rd	Jackson St		None	15,200	25	Class IV Separated Bikeway	No	Yes	No Change	No Change	Class II Bicycle Lane	Connectivity & Gap Closure		$318,120.00	None	$0.00	$19,932.00	$0.00	$338,052.00
118A	60	High	Industrial Pkwy SW	Whipple Rd	Industrial Pkwy W	Whipple Rd to Industrial Pkwy W	Class III Bicycle Route	31,600	35	Class IV Separated Bikeway	Yes	No	No Change	Yes	Class II Bicycle Lane	Connectivity & Gap Closure		$1,200,180.00	None	$0.00	$75,198.00	$0.00	$1,275,378.00
140A	60	High	Hesperian Blvd	City limits (S)	Tennyson Rd	City limits to Eden Shores Blvd	Class II Bicycle Lane	31,800	30	Class IV Separated Bikeway	Yes	No	Parking or Lane Removal	Parking or Lane Removal	Class IV Separated Bikeway	All Ages & Abilities		$2,395,540.00	High	$781,284.00	$333,984.00	$1,211,686.00	$4,388,510.00
140B	60	High	Hesperian Blvd	Tennyson Rd	La Playa Dr			36,000	30	Class IV Separated Bikeway	Yes	No	No Change	Yes	Class IV Separated Bikeway	All Ages & Abilities		$1,901,490.00	High	$620,154.00	$265,104.00	$961,791.00	$3,483,435.00
140C	60	High	Hesperian Blvd	La Playa Dr	City limits (N)	La Playa Dr to Skywest Dr	Class III Bicycle Boulevard	36,000	30	Class IV Separated Bikeway	Yes	No	No Change	Yes	Class IV Separated Bikeway	All Ages & Abilities		$2,482,300.00	High	$809,580.00	$346,080.00	$1,255,570.00	$4,547,450.00
173A	59	High	Elmwood Ln/ UPRR Crossing	Santa Clara St	Amador St		None	1,500	25	Class III Bicycle Boulevard	No	No	No Change	No Change	Class III Bicycle Boulevard	All Ages & Abilities		$78,750.00	None	$0.00	$9,825.00	$0.00	$88,575.00
173B	59	High	Elmwood Ln/ UPRR Crossing	Amador St	Martin Luther King Dr		None			Class I Multi-Use Path	No	No	No Change	No Change	Class I Multi-Use Path	All Ages & Abilities		$0.00	None	$0.00	$87,300.00	$0.00	$87,300.00
106A	58	High	E St	Main St	1st St		None	1,600	20	Class III Bicycle Boulevard	No	No	One Side	No Change	Class II Bicycle Lane	All Ages & Abilities		$89,000.00	None	$0.00	$7,550.00	$0.00	$96,550.00
106B	58	High	E St	1st St	2nd St		None	3,600	20	Class II Bicycle Lane	No	No	One Side	Yes	Class II Bicycle Lane	All Ages & Abilities		$72,980.00	None	$0.00	$6,191.00	$0.00	$79,171.00
143A	55	High	Patrick Ave/Gading Rd	Tennyson Rd	We Harder Rd	Gading Rd to St Bede Ln	Class III Bicycle Route	11,000	30	Class IV Separated Bikeway	No	Yes	No Change	Yes	Class IV Separated Bikeway	All Ages & Abilities		$901,340.00	None	$0.00	$125,664.00	$455,906.00	$1,357,246.00
113A	54	High	Depot Rd/Cathy Wy	Cabot Blvd	Industrial Blvd	Cabot Blvd to Hesperian Blvd	Class III Bicycle Route	5,900	30	Class II Buffered Bicycle Lane	No	Yes	One Side	Yes	Class IV Separated Bikeway	All Ages & Abilities		$469,920.00	Low	$100,320.00	$88,704.00	$321,816.00	$892,056.00
113B	54	High	Depot Rd/Cathy Wy	Industrial Blvd	Adrian Ave	Cabot Blvd to Hesperian Blvd	Class III Bicycle Route	2,400	25	Class III Bicycle Boulevard	No	No	No Change	No Change	Class II Bicycle Lane	All Ages & Abilities		$421,860.00	None	$0.00	$35,787.00	$0.00	$457,647.00
113C	54	High	Depot Rd/Cathy Wy	Adrian Ave	Calaroga Ave	Hesperian Blvd to Calaroga Ave	Class II Bicycle Lane	8,500	25	Class IV Separated Bikeway	No	No	One Side	No Change	Class II Buffered Bicycle Lane	Connectivity & Gap Closure		$137,060.00	None	$0.00	$17,864.00	$0.00	$154,924.00
153A	54	Medium	Montgomery Ave	C St	City limits (N)	B St to City limits	Class III Bicycle Route	500	20	Class III Bicycle Boulevard	No	No	No Change	No Change	Class III Bicycle Boulevard	All Ages & Abilities		$813,750.00	None	$0.00	$101,525.00	$0.00	$915,275.00
174A	53	Medium	Longwood Ave	Hesperian Blvd	Nevada Rd		None	200	20	Class III Bicycle Boulevard	No	No	No Change	No Change	Class III Bicycle Boulevard	All Ages & Abilities		$129,150.00	None	$0.00	$16,113.00	$0.00	$145,263.00
149A	53	Medium	Huntwood Ave	Whipple Rd	Industrial Pkwy W	City limits to Schafer Rd	Class II Bicycle Lane	8,700	30	Class IV Separated Bikeway	No	Yes	No Change	Yes	Class IV Separated Bikeway	All Ages & Abilities		$694,260.00	Low	$129,960.00	$114,912.00	$416,898.00	$1,241,118.00
149B	53	Medium	Huntwood Ave	Industrial Pkwy W	Tennyson Rd	City limits to Schafer Rd	Class II Bicycle Lane	9,600	30	Class IV Separated Bikeway	No	Yes	Parking or Lane Removal	Parking or Lane Removal	Class IV Separated Bikeway	All Ages & Abilities		$584,640.00	Low	$109,440.00	$96,768.00	$351,072.00	$1,045,152.00
149C	53	Medium	Huntwood Ave	Tennyson Rd	Schafer Rd	City limits to Schafer Rd	Class II Bicycle Lane	900	25	Class III Bicycle Boulevard	No	Yes	No Change	No Change	Existing/No New Recommendation	All Ages & Abilities		$0.00	None	$0.00	$0.00	$0.00	$0.00
149D	53	Medium	Huntwood Ave	Schafer Rd	Gading Rd	City limits to Gading Rd	Class II Buffered Bicycle Lane	900	25	Class III Bicycle Boulevard	No	No	No Change	No Change	Class II Buffered Bicycle Lane	All Ages & Abilities		$403,970.00	None	$0.00	$46,168.00	$0.00	$450,138.00
123A	53	Medium	Whipple Rd	Dyer St	Huntwood Ave	Dyer St to Industrial Pkwy SW	Class III Bicycle Boulevard	16,200	40	Class IV Separated Bikeway	Yes	Yes	No Change	Yes	Class IV Separated Bikeway	All Ages & Abilities		$487,200.00	Low	$91,200.00	$80,640.00	$292,560.00	$870,960.00
152A	52	Medium	Western Blvd	A St	Sunset Blvd	A St to City limits	Class III Bicycle Route	6,300	25	Class II Buffered Bicycle Lane	No	No	No Change	No Change	Class III Bicycle Boulevard	Connectivity & Gap Closure		$133,350.00	None	$0.00	$16,637.00	$0.00	$149,987.00
137A	51	Medium	Calaroga Ave	Catalpa Wy	La Playa Dr	Catalpa Wy to Tennyson Rd	Class II Bicycle Lane	8,600	25	Class IV Separated Bikeway	No	No	One Side	No Change	Class II Buffered Bicycle Lane	Connectivity & Gap Closure		$749,700.00	None	$0.00	$165,648.00	$0.00	$915,348.00
138A	51	Medium	Miami Ave	Catalpa Wy	Calaroga Ave	Catalpa Wy to Calaroga Ave	Class II Bicycle Lane	1,500	25	Class III Bicycle Boulevard	No	No	No Change	No Change	Existing/No New Recommendation	All Ages & Abilities		$0.00	None	$0.00	$0.00	$0.00	$0.00
150A	50	Medium	Mission Alternative - Whitman St/Silva Ave/Meek Ave/Filbert St	Tennyson Rd	Raymond Dr	Tennyson Rd to Raymond Dr	Class II Bicycle Lane	13,800	35	Class IV Separated Bikeway	No	Yes	No Change	No Change	Existing/No New Recommendation	Connectivity & Gap Closure		$0.00	None	$0.00	$0.00	$0.00	$0.00
150B	50	Medium	Mission Alternative - Whitman St/Silva Ave/Meek Ave/Filbert St	Raymond Dr	Silva Ave	Raymond Dr to Harder Rd	Class II Bicycle Lane	13,800	35	Class IV Separated Bikeway	No	Yes	One Side	No Change	Class IV Separated Bikeway	All Ages & Abilities		$472,500.00	None	$0.00	$151,200.00	$548,550.00	$1,021,050.00
150C	50	Medium	Mission Alternative - Whitman St/Silva Ave/Meek Ave/Filbert St	Sycamore St	Jackson St	Whitman St to Meek Ave	Class III Bicycle Route	5,400	25	Class II Buffered Bicycle Lane	No	Yes	No Change	No Change	Class III Bicycle Boulevard	Connectivity & Gap Closure		$84,000.00	None	$0.00	$10,480.00	$0.00	$94,480.00
150D	50	Medium	Mission Alternative - Whitman St/Silva Ave/Meek Ave/Filbert St	Jackson St	Filbert St	Jackson St to Grand St	Class III Bicycle Route	4,900	25	Class II Bicycle Lane	No	No	One Side	No Change	Class III Bicycle Boulevard	Connectivity & Gap Closure		$140,180.00	None	$0.00	$21,353.00	$0.00	$161,533.00
150E	50	Medium	Mission Alternative - Whitman St/Silva Ave/Meek Ave/Filbert St	Meek Ave	A St		None	3,800	25	Class II Bicycle Lane	No	No	One Side	No Change	Class III Bicycle Boulevard	Connectivity & Gap Closure		$74,820.00	None	$0.00	$11,397.00	$0.00	$86,217.00

116A	49	Medium	Industrial Blvd	Hesperian Blvd	Clawiter Rd	Hesperian Blvd to Clawiter Dr	Class III Bicycle Route	14,000	30	Class IV Separated Bikeway	Yes	Yes	No Change	Yes	Class IV Separated Bikeway	All Ages & Abilities	$1,808,730.00	Med	$338,580.00	$299,376.00	$1,086,129.00	$3,233,439.00
163A	49	Medium	Dixon St/12th St	Industrial Pkwy	Tennyson Rd	Industrial Pkwy to Tennyson Rd	Class II Bicycle Lane	5,400	25	Class II Buffered Bicycle Lane	No	No	One Side	No Change	Class II Buffered Bicycle Lane	All Ages & Abilities	$222,600.00	None	$0.00	$49,184.00	$0.00	$271,784.00
163B	49	Medium	Dixon St/12th St	Tennyson Rd	Jefferson St		None	1,100	20	Class III Bicycle Boulevard	No	No	No Change	No Change	Class III Bicycle Boulevard	All Ages & Abilities	$126,420.00	None	$0.00	$19,257.00	$0.00	$145,677.00
160A	48	Medium	Soto Rd	Harder Rd	Orchard Ave	Harder Rd to Winton Ave	Class II Bicycle Lane	4,500	25	Class II Bicycle Lane	No	Yes	No Change	No Change	Existing/No New Recommendation	All Ages & Abilities	$0.00	None	$0.00	$0.00	$0.00	$0.00
160B	48	Medium	Soto Rd	Orchard Ave	Winton Ave	Harder Rd to Winton Ave	Class II Bicycle Lane	11,000	25	Class IV Separated Bikeway	No	Yes	No Change	No Change	Existing/No New Recommendation	Connectivity & Gap Closure	$0.00	None	$0.00	$0.00	$0.00	$0.00
187A	48	Medium	Schafer Rd	Gading Rd	Huntwood Ave	Gading Rd to Huntwood Ave	Class II Bicycle Lane	900	25	Class III Bicycle Boulevard	No	Yes	No Change	No Change	Existing/No New Recommendation	All Ages & Abilities	$0.00	None	$0.00	$0.00	$0.00	$0.00
126A	47	Medium	McKeever Ave/ City Center Dr	Main St	Foothill Blvd	2nd St to City limits (N)	None	2,300	25	Class III Bicycle Boulevard	No	No	No Change	No Change	Class III Bicycle Boulevard	All Ages & Abilities	$49,880.00	None	$0.00	$7,598.00	$0.00	$57,478.00
126B	47	Medium	McKeever Ave/ City Center Dr	Foothill Blvd	2nd St	Foothill Blvd to 2nd St	Class III Bicycle Route	9,600	25	Class IV Separated Bikeway	No	No	No Change	Yes	Class II Bicycle Lane	Connectivity & Gap Closure	$26,250.00	None	$0.00	$3,775.00	$0.00	$30,025.00
126C	47	Medium	McKeever Ave/ City Center Dr	2nd St	Foothill Blvd	2nd to Foothill Blvd	Class II Bicycle Lane	4,900	30	Class II Buffered Bicycle Lane	No	No	No Change	No Change	Existing/No New Recommendation	Connectivity & Gap Closure	$0.00	None	$0.00	$0.00	$0.00	$0.00
112A	45	Medium	Harder Rd	Santa Clara St	W Loop Rd	Santa Clara St to Westview Way	Class II Bicycle Lane	15,400	30	Class IV Separated Bikeway	Yes	Yes	No Change	Yes	Class IV Separated Bikeway	All Ages & Abilities	$2,488,780.00	None	$0.00	$411,936.00	$1,494,494.00	$3,983,274.00
146A	44	Medium	Tampa Ave/Gomer St	Folsom Ave	Glad Tidings Way	Folsom Ave to Tennyson Rd	Class III Bicycle Route	6,400	25	Class II Buffered Bicycle Lane	No	Yes	One Side	No Change	Class II Buffered Bicycle Lane	All Ages & Abilities	$181,650.00	Low	$65,740.00	$40,136.00	$0.00	$287,526.00
146B	44	Medium	Tampa Ave/Gomer St	Glad Tidings Way	Patrick Ave	Tennyson Rd to Gomer St	Class II Bicycle Lane	2,000	25	Class III Bicycle Boulevard	No	Yes	No Change	No Change	Existing/No New Recommendation	All Ages & Abilities	$0.00	None	$0.00	$0.00	$0.00	$0.00
108A	44	Medium	Elmhurst St	Santa Clara St	Amador St	Santa Clara St to Amador St	Class III Bicycle Route	7,800	25	Class IV Separated Bikeway	No	No	One Side	No Change	Class IV Separated Bikeway	All Ages & Abilities	$65,100.00	None	$0.00	$20,832.00	$75,578.00	$140,678.00
111A	42	Medium	Turner Ct	Hesperian Blvd	Calaroga Ave	Hesperian Blvd to Kay Ave	Class II Bicycle Lane	1,200	25	Class III Bicycle Boulevard	No	No	No Change	No Change	Existing/No New Recommendation	All Ages & Abilities	$0.00	None	$0.00	$0.00	$0.00	$0.00
120A	42	Medium	Folsom Ave	Tampa Ave	Huntwood Ave	Tampa Ave to Huntwood Ave	Class III Bicycle Boulevard	4,100	25	Class II Bicycle Lane	No	Yes	One Side	No Change	Class II Bicycle Lane	All Ages & Abilities	$263,550.00	None	$0.00	$37,901.00	$0.00	$301,451.00
120B	42	Medium	Folsom Ave	Havana Ave	Tampa Ave			1,500	25	Class III Bicycle Boulevard	No	No	No Change	No Change	Class III Bicycle Boulevard	All Ages & Abilities	$55,650.00	None	$0.00	$6,943.00	$0.00	$62,593.00
167A	41	Medium	Fairway St	Carroll Ave	Mission Blvd	Carroll Ave to Brae Burn Ave	Class III Bicycle Route	1,500	15	Class III Bicycle Boulevard	No	No	No Change	No Change	Class III Bicycle Boulevard	All Ages & Abilities	$132,300.00	None	$0.00	$16,506.00	$0.00	$148,806.00
185A	41	Medium	Martin Luther King Dr	Winton Ave	A St		None	1,500	25	Class III Bicycle Boulevard	No	No	No Change	No Change	Class III Bicycle Boulevard	All Ages & Abilities	$208,120.00	None	$0.00	$31,702.00	$0.00	$239,822.00
164A	41	Medium	Arrowhead Wy	Industrial Pkwy	Mission Blvd		None	1,800	25	Class III Bicycle Boulevard	No	No	No Change	No Change	Class III Bicycle Boulevard	All Ages & Abilities	$189,200.00	None	$0.00	$28,820.00	$0.00	$218,020.00
107A	41	Medium	Middle Ln/ Southland Dr	Clawiter Rd	Eden Ave	Clawiter Rd to Southland Pl	Class III Bicycle Route	1,300	25	Class III Bicycle Boulevard	No	Yes	No Change	No Change	Existing/No New Recommendation	All Ages & Abilities	$0.00	None	$0.00	$0.00	$0.00	$0.00
107B	41	Medium	Middle Ln/ Southland Dr	Eden Ave	Winton Ave			4,500	30	Class II Buffered Bicycle Lane	No	Yes	No Change	Yes	Class II Buffered Bicycle Lane	All Ages & Abilities	$227,900.00	None	$0.00	$61,480.00	$0.00	$289,380.00
109A	41	Medium	Hesperian Bypass - La Playa Dr/Southland Pl/Stonewall Dr/Thelma St La Playa Dr	Calaroga Ave	Hesperian Blvd	Hesperian Blvd to Calaroga Ave	Class III Bicycle Route	1,500	25	Class III Bicycle Boulevard	No	No	Both Sides	No Change	Class II Buffered Bicycle Lane	All Ages & Abilities	$93,450.00	None	$0.00	$20,648.00	$0.00	$114,098.00
109B	41	Medium	Hesperian Bypass - La Playa Dr/Southland Pl/Stonewall Dr/Thelma St La Playa Dr	La Playa Dr	Southland Dr		None	1,500	25	Class III Bicycle Boulevard	No	No	One Side	No Change	Class II Bicycle Lane	All Ages & Abilities	$93,740.00	None	$0.00	$16,459.00	$0.00	$110,199.00
109C	41	Medium	Hesperian Bypass - La Playa Dr/Southland Pl/Stonewall Dr/Thelma St La Playa Dr	Southland Dr	W Winton Ave	Southland Dr to W Winton Ave	Class III Bicycle Route	1,500	25	Class III Bicycle Boulevard	No	No	No Change	No Change	Class IV Separated Bikeway	All Ages & Abilities	$49,880.00	None	$0.00	$19,488.00	$70,702.00	$120,582.00
109D	41	Medium	Hesperian Bypass - La Playa Dr/Southland Pl/Stonewall Dr/Thelma St La Playa Dr	W Winton Ave	W A St		None	1,500	25	Class III Bicycle Boulevard	No	No	No Change	No Change	Class III Bicycle Boulevard	All Ages & Abilities	$313,950.00	None	$0.00	$39,169.00	$0.00	$353,119.00
110A	40	Medium	Orchard Ave/Hayward Blvd	Soto Rd	Mission Blvd	Soto Rd to Fairview Ave	Class III Bicycle Route	9,500	25	Class IV Separated Bikeway	No	No	One Side	No Change	Class II Bicycle Lane	Connectivity & Gap Closure	$353,220.00	None	$0.00	$26,274.00	$0.00	$379,494.00
110B	40	Medium	Orchard Ave/Hayward Blvd	Mission Blvd	Farm Hill Dr	Soto Rd to Fairview Ave	Class III Bicycle Route	20,000	25	Class IV Separated Bikeway	No	No	No Change	Yes	Class IV Separated Bikeway	All Ages & Abilities	$1,494,080.00	Low	$279,680.00	$247,296.00	$897,184.00	$2,670,944.00
110C	40	Medium	Orchard Ave/Hayward Blvd	Farm Hill Dr	Fairview Ave	Soto Rd to Fairview Ave	Class III Bicycle Route	3,900	30	Class II Buffered Bicycle Lane	No	Yes	No Change	No Change	Class III Bicycle Boulevard	Connectivity & Gap Closure	$891,170.00	Low	$166,820.00	$57,509.00	$0.00	$1,115,499.00
181A	40	Medium	Highland Blvd	Mission Blvd	University Ct		None	2,800	25	Class III Bicycle Boulevard	No	No	No Change	No Change	Class III Bicycle Boulevard	All Ages & Abilities	$334,540.00	None	$0.00	$50,959.00	$0.00	$385,499.00
172A	40	Low	Fletcher Ln	Watkins St	Mission Blvd		None	5,000	25	Class II Bicycle Lane	No	No	No Change	No Change	Class II Bicycle Lane	All Ages & Abilities	$14,620.00	None	$0.00	$2,567.00	$0.00	$17,187.00
148A	39	Medium	Ruus Rd	Industrial Pkwy W	Folsom Ave	Industrial Pkwy W to Thiel Rd	Class II Bicycle Lane	14,500	30	Class IV Separated Bikeway	No	Yes	One Side	No Change	Class IV Separated Bikeway	All Ages & Abilities	$179,550.00	None	$0.00	$57,456.00	$208,449.00	$387,999.00
148B	39	Medium	Ruus Rd	Folsom Ave	Tennyson Rd	Thiel Rd to Folsom Ave	Class III Bicycle Route	6,800	30	Class IV Separated Bikeway	No	Yes	One Side	No Change	Class IV Separated Bikeway	All Ages & Abilities	$288,260.00	None	$0.00	$47,712.00	$173,098.00	$461,358.00
155A	38	Medium	4th St	D St	A St	D St to A St	Class III Bicycle Route	9,800	30	Class IV Separated Bikeway	No	No	No Change	No Change	Class III Bicycle Boulevard	Connectivity & Gap Closure	$81,700.00	None	$0.00	$12,445.00	$0.00	$94,145.00
100A	38	High	Clubhouse Rd Bay Trail Connection	San Francisco Bay Trail	Corsair Blvd		None	500	25	Class III Bicycle Boulevard	No	No	No Change	No Change	Class I Multi-Use Path	All Ages & Abilities	$0.00	None	$0.00	$526,128.00	$0.00	$526,128.00
100B	38	High	Clubhouse Rd Bay Trail Connection	Corsair Blvd	Golf Course Rd		None	500	25	Class III Bicycle Boulevard	No	No	No Change	No Change	Class I Multi-Use Path	All Ages & Abilities	$0.00	None	$0.00	$641,364.00	$0.00	$641,364.00
100C	38	High	Clubhouse Rd Bay Trail Connection	Golf Course Rd	Skywest Dr	Golf Course Rd to Skywest Dr	Class II Bicycle Lane	3,001	25	Class II Bicycle Lane	No	No	No Change	No Change	Existing/No New Recommendation	All Ages & Abilities	$0.00	None	$0.00	$0.00	$0.00	$0.00
169A	38	Medium	Rousseau St	Brae Burn Ave	Mission Blvd	Carroll Ave to Brae Burn Ave	Class II Bicycle Lane	1,500	25	Class III Bicycle Boulevard	No	No			Existing/No New Recommendation	All Ages & Abilities	$0.00	None	$0.00	$0.00	$0.00	$0.00
144A	37	Medium	Eldridge Ave I-880 Overcrossing Access - Gomer St/Underwood Ave/Eldridge Ave	Underwood Ave	Tampa Ave	Underwood Ave to Tampa Ave	Class III Bicycle Route	5,900	25	Class II Buffered Bicycle Lane	No	Yes	One Side	No Change	Class II Bicycle Lane	Connectivity & Gap Closure	$56,760.00	None	$0.00	$9,966.00	$0.00	$66,726.00
144B	37	Medium	Eldridge Ave I-880 Overcrossing Access - Gomer St/Underwood Ave/Eldridge Ave	Gomer St	Elridge Ave	Gomer St to Elridge Ave	Class III Bicycle Route	2,700	25	Class III Bicycle Boulevard	No	Yes			Class III Bicycle Boulevard	All Ages & Abilities	$25,200.00	None	$0.00	$3,144.00	$0.00	$28,344.00
144C	37	Medium	Eldridge Ave I-880 Overcrossing Access - Gomer St/Underwood Ave/Eldridge Ave	Underwood Ave	Eden Greenway	Underwood Ave to Regal Ave	Class III Bicycle Route	1,500	15	Class III Bicycle Boulevard	No	No	No Change	No Change	Class III Bicycle Boulevard	All Ages & Abilities	$184,800.00	None	$0.00	$23,056.00	$0.00	$207,856.00
129A	37	Low	Whitesell St/Cabot Blvd	Breakwater Ave	Enterprise St	Breakwater Ave to Depot Rd	Class II Bicycle Lane	1,600	35	Class II Bicycle Lane	Yes	No	No Change	No Change	Existing/No New Recommendation	All Ages & Abilities	$0.00	None	$0.00	$0.00	$0.00	$0.00
129B	37	Low	Whitesell St/Cabot Blvd	Enterprise St	Depot Rd	Breakwater Ave to Depot Rd	Class II Bicycle Lane	3,500	35	Class II Buffered Bicycle Lane	Yes	No	No Change	No Change	Existing/No New Recommendation	Connectivity & Gap Closure	$0.00	None	$0.00	$0.00	$0.00	$0.00
129C	37	Low	Whitesell St/Cabot Blvd	Depot Rd	City Limit - Future SF Bay Trail Access	Depot Rd to W Winton Ave	Class III Bicycle Route	6,500	35	Class IV Separated Bikeway	No	Yes	No Change	Yes	Class IV Separated Bikeway	All Ages & Abilities	$465,150.00	Low	$168,340.00	$148,848.00	$540,017.00	$1,173,507.00
136A	37	Low	Portsmouth Ave/Arf Ave/Panama St	Sleepy Hollow Ave	Baumberg Ave	Arf Ave to Sleepy Hollow Ave	Class II Bicycle Lane	1,700	25	Class III Bicycle Boulevard	No	No	No Change	No Change	Existing/No New Recommendation	All Ages & Abilities	$0.00	None	$0.00	$0.00	$0.00	$0.00
136B	37	Low	Portsmouth Ave/Arf Ave/Panama St	Baumberg Ave	Calaroga Ave	Baumberg Ave to Hesperian Blvd	Class II Bicycle Lane	9,400	25	Class IV Separated Bikeway	No	No	One Side	No Change	Class IV Separated Bikeway	All Ages & Abilities	$198,450.00	None	$0.00	$63,504.00	$230,391.00	$428,841.00
170A	37	Low	Gresel St	Brae Burn Ave	Mission Blvd	Brae Burn Ave to Mission Blvd	Class II Bicycle Lane	1,500	25	Class III Bicycle Boulevard	No	No	No Change	No Change	Existing/No New Recommendation	All Ages & Abilities	$0.00	None	$0.00	$0.00	$0.00	$0.00
170B	37	Low	Gresel St	Carroll Ave	Brae Burn Ave			1,500	25	Class III Bicycle Boulevard	No	No	No Change	No Change	Class III Bicycle Boulevard	All Ages & Abilities	$75,680.00	None	$0.00	$11,528.00	$0.00	$87,208.00
135A	37	Low	Skywest Dr	Hesperian Blvd	Suerrio St	Hesperian Blvd to Sueirro St	Class II Bicycle Lane	1,500	30	Class II Bicycle Lane	No	No	No Change	No Change	Existing/No New Recommendation	All Ages & Abilities	$0.00	None	$0.00	$0.00	$0.00	$0.00
135B	37	Low	Skywest Dr	Suerrio St	Airport Access	Sueirro St to W A St	Class III Bicycle Route	1,300	30	Class II Bicycle Lane	No	No	No Change	No Change	Class II Bicycle Lane	All Ages & Abilities	$34,400.00	None	$0.00	$6,040.00	$0.00	$40,440.00
135C	37	Low	Skywest Dr	Airport Access	W A St	Sueirro St to W A St	Class III Bicycle Route	4,300	30	Class II Buffered Bicycle Lane	No	No	No Change	No Change	Class II Bicycle Lane	Connectivity & Gap Closure	$46,440.00	None	$0.00	$8,154.00	$0.00	$54,594.00
141A	36	Low	Santa Clara St/Hathaway Ave	W Harder Rd	W A St	Harder Rd to W A St	Class II Bicycle Lane	17,000	25	Class IV Separated Bikeway	No	Yes	Parking or Lane Removal	Parking or Lane Removal	Class IV Separated Bikeway	All Ages & Abilities	$1,124,620.00	None	$0.00	$186,144.00	$675,326.00	$1,799,946.00
141B	36	Low	Santa Clara St/Hathaway Ave	W A St	Lansing Wy	W A St to City limits	Class II Bicycle Lane	17,000	25	Class IV Separated Bikeway	No	Yes	No Change	Yes	Class IV Separated Bikeway	All Ages & Abilities	$154,280.00	None	$0.00	$25,536.00	$92,644.00	$246,924.00
166A	36	Low	Revere Ave/Brae Burn Ave	Lafayette Ave	Gresel St			1,500	25	Class III Bicycle Boulevard	No	No	No Change	No Change	Class III Bicycle Boulevard	All Ages & Abilities	$220,160.00	None	$0.00	$33,536.00	$0.00	$253,696.00
166B	36	Low	Revere Ave/Brae Burn Ave	Gresel St	Rousseau St	Gresel St to Rousseau St	Class II Bicycle Lane	1,500	25	Class III Bicycle Boulevard	No	No	No Change	No Change	Existing/No New Recommendation	All Ages & Abilities	$0.00	None	$0.00	$0.00	$0.00	$0.00
166C	36	Low	Revere Ave/Brae Burn Ave	Rousseau St	St Andrews St	Rousseau St to Fairway St	None	1,500	25	Class III Bicycle Boulevard	No	No	No Change	No Change	Class III Bicycle Boulevard	All Ages & Abilities	$72,450.00	None	$0.00	$9,039.00	$0.00	$81,489.00
125A	36	Low	Pacheco Wy/ Strafford Rd	Class I Path	Industrial Pkwy W	Industrial Pkwy W to Class I Path	Class III Bicycle Route	1,500	25	Class III Bicycle Boulevard	No	No	No Change	No Change	Existing/No New Recommendation	All Ages & Abilities	$0.00	None	$0.00	$0.00	$0.00	$0.00
121A	36	Low	Eden Shores Blvd	Sandcreek Dr	Hesperian Blvd	Sandcreek Dr to Hesperian Blvd	Class II Bicycle Lane	1,400	25	Class III Bicycle Boulevard	No	No	No Change	No Change	Existing/No New Recommendation	All Ages & Abilities	$0.00	None	$0.00	$0.00	$0.00	$0.00
114A	36	Low	Breakwater Ave	Sf Bay Trail	Whitesell St	Roadway limit to Whitesell St	Class III Bicycle Route	2,000	30	Class II Bicycle Lane	No	No	Both Sides	No Change	Class II Bicycle Lane	All Ages & Abilities	$181,460.00	None	$0.00	$31,861.00	$0.00	$213,321.00
114B	36	Low	Breakwater Ave	Whitesell St	Clawiter Rd	Whitesell St to Clawiter Rd	Class III Bicycle Route	2,000	30	Class II Bicycle Lane	No	No	One Side	No Change	Class II Bicycle Lane	All Ages & Abilities	$85,140.00	None	$0.00	$14,949.00	$0.00	$100,089.00
131A	36	Low	Eden Landing Rd/Clawiter Rd	San Francisco Bay Trail	Arden Road		None	500	25	Class III Bicycle Boulevard	No	No	No Change	No Change	Class III Bicycle Boulevard	All Ages & Abilities	$118,650.00	None	$0.00	$14,803.00	$0.00	$133,453.00
131B	36	Low	Eden Landing Rd/Clawiter Rd	Arden Rd	Clawiter Rd			6,000	30	Class II Buffered Bicycle Lane	Yes	Yes	One Side	No Change	Class II Buffered Bicycle Lane	All Ages & Abilities	$85,050.00	None	$0.00	$18,792.00	$0.00	$103,842.00
131C	36	Low	Eden Landing Rd/Clawiter Rd	Eden Landing Rd	Breakwater Ave		None	10,000	30	Class IV Separated Bikeway	Yes	Yes	No Change	No Change	Class IV Separated Bikeway	All Ages & Abilities	$74,550.00	None	$0.00	$23,856.00	$86,549.00	$161,099.00
131D	36	Low	Eden Landing Rd/Clawiter Rd	Breakwater Ave	Depot Rd	Eden Landing Rd to W Winton Ave	Class III Bicycle Route	10,000	30	Class IV Separated Bikeway	Yes	Yes	No Change	No Change	Class IV Separated Bikeway	All Ages & Abilities	$196,350.00	Low	$71,060.00	$62,832.00	$227,953.00	$495,363.00
131E	36	Low	Eden Landing Rd/Clawiter Rd	Depot Rd	Industrial Blvd	Eden Landing Rd to W Winton Ave	Class III Bicycle Route	10,000	30	Class IV Separated Bikeway	Yes	Yes	One Side	No Change	Class IV Separated Bikeway	All Ages & Abilities	$84,000.00	None	$0.00	$26,880.00	$97,520.00	$181,520.00
131F	36	Low	Eden Landing Rd/Clawiter Rd	Industrial Blvd	W Winton Ave	Eden Landing Rd to W Winton Ave	Class III Bicycle Route	10,000	30	Class IV Separated Bikeway	Yes	Yes	Parking or Lane Removal	Parking or Lane Removal	Class IV Separated Bikeway	All Ages & Abilities	$491,260.00	Med	$91,960.00	$81,312.00	$294,998.00	$878,218.00
154A	35	Low	2nd St	Campus Dr	D St	Campus Dr to D St	Class II Bicycle Lane	12,000	25	Class IV Separated Bikeway	No	Yes	One Side	No Change	Class III Bicycle Boulevard	Connectivity & Gap Closure	$655,690.00	Low	$122,740.00	$42,313.00	$0.00	$820,743.00
154B	35	Low	2nd St	D St	A St	D St to A St	None	35,000	30	Class IV Separated Bikeway	No	Yes	Parking or Lane Removal	Parking or Lane Removal	Class IV Separated Bikeway	All Ages & Abilities	$170,520.00	Low	$31,920.00	$28,224.00	$102,396.00	$304,836.00
154C	35	Low	2nd St	A St	City Center Dr	A St to City Center Dr	None	15,000	25	Class IV Separated Bikeway	No	No	No Change	Yes	Class IV Separated Bikeway	All Ages & Abilities	$47,250.00	None	$0.00	$15,120.00	$54,855.00	$102,105.00
133A	35	Low	Arden Rd/Baumberg Ave	Corporate Ave	Industrial Blvd	Corporate Ave to Industrial Blvd	Class III Bicycle Route	2,900	30	Class II Bicycle Lane	No	No	One Side	No Change	Class II Bicycle Lane	All Ages & Abilities	$441,000.00	None	$0.00	$63,420.00	$0.00	$504,420.00
119A	35	Low	Catalpa Wy	Hesperian Blvd	Miami Ave	Hesperian Blvd to Miami Ave	Class II Bicycle Lane	1,500	25	Class III Bicycle Boulevard	No	No	No Change	No Change	Class II Bicycle Lane	All Ages & Abilities	$143,850.00	None	$0.00	$20,687.00	$0.00	$164,537.00
156A	33	Low	6th St	D St	B St	D St to B St	Class III Bicycle Route	1,500	25	Class III Bicycle Boulevard	No	No	No Change	No Change	Existing/No New Recommendation	All Ages & Abilities	$0.00	None	$0.00	$0.00	$0.00	$0.00
122A	33	Low	Marina Dr	Eden Park Pl	Industrial Blvd	Eden Park Pl to Industrial Blvd	Class II Bicycle Lane	2,500	25	Class III Bicycle Boulevard	No	No	No Change	No Change	Existing/No New Recommendation	All Ages & Abilities	$0.00	None	$0.00	$0.00	$0.00	$0.00
132A	33	Low	Eden Landing Rd/Corporate Ave	Clawiter Rd	Arden Road	Clawiter Rd to Corporate Ave	Class II Bicycle Lane	300	30	Class II Bicycle Lane	No	No	No Change	No Change	Existing/No New Recommendation	All Ages & Abilities	$0.00	None	$0.00	$0.00	$0.00	$0.00
130A	33	Low	Corsair Blvd	W Winton Ave	Clubhouse Dr	W Winton Ave to Clubhouse Dr	Class II Bicycle Lane	650	35	Class II Bicycle Lane	No	Yes	No Change	Yes	Class II Buffered Bicycle Lane	All Ages & Abilities	$205,540.00	None	$0.00	$55,448.00	$0.00	$260,988.00
128A	32	Low	Fairview Ave	Hayward Blvd	Woodstock Rd	Hayward Blvd to Woodstock Rd	Class II Bicycle Lane	1,500	35	Class II Bicycle Lane	No	No	No Change	No Change	Class II Bicycle Lane	All Ages & Abilities	$401,940.00	None	$0.00	$29,898.00	$0.00	$431,838.00
161A	31	Low	Campus Dr	Hayward Blvd	Oaks Dr	Hayward Blvd to Highland Blvd	Class III Bicycle Route	9,700	30	Class IV Separated Bikeway	No	No	No Change	Yes	Class IV Separated Bikeway	All Ages & Abilities	$304,500.00	Low	$57,000.00	$50,400.00	$182,850.00	$544,350.00
161B	31	Low	Campus Dr	Oaks Dr	2nd St	Highland Blvd to 2nd St	Class II Bicycle Lane	9,700	30	Class IV Separated Bikeway	No	No	No Change	No Change	Class IV Separated Bikeway	All Ages & Abilities	$180,670.00	Low	$33,820.00	$29,904.00	$108,491.00	$322,981.00
171A	31	Low	Sunset Blvd	Princeton St	Western Blvd	Princeton Blvd to Western Blvd	Class II Bicycle Lane	5,300	30	Class II Buffered Bicycle Lane	No	No	No Change	No Change	Existing/No New Recommendation	Connectivity & Gap Closure	$0.00	None	$0.00	$0.00	$0.00	$0.00
171B	31	Low	Sunset Blvd	Western Blvd	Main St			5,300	30	Class II Buffered Bicycle Lane	No	No	One Side	No Change	Class II Bicycle Lane	Connectivity & Gap Closure	$99,750.00	None	$0.00	$14,345.00	$0.00	$114,095.00
177A	29	High	San Mateo Bridge Path	San Mateo Bridge	Breakwater Ave		None	75,500	60	Class IV Separated Bikeway	No	No	No Change	No Change	Class I Multi-Use Path	Connectivity & Gap Closure	$0.00	None	$0.00	$314,280.00	$0.00	$314,280.00
157A	29	Low	5th St	E St	D St	City limits to D St	Class III Bicycle Route	1,500	25	Class III Bicycle Boulevard	No	No	No Change	No Change	Existing/No New Recommendation	All Ages & Abilities	$0.00	None	$0.00	$0.00	$0.00	$0.00
179A	26	Low	E Loop Rd/ W Loop Rd	Harder Rd	Harder Rd		None	4,200	25	Class II Bicycle Lane	No	No	Parking or Lane Removal	Parking or Lane Removal	Class II Bicycle Lane	All Ages & Abilities	$430,000.00	Low	$190,000.00	$75,500.00	$0.00	$695,500.00
195A	25	Low	Sandcreek Drive Bay Trail Access	Eden Shores Blvd	SF Bay Trail		None	1,500	25	Class III Bicycle Boulevard	No	No	No Change	No Change	Class III Bicycle Boulevard	All Ages & Abilities	$49,020.00	None	$0.00	$7,467.00	$0.00	$56,487.00
139A	22	Low	Morningside Dr/ Tahoe Ave	Arf Ave	Hesperian Blvd	Tahoe Ave to Arf Ave	Class II Bicycle Lane	1,500	25	Class III Bicycle Boulevard	No	No	No Change	No Change	Existing/No New Recommendation	Connectivity & Gap Closure	$0.00	None	$0.00	$0.00	$0.00	$0.00
																Totals	**$61,190,570.00**			**$25,883,493.00**	**$24,069,155.00**	**$114,099,314.00**

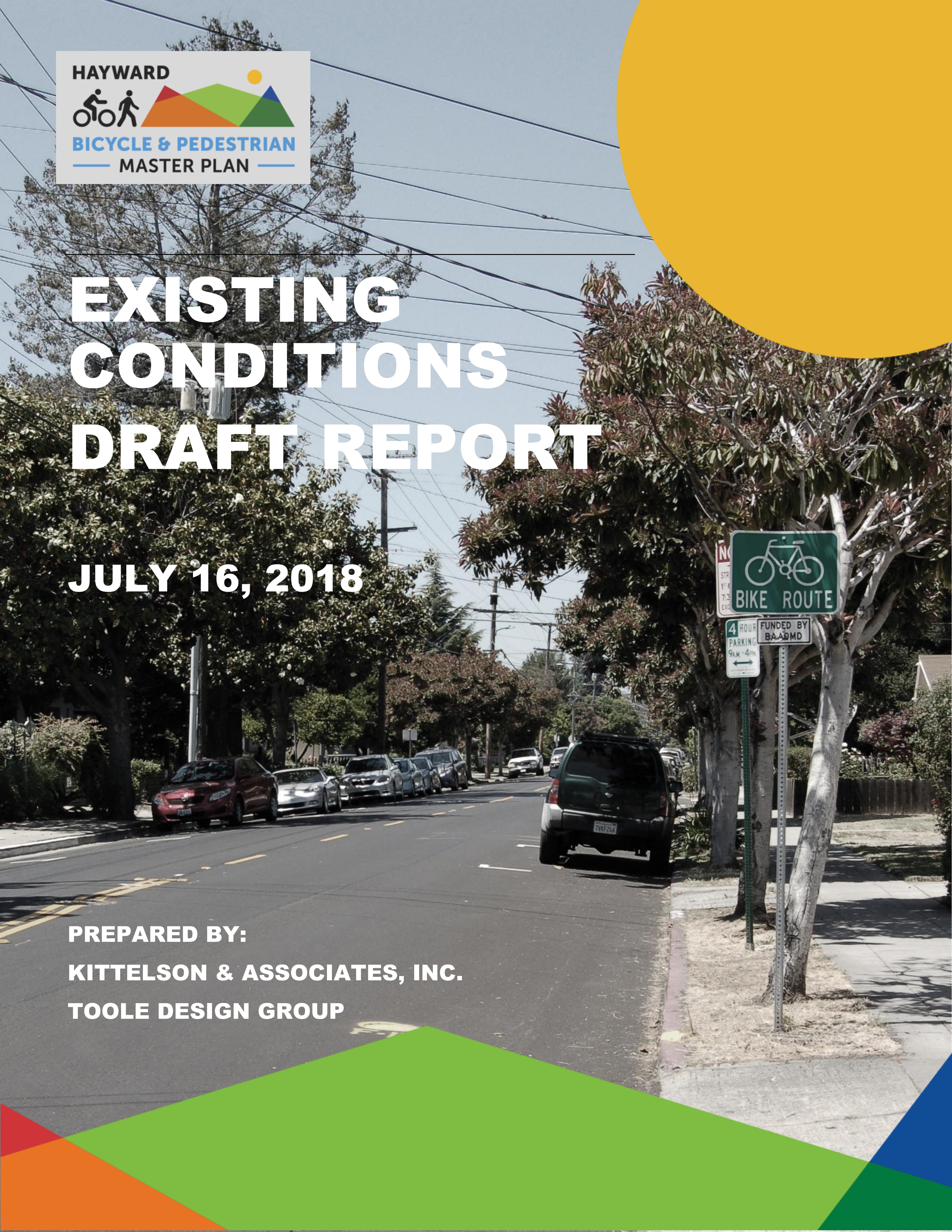
APPENDIX B

EXISTING CONDITIONS MEMO

HAYWARD
BICYCLE & PEDESTRIAN
MASTER PLAN

EXISTING CONDITIONS DRAFT REPORT

JULY 16, 2018



PREPARED BY:
KITTELSON & ASSOCIATES, INC.
TOOLE DESIGN GROUP

TABLE OF CONTENTS

01

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

This existing conditions memorandum captures the current state of walking and biking in Hayward. It includes discussion of the following topics:

- State of Walking and Biking (page 8)
- Existing Bicycle Network (page 20)
- Existing Plans, Policies, and Programs (page 24)
- Bicycle Level of Traffic Stress (page 32)
- Bicyclist and Pedestrian Crash Analysis (page 40)
- Bicyclist and Pedestrian High Injury Corridor Analysis (page 47)

Key findings from this discussion are included graphically on the next two pages, and include the following:

- Among the 1.1% of Hayward residents who bike to work and 2.3% who walk to work, the following population groups exhibit a higher-than-average share of both bikers and walkers:
  - Low-income residents ($0 - $24,999)
  - Young families and professionals (25 - 44 years old)

- Commute and work-related trips only account for 16% of trips in Hayward. Among the remaining 84% of trips, 59% are three miles or shorter. With supportive infrastructure, many of these trips could be converted to walk or bike trips from driving, the dominant travel mode of choice in Hayward.

- This memo includes citywide analysis of bicycle level of traffic stress, a rating commonly used to assess the comfortability of riding conditions on a given roadway. Results show the following breakdown:
  - Arterial streets account for 21% of lane miles in Hayward but 61% of high-stress lane miles.
  - Collector streets account for 12% of lane miles in Hayward but 37% of high-stress lane miles.
  - Local/neighborhood streets account for 67% of lane miles in Hayward but 2% of high-stress lane miles.

- Safety analyses conducted and included in this memo found the following::
  - From 2012-2016, an average of 2.6 pedestrians and 0.4 bicyclists were reported killed in crashes on Hayward streets.
  - Among 57 similarly sized California cities, Hayward compares favorably in bicyclist safety, average in pedestrian safety, and poorly in safety for elderly pedestrians (age 65+).
  - Of the 292 pedestrians involved in crashes, 51% were hit while crossing at a marked crosswalk and 25% were hit while crossing outside a crosswalk altogether.

- Results of the historical bicyclist and pedestrian crash network screening and high injury corridor analysis shows increased risk for pedestrians and bicyclists traveling on arterial roadways with a posted speed of 35 miles per hour or higher.

The analysis and findings presented in this memo will feed into subsequent tasks, including program and policy recommendations, bikeway and pedestrian network recommendations, and incorporated into the final Bicycle and Pedestrian Master Plan.

EXECUTIVE SUMMARY

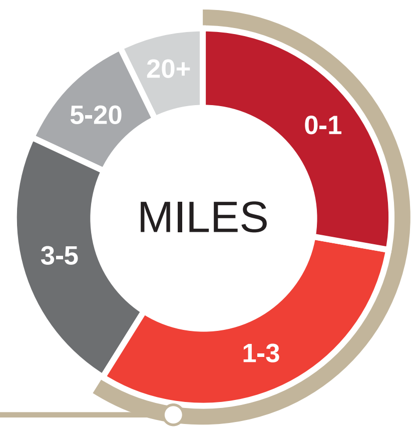
WHO IS BIKING MORE

- LOW-INCOME AND HIGH-INCOME WORKERS
- YOUNG FAMILIES AND PROFESSIONALS
- PEOPLE WITH NO VEHICLES AVAILABLE
- PEOPLE AGED 65 AND OLDER

WHO IS WALKING MORE

- LOW-INCOME WORKERS
- YOUNG FAMILIES AND PROFESSIONALS
- PEOPLE WITH ONE OR TWO VEHICLES AVAILABLE AT HOME

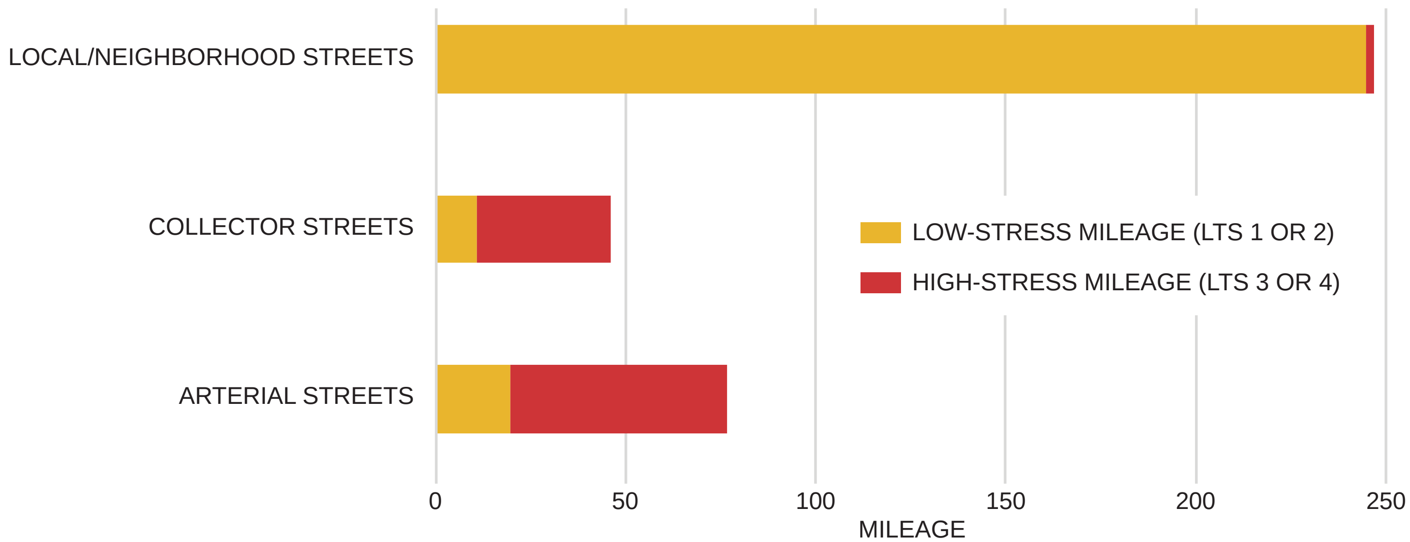
NON-WORK TRIP DISTANCES IN HAYWARD



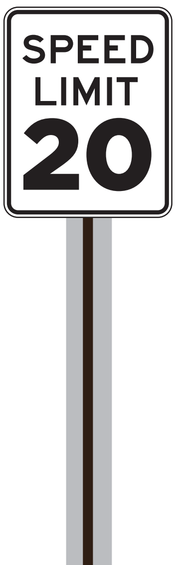
59%

OPPORTUNITY TO CONVERT A PORTION OF SHORT TRIPS TO WALK OR BICYCLE TRIPS

ROADWAY MILEAGE BY BICYCLE LEVEL OF TRAFFIC STRESS

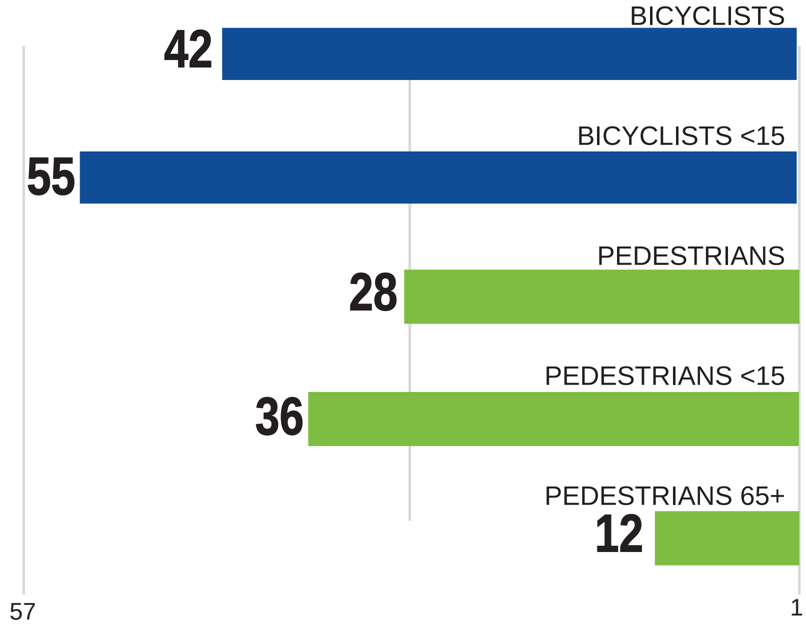


EXECUTIVE SUMMARY CONTINUED



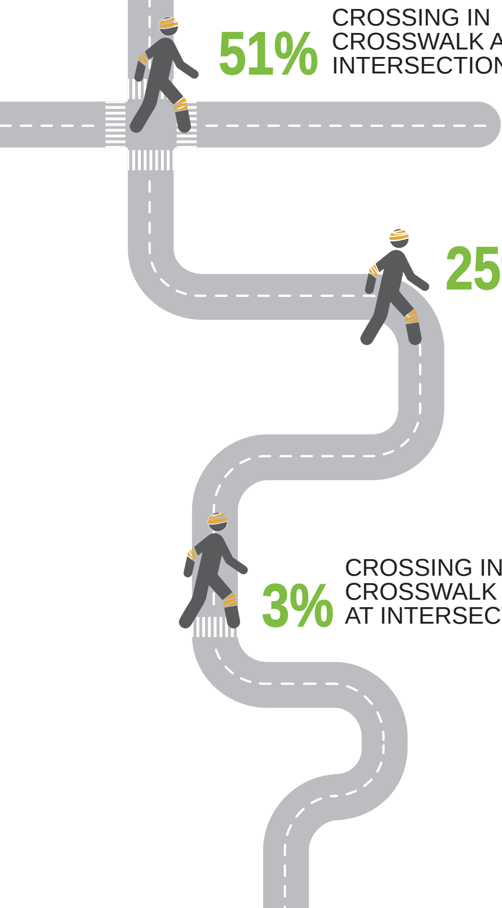
Arterial roadways with 35MPH or higher posted speed are associated with increased risk for pedestrian and bicycle crashes and injuries. Lower posted speed streets are less associated with these outcomes.

HAYWARD SAFETY PERFORMANCE COMPARED TO 57 SIMILARLY SIZED CALIFORNIA CITIES, 2015



(1=worst,57=best)
(<15 = Under the age of 15)
(65+ = Age 65 or older)

PEDESTRIAN CRASHES BY LOCATION



51% CROSSING IN CROSSWALK AT INTERSECTION

25% CROSSING NOT IN CROSSWALK

3% CROSSING IN CROSSWALK NOT AT INTERSECTION

CRASHES YEAR OVER YEAR, HAYWARD, 2012-2016

	Pedestrians	Bicyclists
AVERAGE ANNUAL CRASHES	52	35
AVERAGE ANNUAL FATALITIES	< 3	< 1

CRASH SEVERITY

	Pedestrians	Bicyclists
PROPERTY DAMAGE ONLY	3%	8%
INJURY / DEATH	97%	82%

02

STATE OF BIKING AND WALKING IN HAYWARD

STATE OF BIKING AND WALKING IN HAYWARD

This section provides an overview of demographics and travel patterns related to walking and bicycling in Hayward.

COMMUTE AND NON-COMMUTE TRIPS

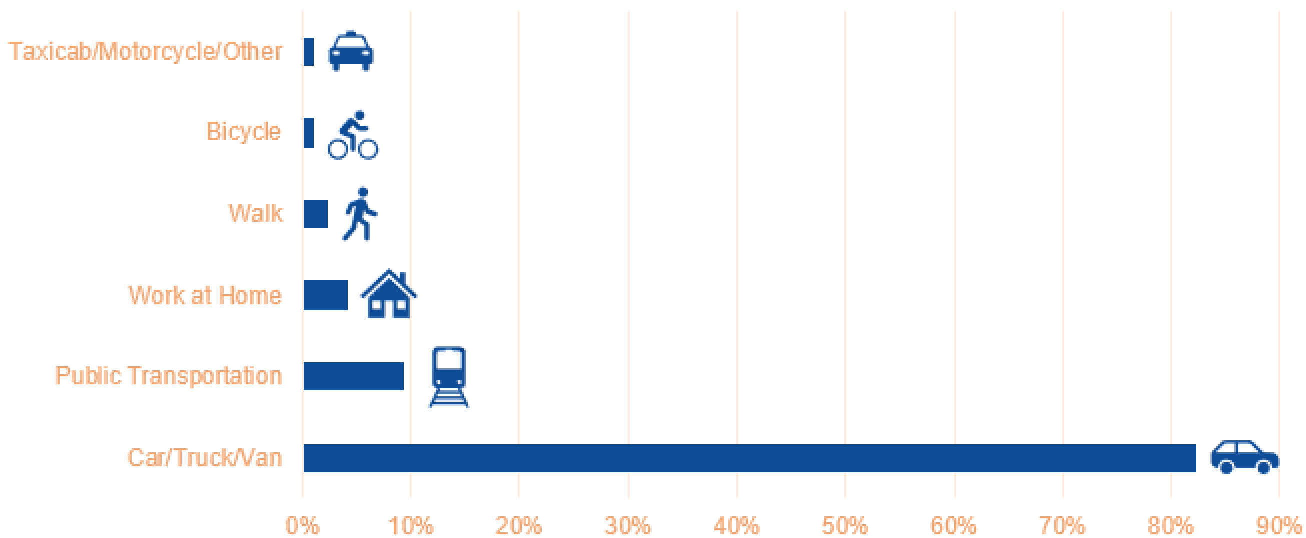
Hayward is located in the heart of the San Francisco Bay Area in central Alameda County. It is a major suburban center with a growing downtown, and it is uniquely situated to provide access to major employment hubs in Oakland, San Francisco, Silicon Valley, and the Tri-Valley. Hayward is the third largest city in Alameda County, with a population of approximately 160,000 people.

MODES OF TRANSPORTATION

Commute Trips

Approximately 75,000 Hayward residents commute to work throughout the Bay Area, with most people commuting by car (82% of commuters). A much smaller proportion of residents take transit (9.3%), walk or bicycle to work (2.3% and 1.1% respectively). Of the 9.3% who take transit to work, many may walk or bicycle to reach transit stops, as shown in Figure 1. Additionally, over 75% of Hayward residents commute outside of the City for work including 35% of residents who travel outside of Alameda County for work. US Census only provides Journey to Work data for the primary mode of transportation and does not include information on other trips, such as walking or biking trips that connect with regional transit services. While work and work-related trips only account for 16% of all travel.

Figure 1: Commute Mode Share, Hayward Residents (2016)

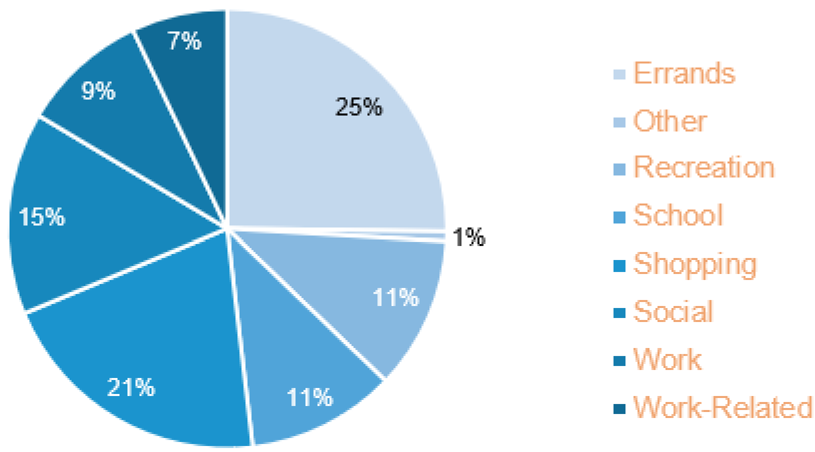


SOURCE: US CENSUS, ACS 2016 (1-YEAR ESTIMATE)

Non-Commute Trips

Hayward residents travel for many reasons other than work commutes. In fact, as shown in Figure 2, running errands and shopping account for almost half of all trips within Hayward. Recreational and social outings account for another quarter of all trips made within the city. Recreational and social outings account for another quarter of all trips made within the city. shows trip purposes by all modes for trips that start or end in Hayward. Planning for better connections to key destinations for shopping, entertainment, and recreation areas may provide more opportunities to encourage people to walk or bike.

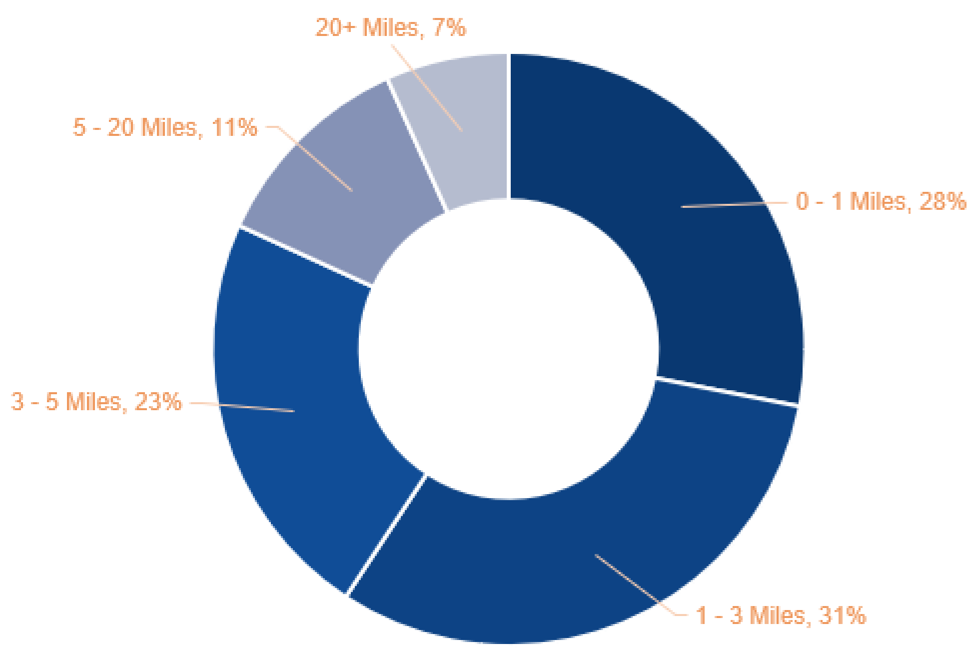
Figure 2: Trip Purposes for All Transportation Modes within Hayward



SOURCE: CALIFORNIA HOUSEHOLD TRAVEL SURVEY, 2013.

Almost 30% of all non-work trips made by Hayward residents are less than one mile in length. This means that there is a large opportunity to convert many short trips into potential walking trips. Additionally, another 30% of all non-work trips that start or end within the city fall within the one to three-mile range which is a relatively accessible biking distance for many people, depending on a number of factors including age, ability, comfort level, equipment, weather, perception of safety, vehicle speeds and volumes, presence of bike facilities, and topography. Therefore, the City of Hayward has a large opportunity to convert short trip distances to walk or bicycle trips.Figure 3 shows distances for all non-work trips that start or end within the city.

Figure 3 Non-Work Trip Distances for All Transportation Modes within Hayward



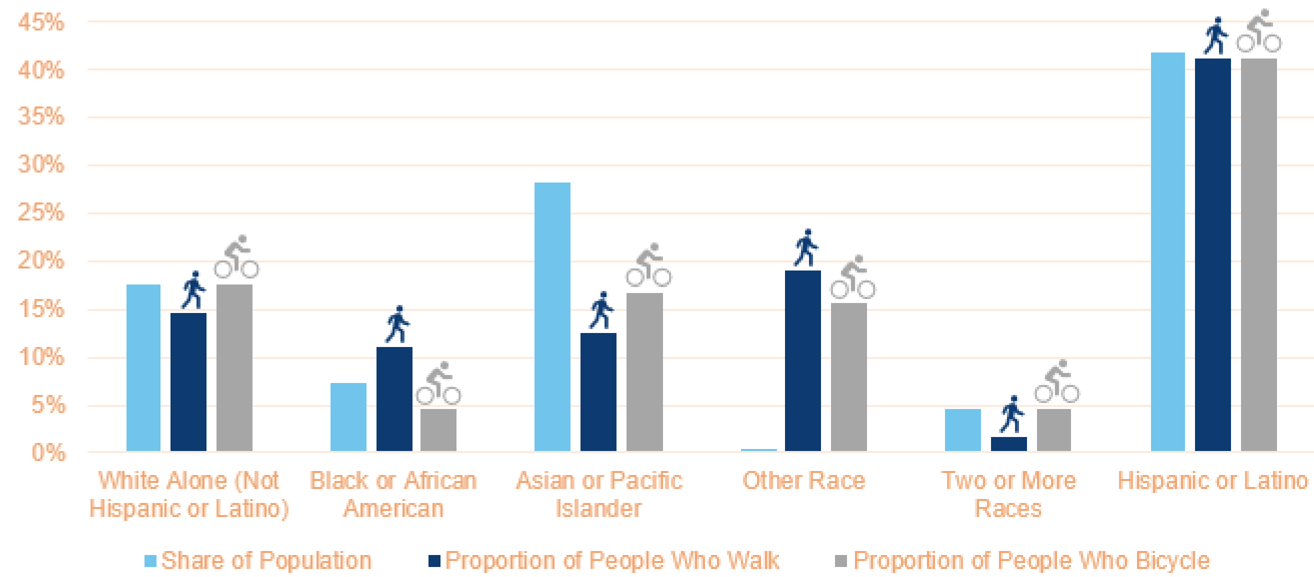
SOURCE: CALIFORNIA HOUSEHOLD TRAVEL SURVEY, 2013.

DEMOGRAPHICS OF PEOPLE WALKING & BIKING IN HAYWARD

RACE & ETHNICITY

As demonstrated by Hayward's Commitment for an Inclusive, Equitable, and Compassionate Community (CIECC), Hayward supports diverse and inclusive communities. Approximately 42% of Hayward’s population is Latinx, 28% is Asian or Pacific Islander, 18% White, seven percent is Black, and five percent are of mixed race. Figure 4 presents Hayward’s population by racial groups, as well as biking and walk commute rates by race. Latinxs make up the largest proportion of the population and almost half of the proportion of users who walk or bike, at approximately 42%. Asian or Pacific Islanders make up the second highest proportion of the population but make disproportionately fewer walk or bike trips, at approximately 27%, compared to their share of the population.

Figure 4 Population and Walk/Bicycle Commute Mode Share by Race



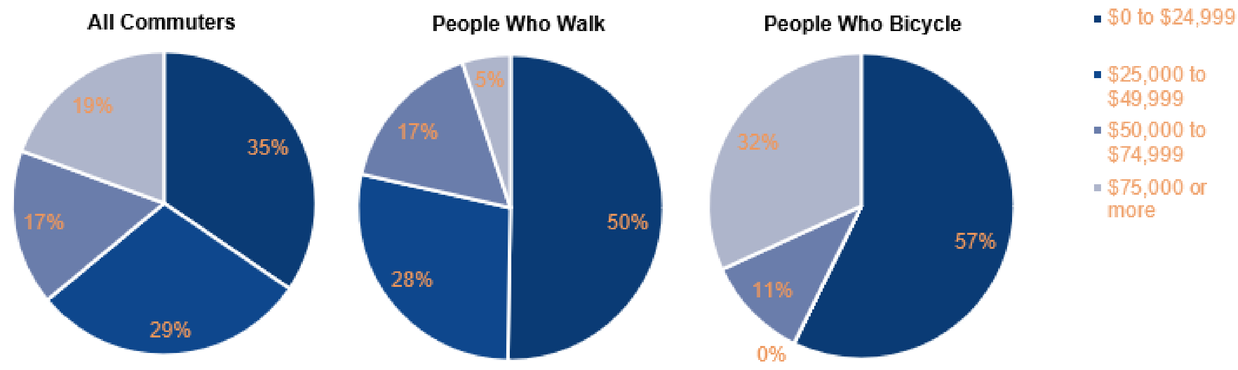
SOURCE: US CENSUS, ACS 2016 (1-YEAR ESTIMATE).

INCOME & POVERTY STATUS

Approximately 35% of workers earn an annual income of less than $25,000 per year. Looking at only people who walk and bicycle in Hayward, over 50% have incomes below $25,000 per year. Workers with annual incomes over $75,000 make up about 20% of the population and approximately 32% of bicyclists fall within that income bracket. This means that people in both the highest and lowest annual income categories are more likely to bicycle to work. However, residents making over $75,000 per year are far less likely to walk to work.

Figure 5 shows all commuter income levels compared with those of just people who walk or bicycle.

Figure 5: Annual Workers' Earnings and Walk/Bike Commute Mode Share



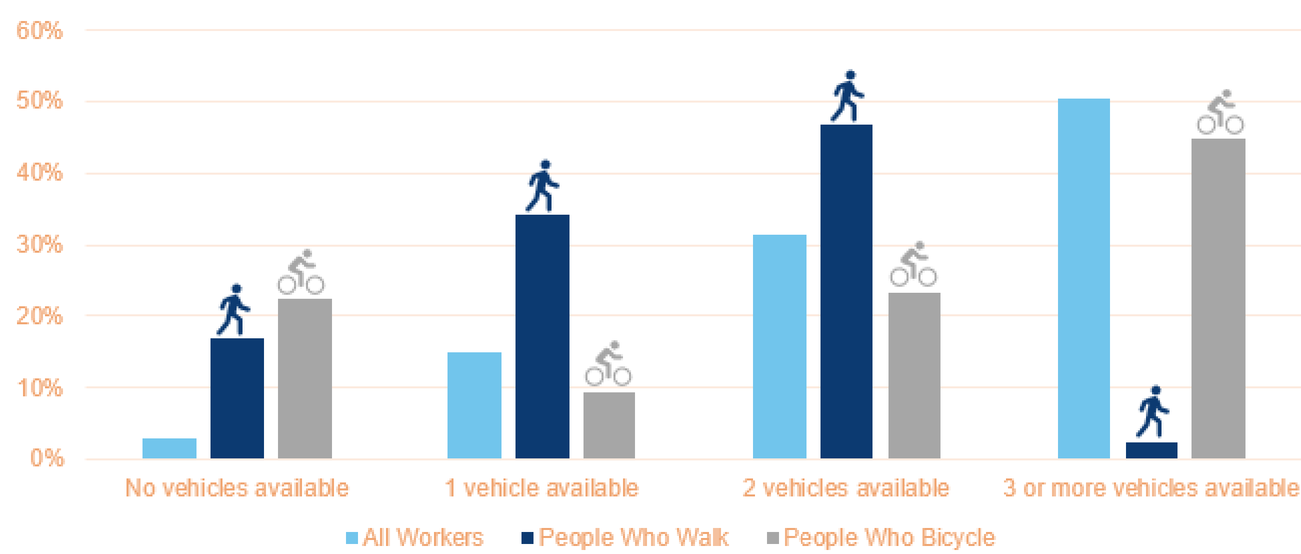
Source: US Census, ACS 2016 (1-Year Estimate).

Many of Hayward's residents may need to walk or ride out of necessity, as a way to get to work. Poverty status is one indicator of need; the Census sets poverty thresholds based on family size (i.e., number of children). For instance, for a family of four, the poverty line is approximately $25,000 annual income. Almost five percent of Hayward's population is below the poverty line while another six percent makes at or below 1.5 times the poverty threshold.

VEHICLE OWNERSHIP

Over 50% of Hayward workers have three or more vehicles available at home while almost 45% have at least one vehicle available. Almost half of people who walk to work own two vehicles and over 40% of people who bicycle to work own three or more vehicles, as shown in Figure 6.

Figure 6: Vehicle Ownership and Walk/Bike Commute Mode Share



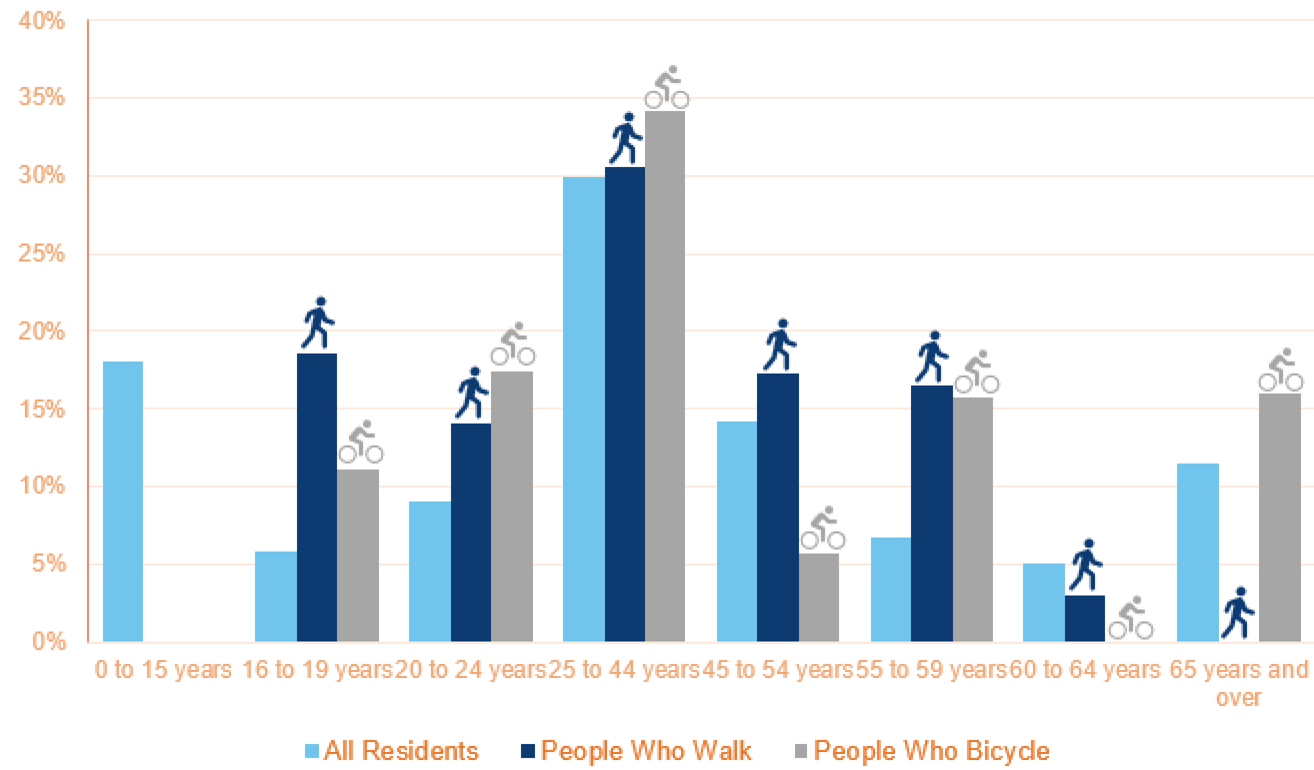
Source: US Census, ACS 2016 (1-Year Estimate).

AGE

Residents age 25 to 44 years old make up the largest age groups in the city. This same age group also makes up the highest number of workers who walk or bike for their commute. Young children up to the age of 15 years old make up the second highest age group in Hayward. While data is not available for the walk and bikes rates of residents under 15 years old, it is assumed that many of the City's younger residents walk and bicycle to school, church, parks, or other local amenities.

As home to multiple high schools, California State University East Bay, and Chabot College, students and young adults age 16 to 24 years old make up nearly 15% of the population but rely on walking and biking at a much higher rate, compared to their share of the overall population. At the other end of the age spectrum, seniors age 65 and older make up almost 10% of the population overall population but 16% rely on bicycles as their primary mode transportation to work. However, this does not capture the number of seniors that may be retired and no longer commute to work but may walk or bike for other purposes.

Figure 7: Age and Commute Mode Share

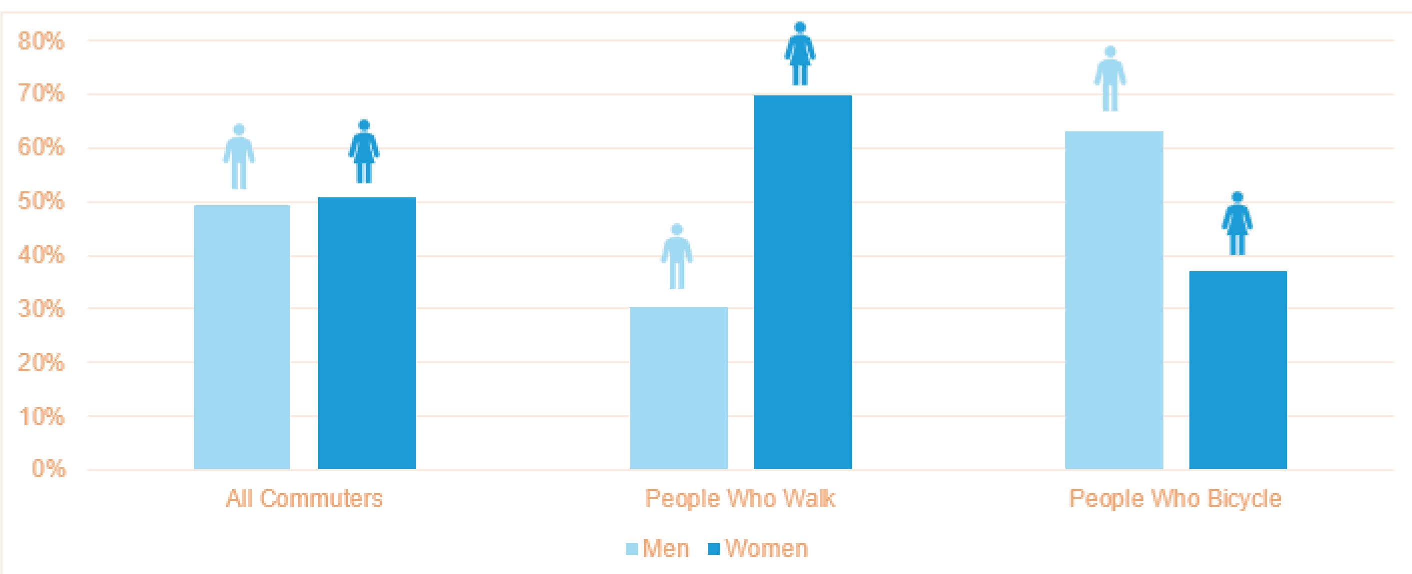


SOURCE: US CENSUS, ACS 2016 (1-YEAR ESTIMATE).

GENDER

Hayward has an almost 50/50 split of men and women for all residents. However, like many cities across the United States, Hayward has more men than women who bike to work. Over double the number of women walk to work than men, as presented in Figure 8.

Figure 8: Gender and and Walk/Bike Mode Share



SOURCE: US CENSUS, ACS 2016 (1-YEAR ESTIMATE).

DISADVANTAGED NEIGHBORHOODS

Local neighborhood characteristics and equity issues were assessed using the Office of Environmental Health Hazard Assessment's (OEHHA) CalEnviroScreen tool. The CalEnviroScreen tool uses socioeconomic and environmental health data to map disadvantaged areas as determined by a number of indicators. Specifically, it uses pollution exposure, environmental effect, sensitive population, and socioeconomic indicators. Table 1 provides a summary of the indicators analyzed as part of the CalEnviroScreen tool most related to transportation.

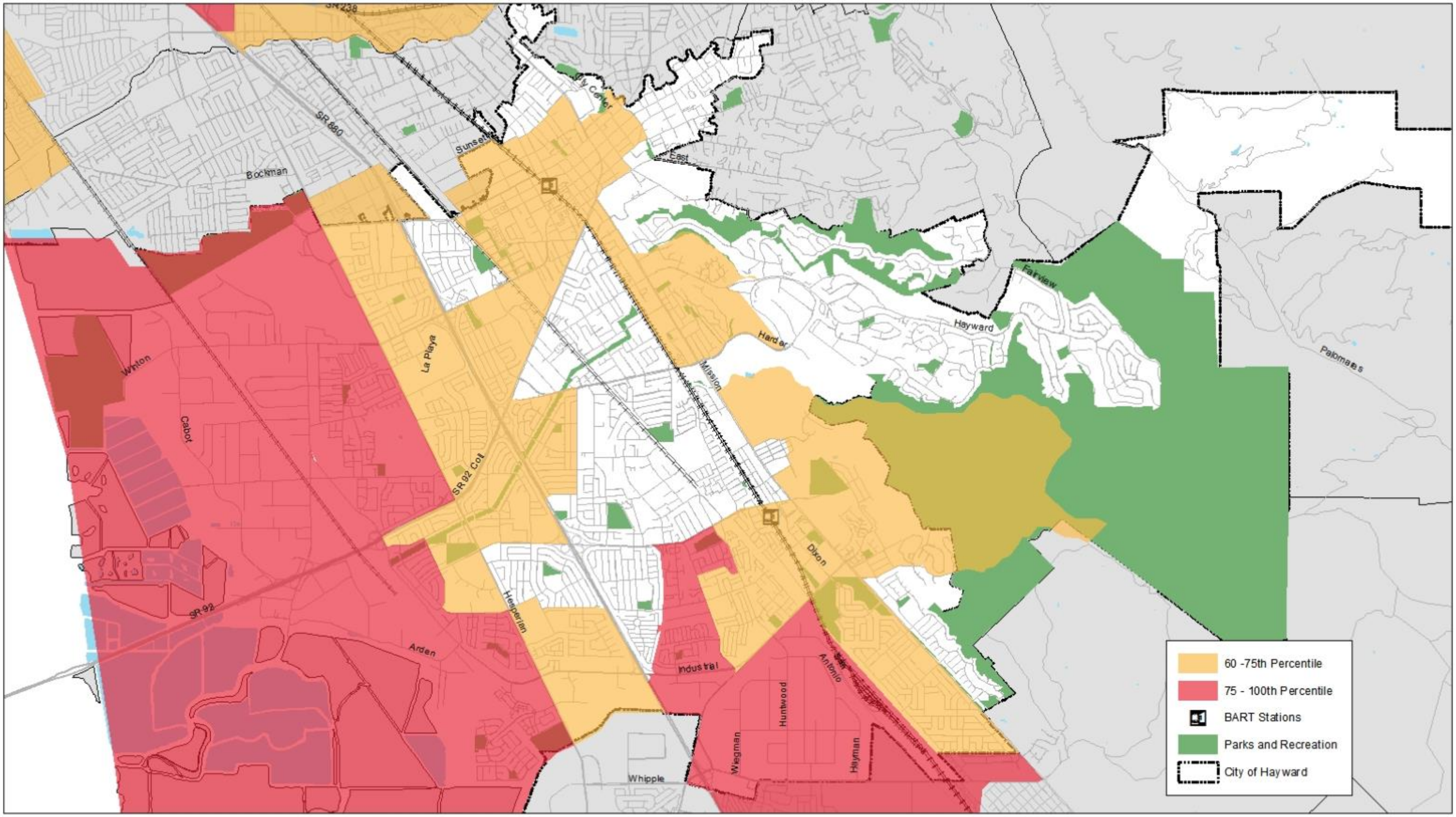
Table 1 CalEnviroScreen Disadvantaged Communities Indicators

Pollution Burden	Population Characteristics
EXPOSURE • Ozone concentrations in air • Diesel particulate matter emissions • Traffic density	SENSITIVE POPULATIONS • Asthma emergency department visits • Cardiovascular disease (emergency department visits for heart attacks)
ENVIRONMENTAL EFFECTS • Toxic cleanup sites • Solid waste sites and facilities	SOCIO-ECONOMIC FACTORS • Educational attainment • Poverty • Unemployment

The CalEnviroScreen tool produces an overall score for each census tract and compares the results as percentiles across all of California. Communities within the top 25th percentile statewide are considered disadvantages communities under the California Department of Transportation (Caltrans) Active Transportation Program grant guidelines. Communities within the top 25th percentile statewide are considered disadvantaged communities under the California Department of Transportation (Caltrans) Active Transportation Program grant guidelines.

Areas falling within the top 25th percentile (i.e., 75th-100th percentile) within Hayward are located in the western and southern industrial portions of the city and include the Mount Eden and Tennyson-Alquire neighborhoods. Many neighborhoods adjacent to industrial areas and major transportation corridors – including Longwood-Winton Grove, Southgate, Glen Eden, Santa Clara, Burbank, Mission-Foothill, Mission-Garin, and Fairway Park – fall within the 60th to 75th percentiles for disadvantaged communities. While these areas may not meet Caltrans' definition of disadvantaged communities, they may have greater need for transportation services that could be explored as part of the Plan.Figure 9 shows the locations of disadvantaged communities in Hayward with additional possible focus areas.

Figure 9: Disadvantaged Communities in Hayward



SOURCE: CALIFORNIA OFFICE OF ENVIRONMENTAL HEALTH HAZARD ASSESSMENT CALENVIROSCREEN 3.0 TOOL (JANUARY 2017).

DEMOGRAPHICS SUMMARY

To better plan for future walking and bicycle infrastructure and programs, the Plan should acknowledge who is currently being served by existing infrastructure and who could be better served with new infrastructure Table 2 summarizes the key demographic trends from this section are largely based on available commute data.

Table 2 Summary of Demographics Findings

Who is Walking More	Who is Biking More
• Low-income workers • High School and College Students • Young families and professionals • People slightly above the poverty line • People with one or two vehicles available at home • Women • Hispanic/Latino residents	• Low-income and high-income workers • High School and College Students • Young families and professionals • People below the poverty line • People with no vehicles available • Men • Hispanic/Latino residents • People aged 65 and older
Who is Walking Less	**Who is Bicycling Less**
• High-income workers • Middle-aged families and established professionals • People with three or more vehicles available at home • Seniors • Men	• Moderate-income workers • Workers age 45 to 55 years old • People with only one vehicle available at home • Women • Black or African American Residents

Source: Toole Design Group, 2018.

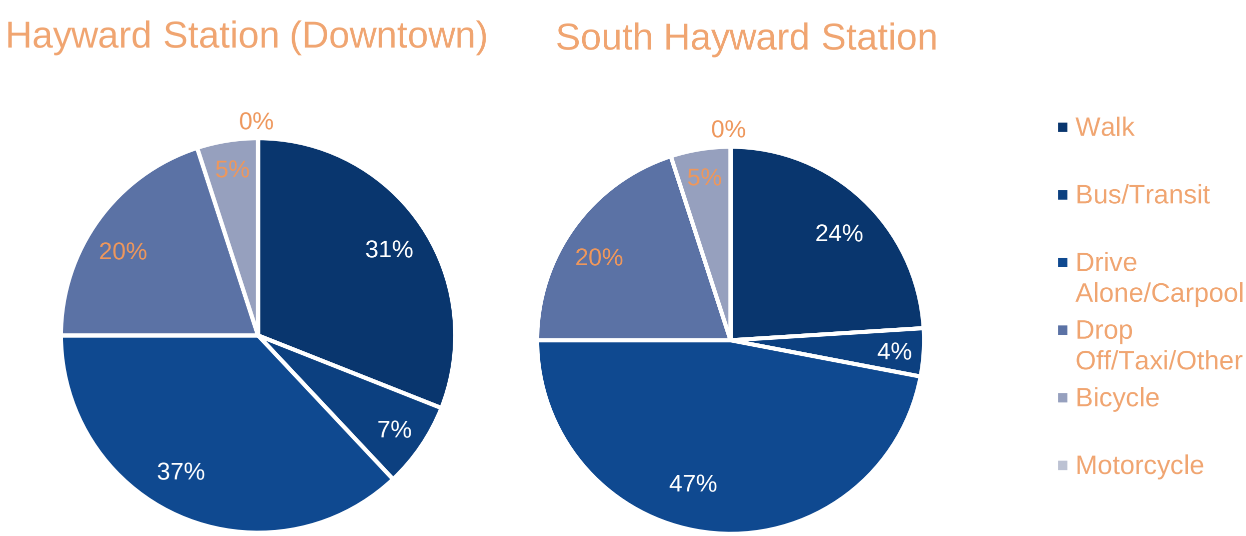
TRANSIT ACCESS

The two largest transit providers in Hayward are Bay Area Rapid Transit (BART) rail service and Alameda-Contra Costa Transit (AC Transit) bus service. Additionally, Cal State East Bay operates a shuttle service that connects with the Hayward and Castro Valley stations and is provided for free or a reduced cost for students and faculty. Figure 10 shows all AC Transit bus stops in Hayward and identifies the top 20 in terms of daily boardings/alightings. The highest ridership stops typically fall along major arterials within Hayward (e.g., Hesperian Boulevard, Tennyson Road, and Mission Boulevard) at large retail sites, employment centers, transportation hubs, or schools (e.g., Southland Mall, Chabot College, AC Transit Division 6 Facility, Hayward and South Hayward BART stations, and Downtown Hayward). Most of these stops are not well-connected to Hayward's existing network of bike lanes and signed bicycle routes.

Located in Hayward's downtown, the Hayward BART Station serves about 5,600 daily riders. The South Hayward BART Station serves almost 3,500 daily riders and is located in a primarily residential setting between the Tennyson-Alquire and Mission-Garin neighborhoods in the southeastern portion of the city. Figure 10 shows BART Station access mode for each station. Almost one-third of riders using the downtown Hayward BART Station and a quarter of riders using the South Hayward Station walk to access BART. While a larger proportion of transit riders walk to BART in Hayward, only five percent of transit riders at each bike to BART. Low bicycle access mode to BART Stations may be attributed to relatively disconnected or high-stress existing networks of bicycle facilities serving each station area and a low number of secure bicycle parking spaces at the stations. The Hayward BART Station has 106 total bike parking spaces, of which only 26 are secure spaces (electronic or keyed lockers). The South Hayward BART Station has 132 total bike parking spaces, of which 46 are secure spaces. Neither BART station has a dedicated Bicycle Station like those at 19th St Station in Downtown Oakland or Ashby Station in Berkeley.

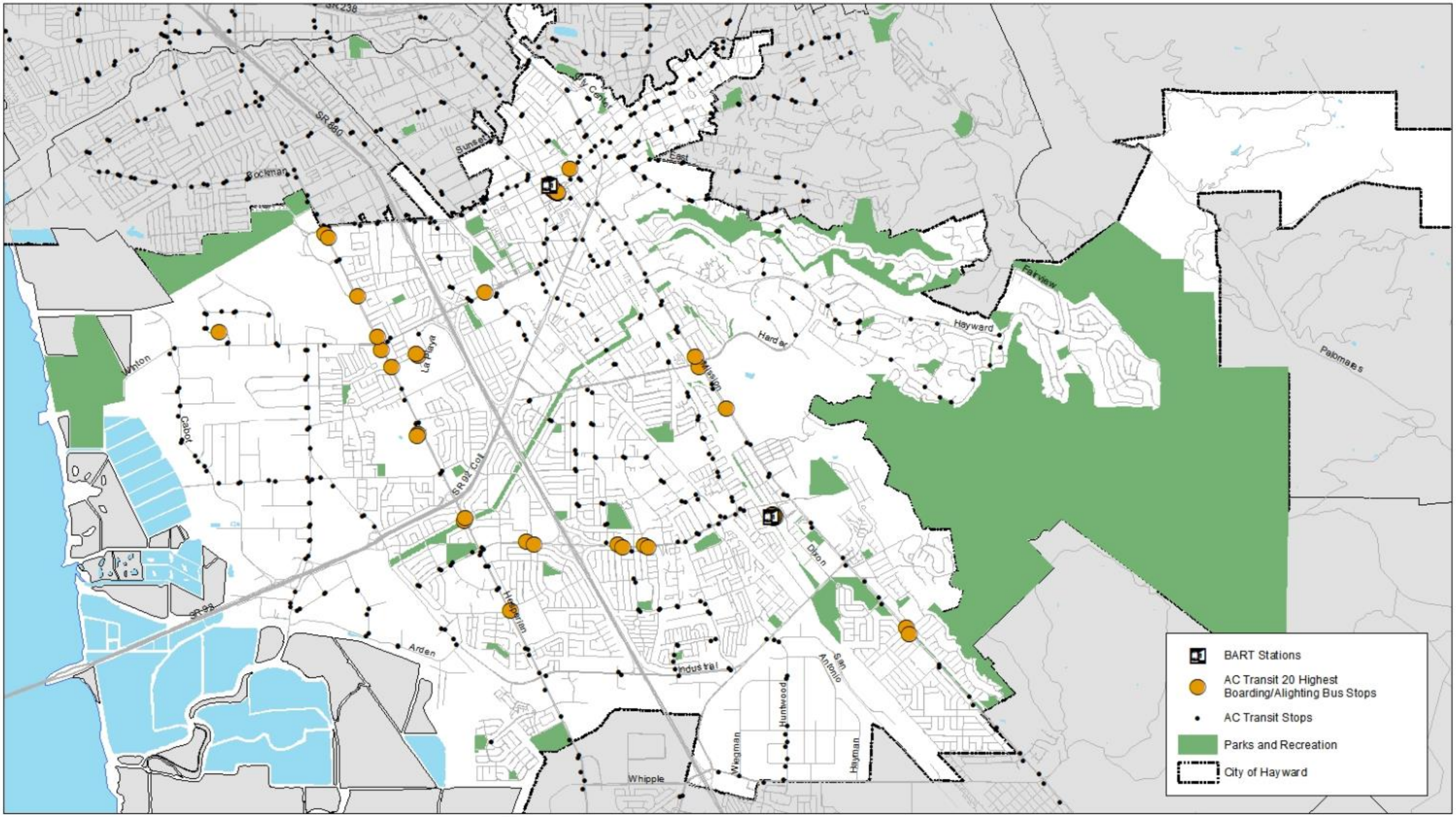
With almost 10% of residents using public transportation to access jobs, there is an opportunity to encourage more people to walk or bike to transit through reducing barriers to station or stop access. This can be accomplished by focusing on convenient, safe first-mile/last-mile connections to these stations and secure end-of-trip facilities.

Figure 10: BART Station Access Mode



SOURCE: BART STATION PROFILE STUDY, 2015.

Figure 11: AC Transit Bus Stops in Hayward – Top 20 Boardings/Alightings (2017-18)



SOURCE: AC TRANSIT WINTER 2017-2018 RIDERSHIP DATA (DECEMBER 2017 – MARCH 2018).

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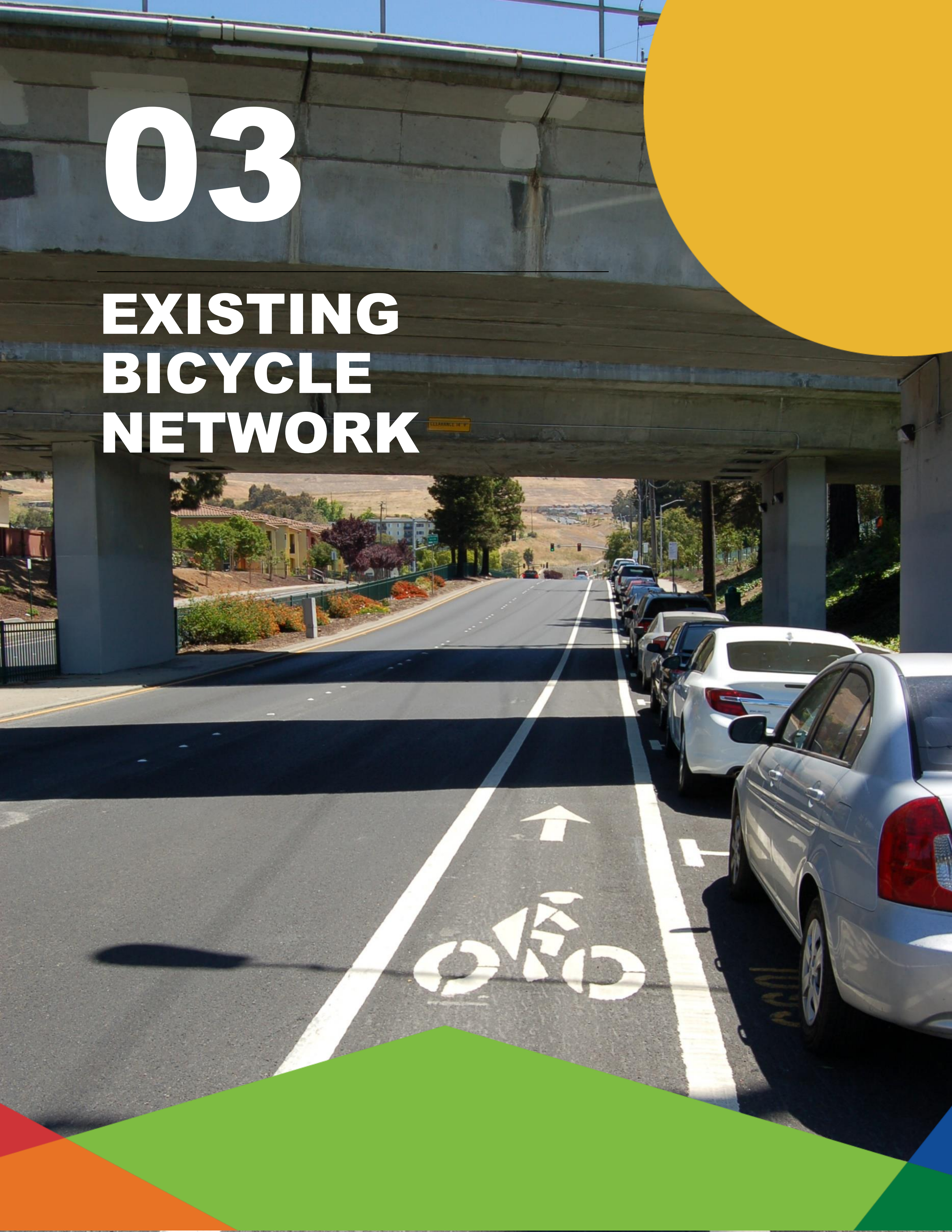


03

EXISTING BICYCLE NETWORK

EXISTING BICYCLE NETWORK

EXISTING BICYCLE NETWORK

Hayward's existing bikeway system consists of a network of bicycle paths, bicycle lanes, and bicycle routes, as shown in Figure 16.

There are four types of bikeways as defined by Chapter 1000 of the Caltrans Highway Design Manual (2017):

- Bicycle Paths (Class I)
- Bicycle Lanes (Class II)
- Bicycle Routes (Class III)
- Separated Bikeways (Class IV)

Of these types, the first three have been implemented in Hayward while the fourth type, separated bikeways, has not yet been implemented.

BICYCLE PATH (CLASS I)

Bicycle paths provide a completely separate facility designed for the exclusive use of bicycles and pedestrians with minimal vehicle crossflows. Generally, bicycle paths serve corridors not served by streets or are parallel to roadways where right of way is available. Bicycle paths provide both recreational and high-speed commute routes for bicyclists with minimal conflicts with other road users. This class of bikeway exists on the southern section of Mission Boulevard in the southeastern portion of Hayward.

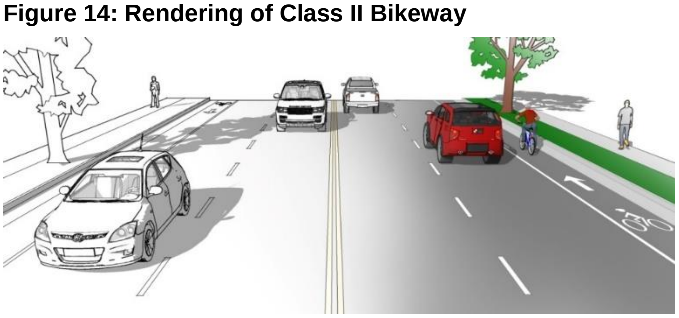
Figure 13: Rendering of Class I Bikeway

Source: Kittelson 2018.

BICYCLE LANE (CLASS II)

Bicycle lanes are on-street bikeways that provide a designated right of way for the exclusive or semi-exclusive use of bicycles.

Figure 14: Rendering of Class II Bikeway



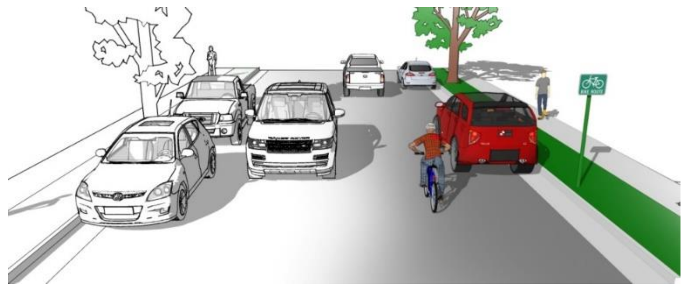
Source: Kittelson 2018.

Through travel by motor vehicles or pedestrians is prohibited, but vehicle parking and crossflows by pedestrians and motorists are permitted. This class of bikeway exists along Harder Road up to Mission Boulevard.

BICYCLE ROUTE (CLASS III)

Bicycle routes provide a right of way designated by signs or permanent markings and shared with pedestrians and motorists. Roadways designated as Class III bicycle routes should have sufficient width to accommodate motorists, bicyclists, and pedestrians. Shared-lane markings ("sharrows") can be used to provide an additional alert to drivers of the shared roadway environments with bicyclists. This class of bikeway exists on Clawiter Road.

Figure 12: Rendering of Class III Bikeway

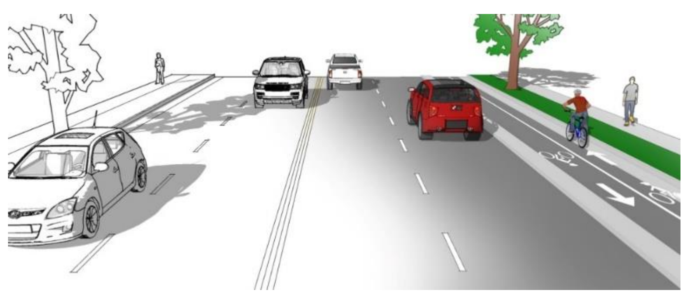


Source: Kittelson 2018.

SEPARATED BIKEWAY (CLASS IV)

Separated bikeways provide a physical separation from vehicular traffic. This separation may include grade separation, flexible posts, planters or other inflexible physical barriers, or on-street parking. These bikeways provide some bicyclists a greater sense of comfort and security, especially in the context of high speed roadways. Separated facilities can provide one-way or two-way travel and may be located on either side of a one-way roadway. This class of bikeway has not yet been implemented in Hayward.

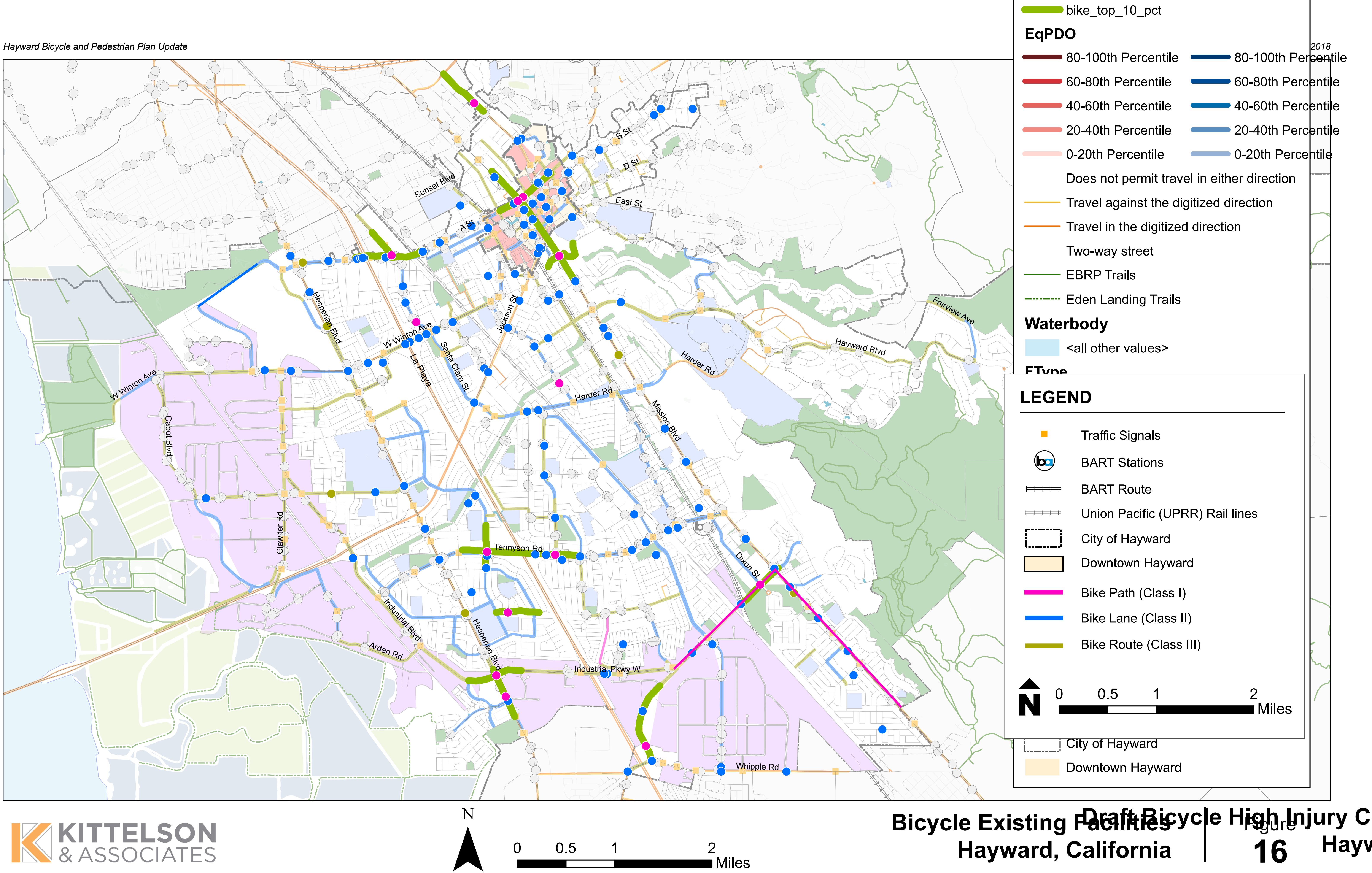
Figure 15: Rendering of Class IV Bikeway



Source: Kittelson 2018.

DESIGN GUIDANCE

As part of this plan, guidance will be developed to ensure safety and low levels of difficulty for navigation within Hayward.



KITTELSON & ASSOCIATES

Bicycle Existing Facilities
Hayward, California

Figure
16

Draft Bicycle High Injury C
Hayw

Source : 2012 – 2016 Statewide Integrated Traffic Reporting System Data , 2016 Caltrans Data

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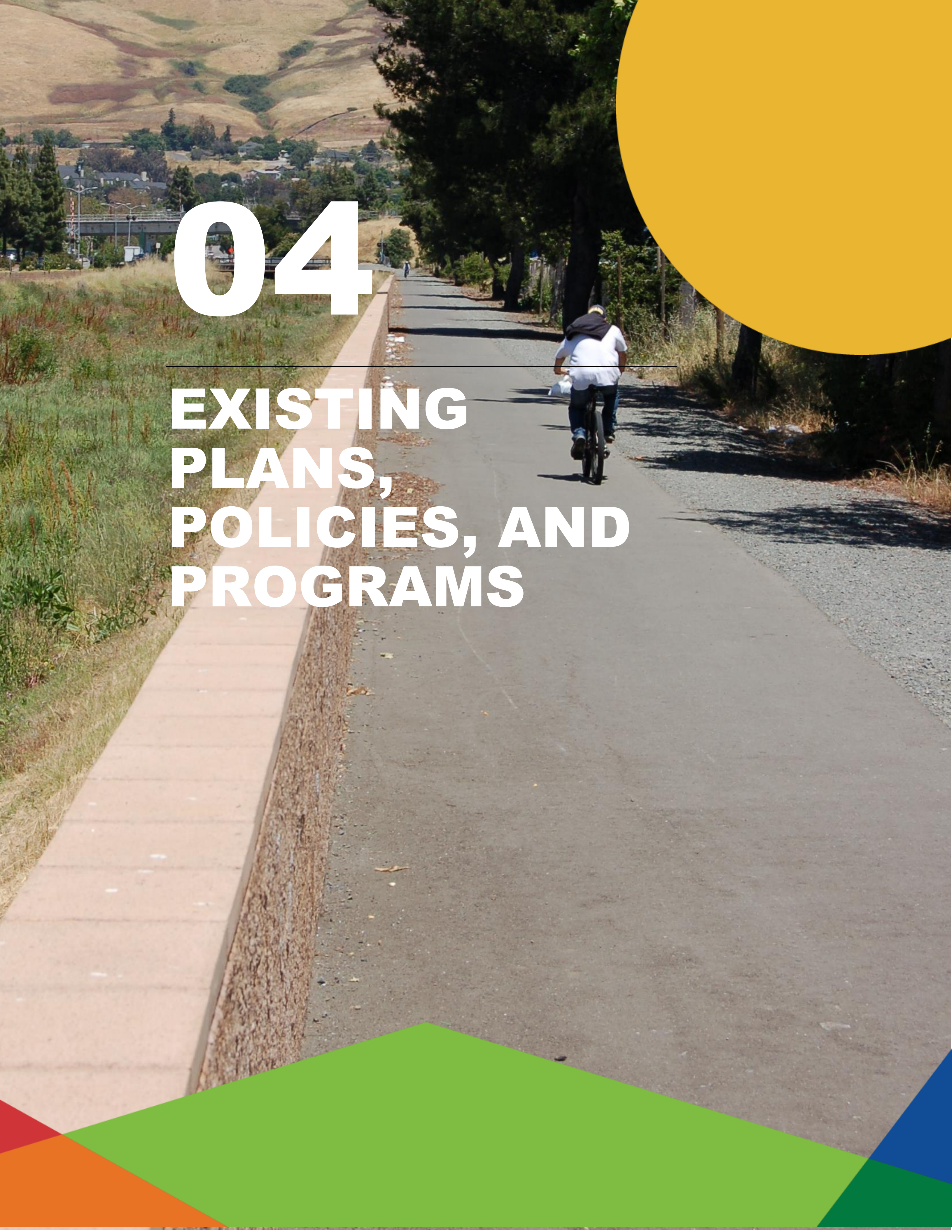


04

EXISTING PLANS, POLICIES, AND PROGRAMS

EXISTING PLANS, POLICIES, AND PROGRAMS

This section provides an overview of existing plans and documents is relevant to the creation of the Bicycle & Pedestrian Master Plan. Guidance provided from the documents listed in Table 3 **will** be reviewed for inclusion in the updated Plan along with additional national best practice programs and policies. Key bicycle and pedestrian programs and policies described in these documents are highlighted in this section. Citywide plans and policies are presented first, followed by area-specific plans and policies.

Table 3 Existing Plans & Policy Summary

PLAN	BICYCLE POLICIES	PEDESTRIAN POLICIES	FACILITY/ NETWORK MAPS	DESIGN GUIDELINES	STREET-SPECIFIC DESIGN CONCEPTS	PROGRAM REC
HAYWARD 2040 GENERAL PLAN	✓	✓	✓			✓
2007 HAYWARD BICYCLE MASTER PLAN	✓		✓			✓
HAYWARD COMPLETE STREETS RESOLUTION	✓	✓				
HAYWARD DESIGN GUIDELINES	✓	✓		✓		
MISSION BOULEVARD CORRIDOR SPECIFIC PLAN	✓	✓		✓	✓	
ROUTE 238 CORRIDOR IMPROVEMENT PROJECT	✓	✓		✓	✓	
SOUTH HAYWARD BART DEVELOPMENT, DESIGN, AND ACCESS PLAN	✓	✓	✓	✓	✓	
DOWNTOWN SPECIFIC PLAN	✓	✓	✓		✓	✓
NEIGHBORHOOD PLANS (16)	✓	✓	✓			✓

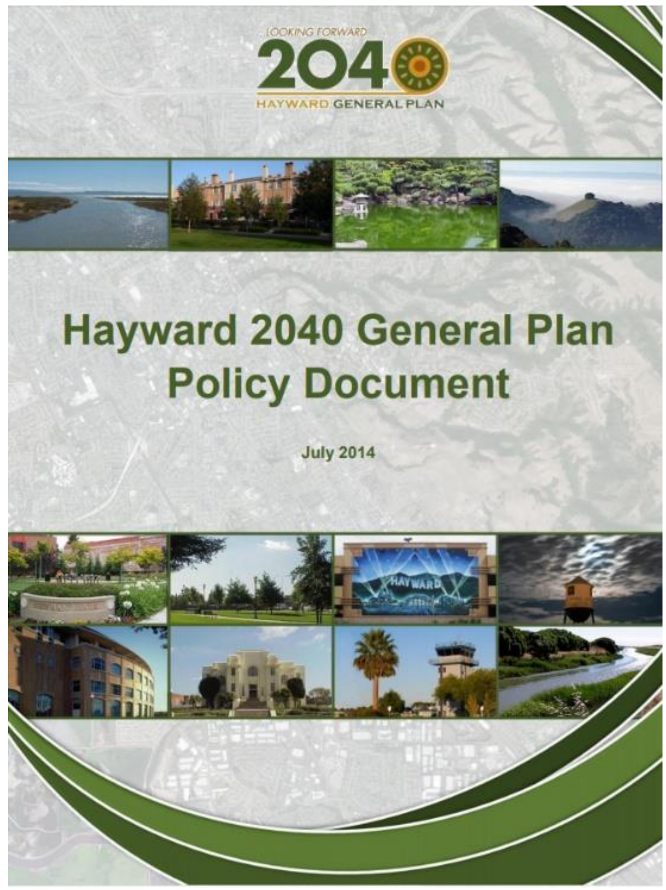
CITYWIDE PLANS & POLICIES

HAYWARD 2040 GENERAL PLAN (2014)

The Hayward 2040 General Plan[1] provides a blueprint for the City's land use, growth and development, safety, and open space conservation in the coming decades. It is organized into ten policy elements, including a Mobility, Land Use & Community Character, Community Health & Quality of Life Elements. Based on public feedback early in the development of the General Plan, it has eight guiding principles, one of which is transportation-related. Guiding Principle #7 states, "Hayward residents, workers, and students should have access to an interconnected network of safe, affordable, dependable, and convenient transportation options."

The Mobility Element of the General Plan includes 12 policy goals. Those most relevant to the Bicycle & Pedestrian Master Plan update include:

- Goal M-1: Provide a comprehensive, integrated, and connected network of transportation facilities and services for all modes of travel.
    - Sub-goals include providing a safe and efficient transportation system, promoting multimodal choices and connections to activity centers, flexible level of service standards for new developments that encourage active transportation and transit ridership, encouraging the development of bicycling and walking facilities and transit amenities, eliminating gaps in walking and bicycling networks, and educating the community on alternative transportation modes.
- Goal M-2: Connect Hayward to regional and adjacent communities' transportation networks and reduce the impacts of regional through traffic in Hayward.
    - Sub-goals include regional coordination of transportation planning and developing multimodal and multi-jurisdictional transportation corridors.
- Goal M-3: Provide complete streets that balance the diverse needs of users of the public right-of-way.
    - Sub-goals include providing safe and comfortable travel for all street users, considering the needs of road users not in automobiles, balancing the needs of all travel modes when planning transportation projects, making complete streets practices a routine part of everyday transportation planning tasks, incorporating complete streets infrastructure into all projects and processes, and developing safe and convenient bikeways and pedestrian crossings that reduce conflicts between different roadway users.
- Goal M-5: Provide a universally accessible, safe, convenient, and integrated pedestrian system that promotes walking.
    - Sub-goals include considering pedestrian needs in long-range planning and street design, creating and maintaining a continuous system of pedestrian facilities throughout the city that facilitates convenient and safe pedestrian travel between neighborhoods and activity centers, prioritizing pedestrian access to key transit stops, requiring sidewalk designs to accommodate disabled street users and streetscape amenities, and improving pedestrian safety at intersections and midblock locations with well-maintained pedestrian crossings.



- Goal M-6: Create and maintain a safe, comprehensive, and integrated bicycle system and support facilities throughout the city that encourage bicycling that is accessible to all.
    - Sub-goals include encouraging bicycle use in all neighborhoods and especially those where short trips are common, providing bikeway facilities that are appropriate given a street's traffic volumes and speeds, encouraging linked bicycle-transit trips, supporting infrastructure and programs that encourage children to bicycle safely to school, and providing bicycle wayfinding that directs bicyclists to activity centers via low-stress bicycle routes.

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[1] Hayward 2040 General Plan - https://www.hayward-ca.gov/sites/default/files/documents/General_Plan_FINAL.pdf

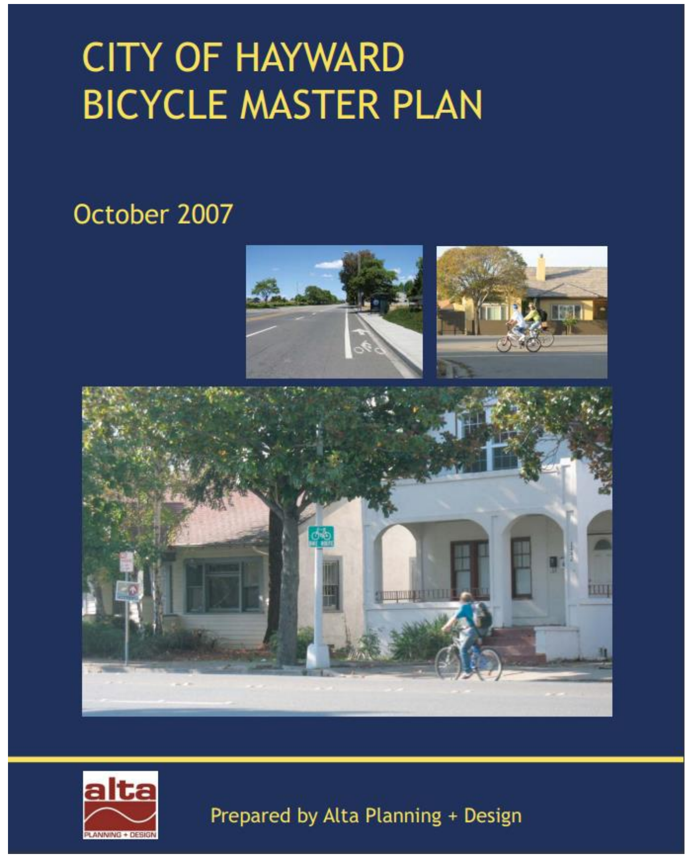
- Goal M-8: Encourage transportation demand management strategies and programs to reduce vehicular travel, traffic congestion, and parking demand.
    - Sub-goals include encouraging employers to provide bicycle facilities at worksites, helping employers develop commuter benefits programs for those who walk and bike to work, and assisting businesses in the development and implementation of bikeshare programs.

The Mobility Element also includes a map of existing and planned bikeway facilities (i.e., bicycle paths, bicycle lanes, and bicycle routes) in Hayward.

HAYWARD BICYCLE MASTER PLAN (2007)

The 2007 Hayward Bicycle Master Plan[2] is an update of the 1997 Bicycle Master Plan. It provides long-term vision and direction for bicycle transportation and recreation in Hayward. According to the 2007 Plan, its purpose is to expand Hayward's bikeway network and close gaps in the existing network, integrate the city bicycle network into the regional network, develop an implementation strategy (i.e., provide cost estimates and potential funding sources) for proposed bicycle facilities, maximize funding sources, and enhance the quality of life in the city. As stated in the 2007 Plan, the goal of new bicycle facilities is to provide the opportunity for safe, convenient, and pleasant bicycle travel throughout all areas of Hayward. An additional goal is to encourage the use of the bicycle as a pleasant means of travel and recreation embodying physical, environmental, and social benefits.

The 2007 Plan inventories existing bicycle paths, bicycle lanes, and bicycle routes in the city (pre-2007), and it provides a list of proposed bikeways, bicycle support facilities, and projects. The 2007 Plan recommends bicycle facilities proposed in the 1997 Plan that were not installed as of 2007, bicycle projects in the vicinity of the Route 238 Corridor Improvement Project, bicycle projects related to the South Hayward BART Concept Design Plan, and new bikeway projects not mentioned in previous plans or projects. A majority of suggested projects are either bicycle routes or bicycle lanes, with several bicycle paths included and no separated or buffered bicycle lanes mentioned. The 2007 Plan closes with cost estimates for proposed bicycle facilities as well as potential funding sources.



The 2007 Plan focused primarily on infrastructure improvements with few recommendations for enforcement and educational opportunities. However, the 2007 Plan did make recommendations to incorporate Caltrans bikeway signage and wayfinding along designated routes.

HAYWARD COMPLETE STREETS RESOLUTION (2013)

Hayward adopted a Complete Streets Policy in 2013[3], with the vision of creating and maintaining a safe and efficient transportation system that promotes the health and mobility of citizens and visitors, supporting better access to businesses and neighborhoods, and fostering new opportunities.The resolution details complete streets commitments, safe travel

[2] 2007 Bicycle Master Plan - https://www.hayward-ca.gov/sites/default/files/Hayward%20Bicycle%20Master%20Plan%202007.pdf

[3] 2013 Complete Streets Resolution - https://www.alamedactc.org/files/managed/Document/17343/Hayward_CompleteStreetsPolicy_Final.pdf Additionally: https://www.hayward-ca.gov/your-government/city-council/complete-streets-strategic-initiative

requirements, effects on policies and studies, and performance standards and evaluation.

Complete streets commitments include:

- Complete streets serving all users and modes (i.e., pedestrians, bicyclists, persons with disabilities, motorists, movers of commercial goods, users and operators of public transportation, emergency responders, seniors, children, and families)
- Complete streets infrastructure that enables safe, convenient, and comfortable travel (i.e., sidewalks, shared-use paths, bicycle lanes, bicycle routes, paved shoulders, street trees and landscaping, planting strips, curb ramps, crosswalks, refuge islands, pedestrian signals, street furniture, bicycle parking, public transportation stops and facilities, transit signal priority, traffic calming, and lane reassignments)
- Context sensitivity to ensure a strong sense of place is created and maintained

Safe travel requirements include:

- Complete streets routinely addressed by all departments in everyday operations and maintenance work (e.g., pavement resurfacing, utility access, signal operations, and landscaping maintenance)
- Complete streets incorporated in all new street construction and retrofit projects
- Consultation of pedestrian, bicycle, transit, and other multimodal plans during the maintenance, planning, and design of projects affecting the transportation system
- Leadership approval for project exemptions from this resolution
- Complete streets prioritized to create connected networks of facilities accommodating all roadway users

Requirements for policies and studies include:

- Assessment of potential obstacles to implementing complete streets in Hayward, and revising plans, zoning codes, laws, regulations, programs, and design manuals as necessary
- Incorporation of complete streets considerations into future planning and design studies, health impact assessments, and environmental reviews

Performance standards and evaluation requirements include:

- Standards with measurable outcomes to assess safety, comfort, use, and functionality for each category of user, particularly in pedestrian and bicycle networks
- Evaluations of how well streets and the transportation network as a whole serve each category of user, including new infrastructure installed, pedestrian and bicycle mode shares and transit demand, and changes in the severity and frequency of collisions
- Reporting findings annually to track how well the city is implementing complete streets

The City also has a Complete Streets and Complete Communities Strategic Initiative that created a Two-Year Action Plan to begin implementing the citywide complete streets vision by focusing on the Tennyson corridor as a pilot project.

CITY OF HAYWARD DESIGN GUIDELINES (1993)

The City of Hayward has adopted standards that provide general considerations for the design of bicycle and pedestrian facilities.The Guidelines[4] include recommendations for topics like accommodating wider sidewalks in high traffic areas and encouraging bicycle connections to transit facilities. However, this document does not include best practice design guidance for newer bicycle and street design treatments like separated bicycle lanes, which have become more common since the document was adopted in 1993. These guidelines will be updated as part of this effort.

NEIGHBORHOOD AND SPECIFIC PLANS & POLICIES

MISSION BOULEVARD CORRIDOR SPECIFIC PLAN (2014)

The Mission Boulevard Corridor Specific Plan[5] guides the redevelopment of Mission Boulevard into a vibrant commercial corridor with safe, desirable, and pedestrian-friendly neighborhoods. Key objectives of the Specific Plan include:

- Revitalize an economic spine that provides services to the eastern portion of the city while addressing the current deterioration of the existing uses, including distressed auto-related uses
- Establish a vision for transit-oriented development that incorporates economic and environmental sustainability; offers housing options and civic functions
- Strengthen the city's economy
- Create a vibrant pedestrian-oriented environment
- Foster a safe public realm
- Improve circulation and streetscapes
- Support environmentally sustainable forms of development, while enhancing Hayward's existing character and quality of life

The Specific Plan ties into many of the strategies listed in the Land Use Element of the 2040 General Plan, and it relies heavily on form-based code to regulate redevelopment of the corridor. It also includes pedestrian and bicycle components of the General Plan's Mobility Element, including improved and safer circulation facilities for pedestrians and safe, convenient, and pleasant bicycle facilities. The Specific Plan defers to the

[4] 1993 City Design Guidelines -https://www.hayward-ca.gov/sites/default/files/COH%20Design%20Guildlines.pdf.

[5] 2014 Neighborhood Specific Plans and Policies -https://www.hayward-ca.gov/sites/default/files/documents/140128-MissionBlvdSpecificPlanEntireDocument.pdf

2007 Bicycle Master Plan and 2040 General Plan for proposed bicycle facilities in the area. Planned pedestrian facilities in the planning area include sidewalks on all new thoroughfares along with crosswalks on Mission Boulevard at all key signalized intersections.

ROUTE 238 CORRIDOR IMPROVEMENT PROJECT (2015)

The Route 238 Corridor Improvement Project reconstructed curbs, gutters, drainage facilities, sidewalks, and median islands and reconstructed many pedestrian crossings to include accessible curb ramps. It also retrofitted streetlights and poles with brighter LED lighting, relocated overhead utility lines underground along Mission Boulevard, replaced median concrete with landscaping and street trees, added Downtown gateway enhancements, and upgraded traffic signals. The project was divided into three segments: Interstate 580 to A Street, the “Mini-Loop” through Downtown (comprised of Route 238, A Street, and Mission Boulevard), and Fletcher Lane to Industrial Parkway.

SOUTH HAYWARD BART DEVELOPMENT, DESIGN, AND ACCESS PLAN (2006)

BART adopted a Development, Design, and Access Plan[6] for the South Hayward station to help facilitate efforts to redevelop the station area into a more vibrant and pedestrian-friendly mixed-use neighborhood with increased BART ridership. The Plan works towards achieving BART’s transit-oriented development policy, station modal access hierarchy, and mode split goals. The Plan encompasses all land owned by BART, including surface parking lots, a bus intermodal facility, and undeveloped parcels.

Pedestrian and bicycle access improvements are detailed in the Plan, including enhanced walkways within half a mile of the station, a new pedestrian bridge over Tennyson Road, enhanced pedestrian connections under the BART tracks, a pedestrian and bicycle corridor along the Union Pacific Railroad tracks, bicycle lanes on roads in the station vicinity, bicycle stairway channels at the station, and electronic bicycle lockers at the station.

DOWNTOWN SPECIFIC PLAN (ONGOING)

Hayward is currently developing Hayward’s Downtown Specific Plan[7]. The Plan’s vision statement reads, “Downtown Hayward is a regional destination, celebrated for its history culture, and diversity; providing shopping, entertainment, and housing options for residents and visitors of all ages and backgrounds; that is accessible by bicycle, foot, car, and public transit.” Community priorities identified early in Plan development include:

- Establish Downtown as a regional destination with a robust and diverse mix of shopping, entertainment, and employment opportunities
- Promote health and sustainability by integrating natural features into new development, protecting environmental resources, and creating a network of open spaces that allows for active lifestyles
- Prioritize improvements to the circulation system that serves the needs of Downtown Hayward visitors, residents, and employees
- Improve the perception of living, shopping, working, and doing business in Downtown
- Retain and enhance the historic and cultural character of Downtown

NEIGHBORHOOD PLANS (1987-1997)

From 1987 through 1997, Hayward undertook the preparation of 16 Neighborhood Plans covering all residential and commercial areas of the city, with the exception of the Downtown area:

- Burbank Neighborhood Plan (1988)
- Fairway Park Neighborhood Plan (1996)
- Glen Eden Neighborhood Plan (1996)
- Harder Tennyson Neighborhood Plan (1989)
- Hayward Highlands Neighborhood Plan (1998)
- Jackson Triangle Neighborhood Plan (1991)
- Longwood-Winton Grove Neighborhood Plan (1994)
- Mission Foothills Neighborhood Plan (1992)
- Mission-Garin Neighborhood Plan (1987)
- Mt. Eden Neighborhood Plan (1990)
- North Hayward Neighborhood Plan (1994)
- Santa Clara Neighborhood Plan (1995)
- Southgate Neighborhood Plan (1996)
- Tennyson-Alquire Neighborhood Plan (1989)
- Upper B Street Neighborhood Plan (1992)
- Whitman-Mocine Neighborhood Plan (1997)

Land use plans and guidance were established in the respective plans and strategies for neighborhood improvements and revitalization were developed and are being implemented. Transportation components are included in each plan with general policy guidance around traffic signal locations and operations, the use traffic calming devices such as speed humps, and encouraged the City to pursue the implementation of bikeways with new developments

HAYWARD COMMITMENT FOR AN INCLUSIVE, EQUITABLE, AND COMPASSIONATE COMMUNITY (2017)

Hayward's Commitment for an Inclusive, Equitable, and Compassionate Community (CIECC)[8] Action Plan 2017,

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[6] 2006 South Hayward BART Development, Design, and Access Plan- https://www.bart.gov/sites/default/files/docs/SouthHaywardDevelopDesignAccessPlanpartA.pdf

[7] Hayward Downtown Specific Plan-https://www.hayward-ca.gov/content/downtown-specific-plan

[8] CIECC- https://www.hayward-ca.gov/sites/default/files/documents/CIECC%20Plan%20-%20Accepted%20by%20CC%20on%2011.28.18.pdf

represents Hayward’s supports to include diverse and inclusive communities.

EAST 14TH ST. / MISSION BLVD. AND FREMONT BLVD. MULTIMODAL CORRIDOR PROJECT (ONGOING)

The Alameda County Transportation Commission is currently studying The East 14th Street/Mission Boulevard and Fremont Boulevard corridor that passes through Hayward. The project will identify specific short-, medium-, and long-term mobility improvements for implementation. **T**he project corridor, which extends through San Leandro, unincorporated Alameda County (Ashland and Cherryland), Hayward, Union City, and Fremont, includes the following:

- E. 14th St. and Mission Blvd. from Davis St. in San Leandro to Interstate 680
- Decoto Rd. from Mission Blvd. to Fremont Blvd.
- Fremont Blvd. from Decoto Rd. to Washington Blvd. and potentially to the Warm Springs BART station (via either Fremont Blvd. or Osgood Rd.)

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05

BICYCLIST LEVEL OF TRAFFIC STRESS ANALYSIS

LEVEL OF TRAFFIC STRESS ANALYSIS

Level of Traffic Stress (LTS) is a rating given to a road segment or crossing indicating the traffic stress it imposes on bicyclists. It is based on the premise that a person's level of comfort on a bicycle increases as separation from vehicular traffic increases and as traffic volumes and speeds decrease.

When analyzing LTS, it is important to consider the range of people who ride bikes. On one end of the bicyclist spectrum are people who are comfortable riding with traffic. These are highly confident bicyclists (e.g., adult regular bicycle commuters), and they are willing to ride on roads with little or no bicycle infrastructure. The other end of the bicyclist spectrum includes those who are not comfortable riding with or adjacent to traffic (e.g., children, the elderly, and non-regular adult bicyclists). They prefer off-street bicycle facilities or bicycling on low-speed, low-volume streets and may not bike at all if bicycle facilities do not meet their comfort preferences.

The middle of the spectrum includes bicyclists who prefer separated facilities but are willing to ride with or adjacent to traffic if needed. Figure 17 provides additional information on different types of bicyclists and their preferences when bicycling.

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Figure 17: Comfort Typology of Bicyclists

Comfort Typology of Bicyclists

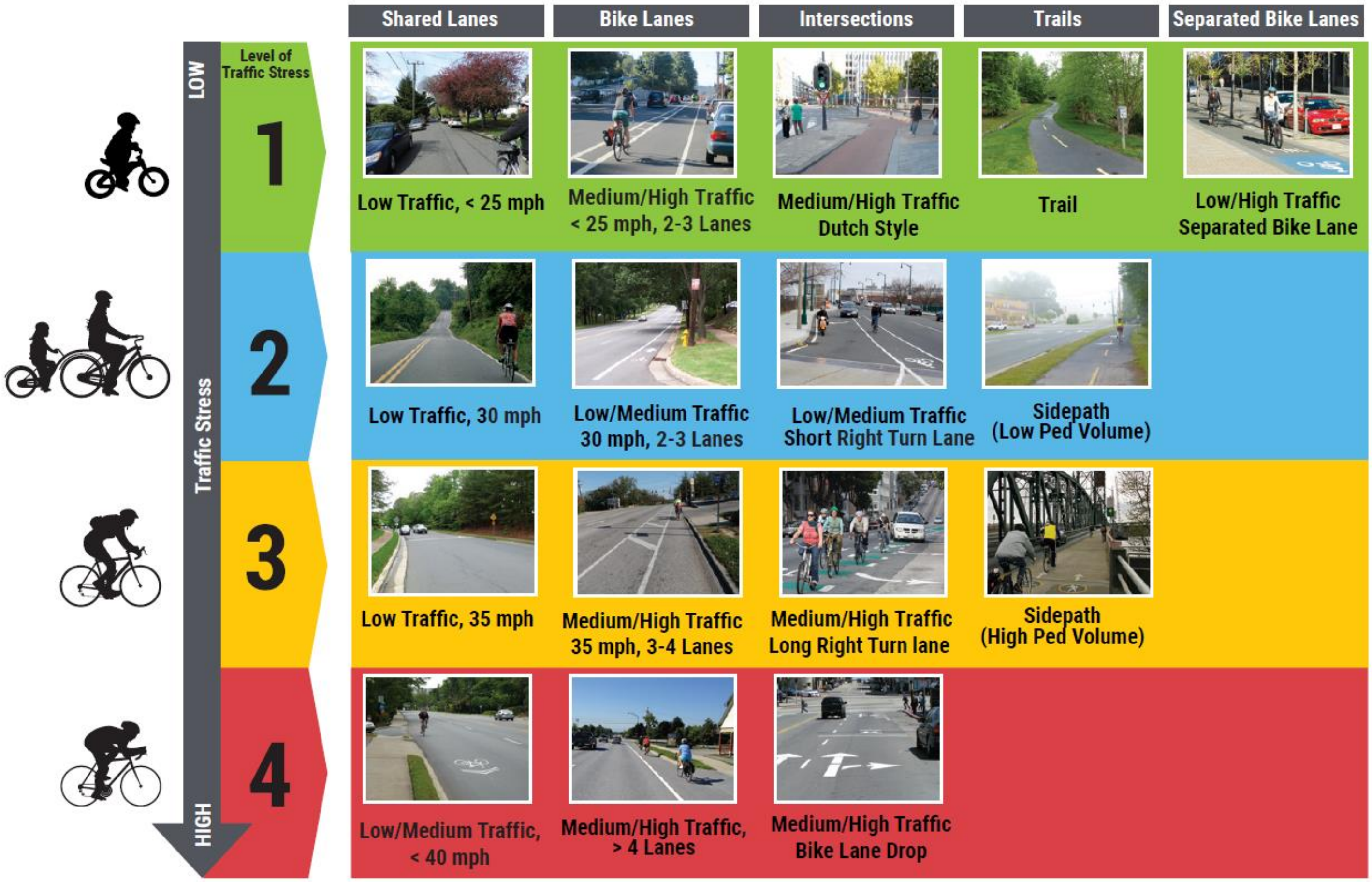
Design User Profile	Non-Bicycle	Interested but Concerned	Somewhat Confident	Highly Confident
Bicycling Preferences	Uncomfortable bicycling in any condition, have no interest in bicycling, or are physically unable to bicycle.	Often not comfortable with bike lanes, may bike on sidewalks even if bike lanes are provided; prefer off-street or separate bicycle facilities or quiet or traffic-calmed residential roads. May not bike at all if bicycle facilities do not meet needs for perceived comfort.	Generally prefer more separated facilities, but are comfortable riding in bicycle lanes or on paved shoulders if need be.	Comfortable riding with traffic, will use roads without bike lanes.
Percent of General Public	31-37%	51-56%	5-9%	4-7%

Source: Toole Design Group, 2018.

LTS analysis is useful for selecting appropriate bike facilities that are comfortable to bicyclists of all ages and abilities and can also be a factor when prioritizing projects. LTS ranges from 1 to 4. LTS 1 indicates little or no traffic stress, and facilities with this score are generally suitable for the entire population. LTS 2 means little traffic stress, and facilities with this score are suitable for most adults, even those with little confidence or experience interacting with motor vehicles. LTS 3 describes facilities with moderate traffic stress that are uncomfortable and unappealing for some bicyclists but suitable for more experienced bicyclists. LTS 4 includes facilities with high traffic stress that are only suitable for very skilled bicyclists.

Figure 18 details levels of traffic stress and bicycle facilities falling under each category. Communities that want to increase bicycle ridership should focus on implementing LTS 1 and LTS 2 bicycle facilities.

Figure 18: Levels of Traffic Stress and Facility Types



Note: "Ped" = pedestrian.
Source: Toole Design Group, 2018

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METHODOLOGY

This analysis uses the Mineta Transportation Institute's nationally-recognized research on low-stress bicycling and network connectivity developed in 2012. It includes the following inputs: traffic volumes, speeds, number of travel lanes, and the presence and quality of bicycle facilities. This analysis emphasizes a "weakest link" method whereby the characteristic of any portion of a street segment that scores the highest stress level on a scale of 1 to 4 determines the score for that entire segment. For instance, a low-volume two-lane street with a speed limit of 40 mph would rate poorly with an LTS 4 score because of the high-speed limit.

LEVEL OF TRAFFIC STRESS RESULTS

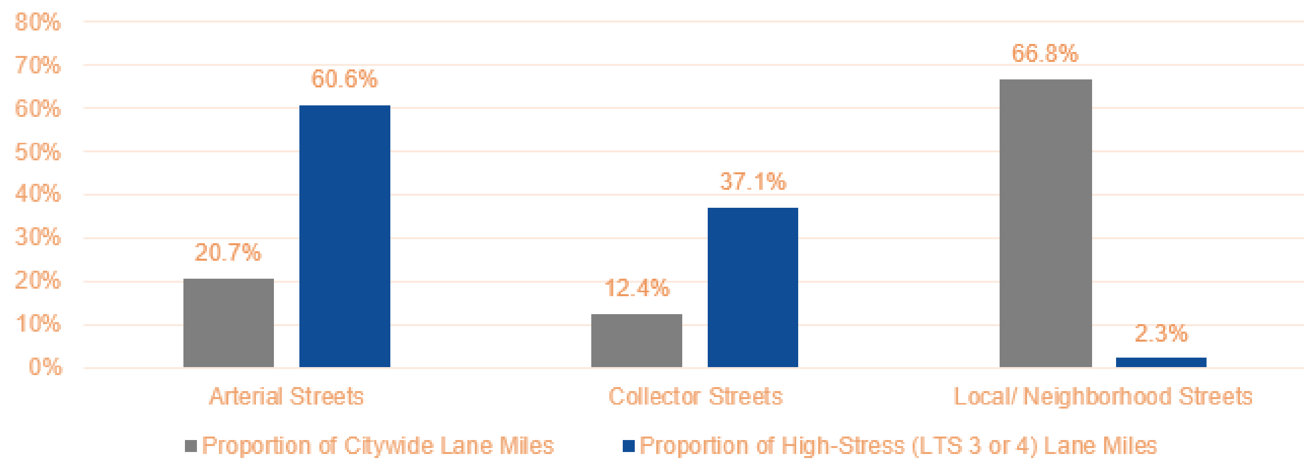
Table 4 presents the total lane miles of roadways in Hayward by functional classification (i.e., arterials, collectors, and local/neighborhood streets).

Table 4: L 5 LTS Analysis of Hayward Streets by Street Type

	Total Lane Miles	LTS 1 Lane Miles	LTS 2 Lane Miles	LTS 3 Lane Miles	LTS 4 Lane Miles
Arterial Streets	77 (21%)	3 (1%)	17 (41%)	10 (22%)	48 (92%)
Collector Streets	46 (12%)	0.3 (< 1%)	11 (26%)	31 (73%)	4 (7%)
Local/ Neighborhood Streets	247 (67%)	232 (99%)	13 (32%)	2 (4%)	0.3 (< 1%)
Total	**370 (100%)**	**235 (100%)**	**41 (100%)**	**43 (100%)**	**52 (100%)**

Arterials comprise the largest amount of high-stress (LTS 3 or 4) lane miles in Hayward (58 miles), followed by collectors (35 miles) and finally locals (2 miles). As shown in Figure 19, arterials make up 21% of total lane miles in Hayward but account for 61% of LTS 3 or 4 lane miles, collectors are 12% of total lane miles but account for 37% of high-stress lane miles, and local streets comprise 67% of citywide lane miles but only comprise 2 percent of high-stress lane miles.

Figure 19:Street Type by Proportion of Citywide Lane Miles and High-Stress (LTS 3 or 4) Lane Miles



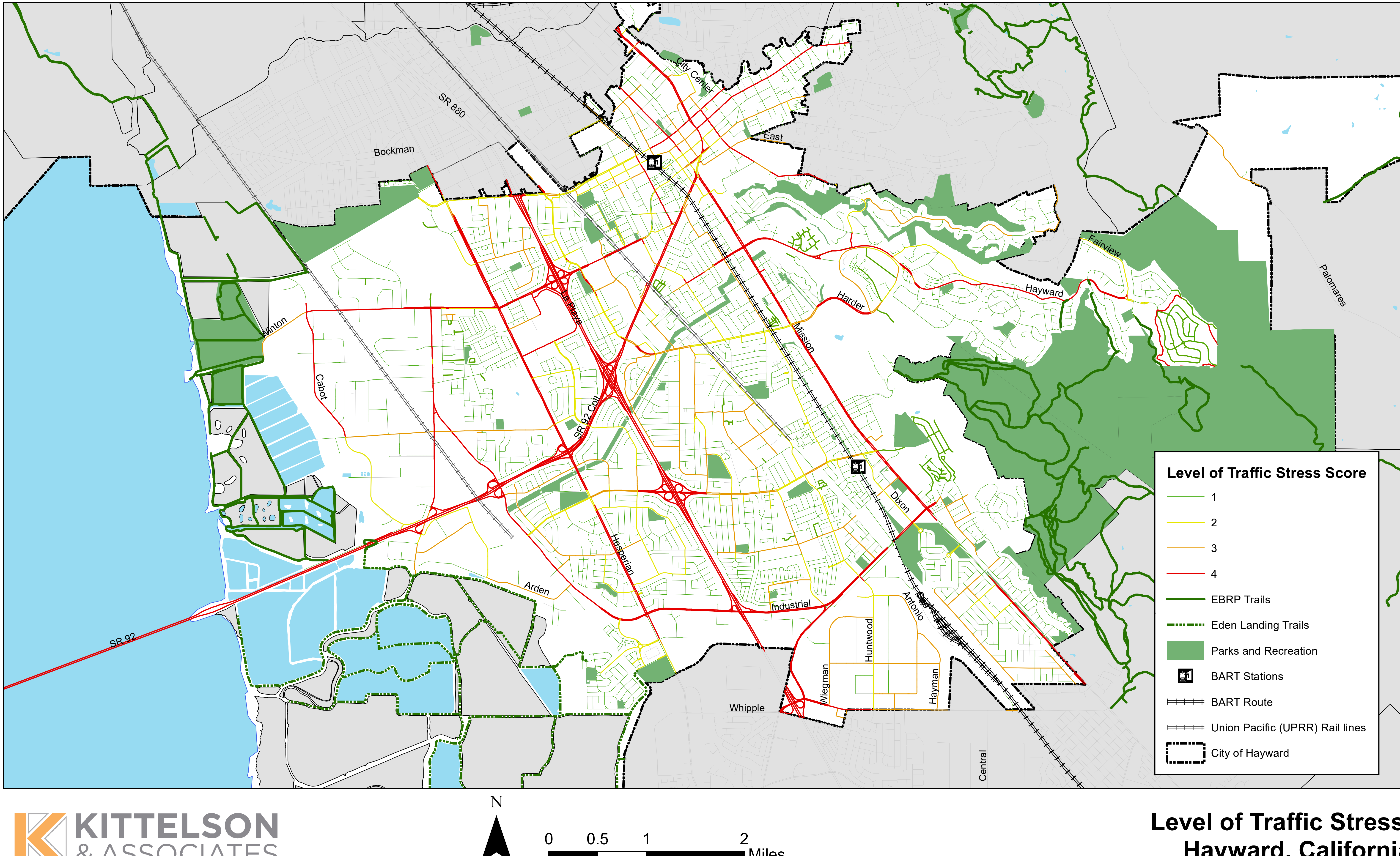
Arterials are typically higher stress roadways than collectors and local neighborhood streets due to their high vehicular speeds and volumes. The design of arterials promotes these traffic characteristics since they have multiple travel lanes in each direction, provide access to many destinations in Hayward, and have geometries (e.g., wide travel lanes, gradual curves) that promote vehicular throughput. Conversely, local streets are mainly low-stress corridors characterized by low-speed, low-volume vehicular traffic. This is because these roadways typically have only one travel lane serving each direction (or are unlaned), provide only local access, and are not designed for high-speed traffic. Collector streets have characteristics of both arterials and locals, providing local access, connecting to the arterial network, and carrying moderate volumes of vehicles. However, because of the "weakest link" method used when assigning LTS values, collectors skew towards higher stress facilities (LTS 3 or 4) because these facilities oftentimes have higher posted speed limits and/or multiple lanes in each direction.

Figure 20, Figure 21, and Figure 22 display the LTS results for all facilities within the city, locations of only low-stress facilities, and locations of only high-stress facilities, respectively.

Similar to many other large suburban and urban cities in California, the major arterial roadways in Hayward (e.g., Hesperian Boulevard and Mission Boulevard) present the most stressful conditions to the average bicyclist. This is due to a lack of bicycle facilities on these roadways or facilities with little separation from high-speed, high-volume traffic (e.g., shared lane markings and standard bicycle lanes). However, it is also important to note that Hayward's street network is predominantly comprised of low-stress local streets, which are a great resource to leverage when developing a citywide low-stress bicycling network.

A network of low-stress bikeways serving destinations throughout the city is critical to increasing the desirability and utility of bicycling in Hayward. The low-stress network can be a mix of off-street trails, well-defined bicycle routes on low-speed and low-volume neighborhood streets, and separated bicycle facilities (i.e., protected bicycle lanes) on higher speed and higher volume roadways. Key destinations that will be considered when prioritizing low-stress facilities for bicyclists of all ages and abilities include schools, retirement homes and senior centers, parks and community centers, major employment areas, transit hubs, and key retail areas.

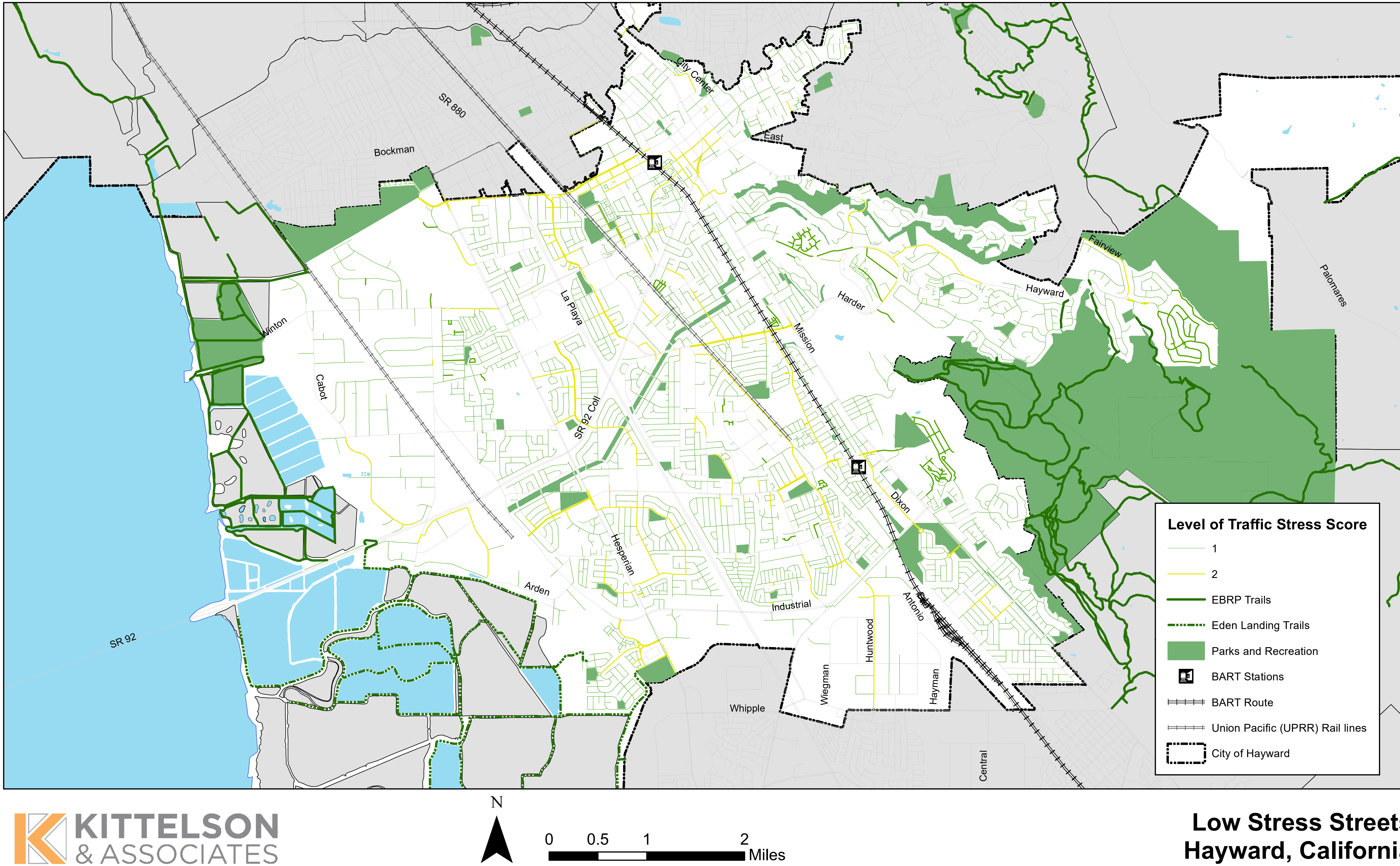
As noted previously, Hayward's arterials (and collectors, in some instances) currently create high-stress barriers to comfortably traversing the city and result in isolated low-stress networks within each neighborhood that do not serve all destinations. They limit comfortable bicycle connectivity between BART stations and employment and industrial centers in Hayward. While many home-to-school trips fall entirely within low-stress islands in neighborhoods, there are also instances where crossings of major arterials are necessary for students to go to school, especially those making longer trips (i.e., high schoolers and Chabot College students). Low-stress (LTS 1 or 2) segments of arterials do exist, but these instances are limited to occasional areas with lower traffic volumes or speeds and/or enhanced bicycle infrastructure.



KITTELSON & ASSOCIATES

Level of Traffic Stress Hayward, California

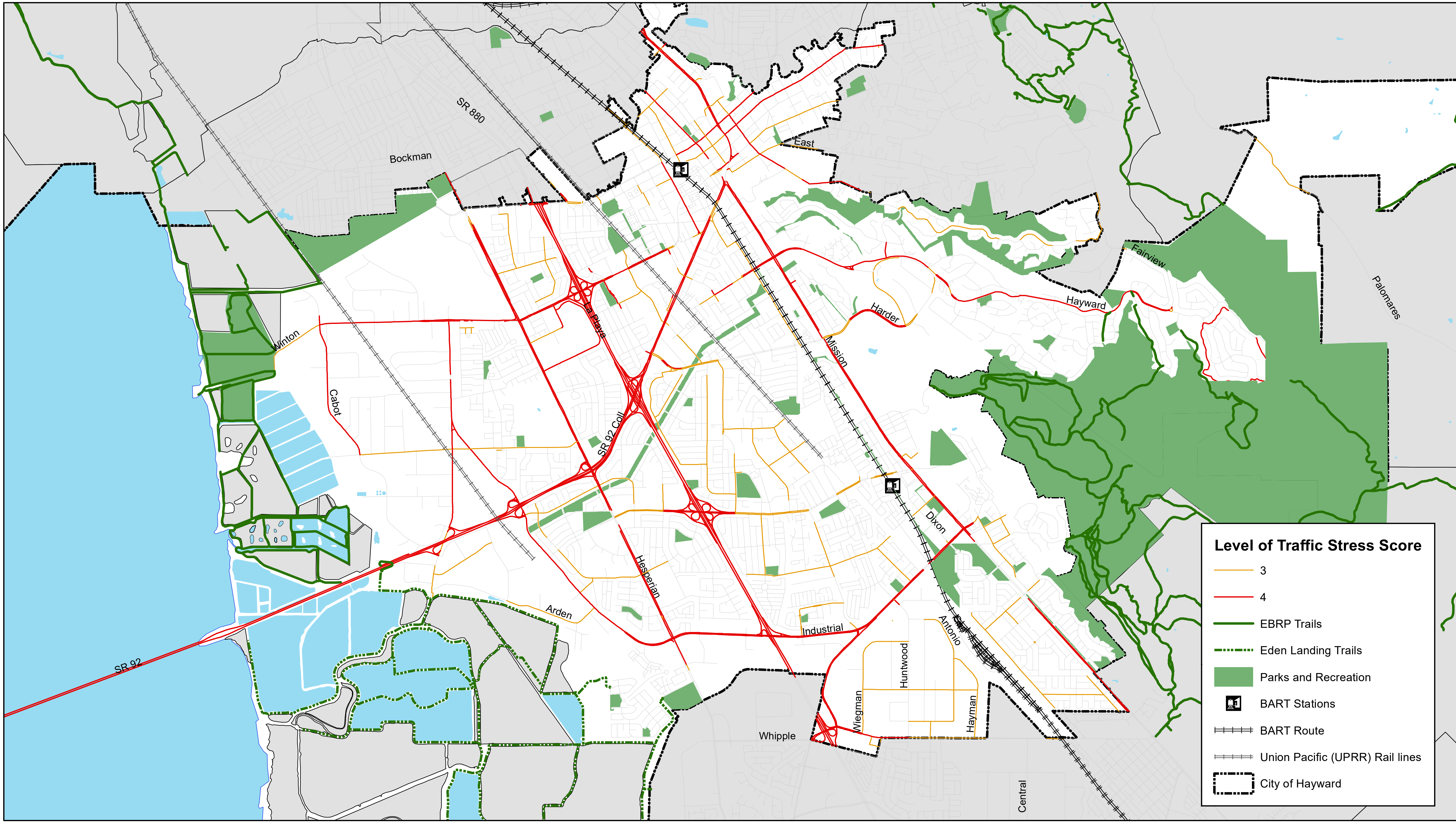
Source : 2012 – 2016 Statewide Integrated Traffic Reporting System Data , 2016 Caltrans Data



KITTELSON & ASSOCIATES

Low Stress Streets Hayward, California

Source : 2012 – 2016 Statewide Integrated Traffic Reporting System Data , 2016 Caltrans Data



KITTELSON & ASSOCIATES

N

0 0.5 1 2 Miles

High Stress Streets Hayward, California

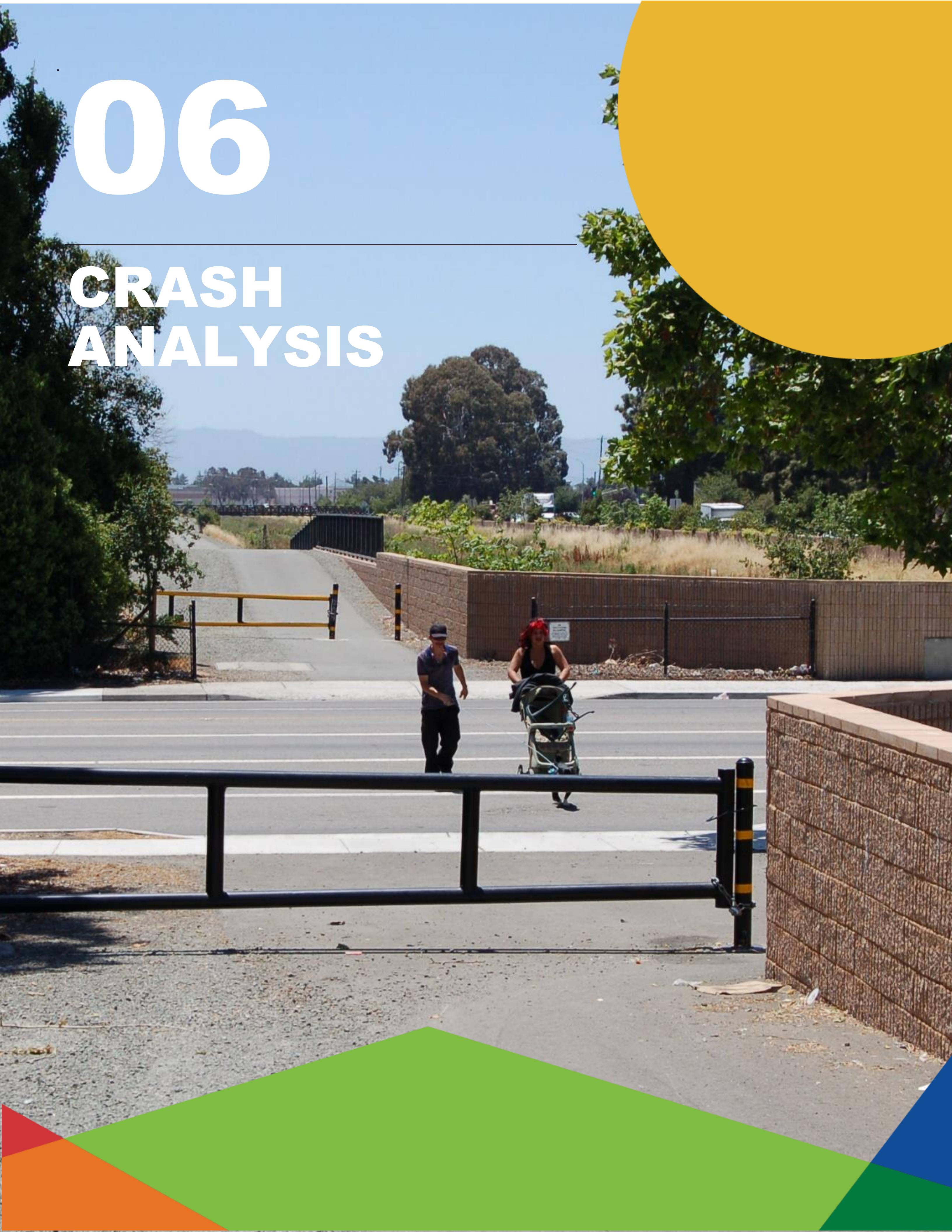
Source : 2012 – 2016 Statewide Integrated Traffic Reporting System Data , 2016 Caltrans Data

LTS FINDINGS

The LTS findings presented earlier are useful in determining appropriate low-stress bicycle facilities and where these facilities should be located in the city. Hayward’s extensive network of low-speed, low-volume local neighborhood streets already serves as a backbone for a low-stress bicycling network; however, these streets are currently isolated pockets throughout the city, separated by higher stress arterial and collector streets. Enhancements to some of these low-stress streets (e.g., bicycle wayfinding signage, shared lane markings to inform drivers that these streets serve as priority neighborhood bicycling routes), coupled with separated bicycle facilities on targeted segments of higher speed and higher volume collectors and arterials would result in a connected low-stress bicycle network serving key destinations in the city. For example, a separated bicycle lane on Hesperian Boulevard from Sleepy Hollow Avenue to Cathy Way would help to provide a low-stress north-south connection between Hayward’s Glen Eden and Mount Eden neighborhoods, each of which currently has a large network of low-stress local streets. This link would also serve as a low-stress connection over State Route 92, a major barrier to Hayward’s street network, and provide access to Chabot College and Southgate Park.

06

CRASH ANALYSIS



CRASH ANALYSIS

This section presents the results of an analysis of bicyclist and pedestrian crashes citywide. Included in the results are descriptive findings summarizing the nature of bicyclist and pedestrian crashes in Hayward, and identification of high injury corridors. Crash patterns and trends for bicyclist crashes and for pedestrian crashes are discussed in separate sections.

These findings will help staff to identify areas within Hayward where bicyclist and pedestrian safety could be improved, through policies that targets individual crash locations or through policies that seek to improve safety citywide.

DATA AND APPROACH

The data used for this analysis was retrieved from two sources: the Statewide Integrated Traffic Records System (SWITRS), and the University of California at Berkeley's Traffic Injury Mapping System (TIMS). The analysis period includes all crashes during the five most recently available complete years of data, 2012 through 2016. The data includes reported totals of 177 bicyclist crashes and 292 pedestrian crashes. Any crashes that occurred on freeways or freeway ramps were omitted from the data used for analysis, as these roadways are under the jurisdiction of the California Department of Transportation (Caltrans). Crashes that occurred at ramp terminal intersections and all other city roads were included in analysis.

It should be noted that because police reports form the basis of the crashes in both databases, the available data are likely underreporting the true number of crashes. Research conducted by the San Francisco Department of Public Health has found that police-reported data underreports the overall count of pedestrian- and bike-related crashes, including reporting an injury severity level that is inconsistent with subsequent assessments by medical staff. However, these data sources represent the best available source of crash data and are regularly used in industry practice.

ROADWAY DATA

To associate roadway characteristics with spatial crash patterns, Kittelson used roadway data provided by the City of Hayward, supplemented with data from OpenStreetMap data, that included the following characteristics:

- Functional class;
- One-way or two-way designation;
- Bicycle infrastructure presence; and,
- Posted speed.

CRASH PATTERNS AND TRENDS: BICYCLIST CRASHES

This section presents descriptive findings for citywide bicyclist crashes. In the five-year period from 2012 to 2016, total bicyclist crashes maintained a steady trend between 30 and 40 crashes per year, as presented in Table 5. Five of the 177 reported bicyclist crashes were single-party crashes, with the majority of crashes (165) involving two parties.

Table 5: Bicyclist Crashes Year over Year, Hayward, 2012-2016

Year	2012	2013	2014	2015	2016
Reported Crash Count	33	39	30	38	37

Source: SWITRS, Kittelson 2018

Direct comparison of crash counts among jurisdictions may be misleading due a number of factors including populations, biking activity, vehicle volumes. However, to frame relative safety performance, California's Office of Transportation Safety (OTS) maintains a ranking system to compare traffic safety statistics among similarly sized California cities. OTS uses data from SWITRS, Caltrans, California Department of Justice, and the Department of Finance to develop rankings. A number one ranking in a category indicates that a city is the worst performer in its peer city group. Table 6 presents Hayward's annual safety performance among bicyclist-related categories relative to the other 56 similarly-sized California cities. In terms of safety performance for bikers, Hayward compares favorably with similarly sized cities throughout California.

Table 6: Bicycle Crashes in Hayward Compared to Similarly Sized California Cities, 2012-2015. (1=Worst, 56/57=Best)

Year	2012	2013	2014	2015
Bicyclists	42/56	28/56	47/57	42/57
Bicyclists < age 15	47/56	38/56	44/57	55/57

Green text indicates highest-performing third peer group.
Note that there were 56 peer cities in 2012-3 and 57 in 2014-5.
Source: California Office of Traffic Safety

Further analysis included identifying trends among the following attributes:

- **Crash severity:** The reporting officer's assessment of the most severe injury incurred.
- **Primary collision factors**: A road user's violation or movement associated with the crash. These categories represent an aggregation of California Vehicle Code violations.
- **Time of day:** The hour of the day during which a crash occurred .

CRASH SEVERITY

Among the 177 bicyclist crashes, 17 crashes (9%) resulted in death or severe injury. Table 7 presents crashes by severity level.

Table 7: Severity of Bicyclist Crashes, Hayward 2012-2016

Crash Severity	Crash Count	Crash Share
Fatal	2	1%
Injury (Severe)	15	8%
Injury (Other)	147	83%
Property Damage Only	13	7%
Total	177	100%

Source: SWITRS, Kittelson 2018

The two fatal crashes involving bicyclists occurred at the following locations (see Figure 23):

- Hesperian Boulevard, approximately 200 feet north of Tripaldi Way
- Santa Clara Street at West A Street

PRIMARY COLLISION FACTORS OF BICYCLIST CRASHES

Figure 24 presents the cited primary factors most commonly cited in bicyclist crashes. The most commonly reported primary collision factors among bicyclist crashes were:

- Wrong side of the road riding;
- Traffic signals and signs[9]; and,
- Automobile right of way[10].

As illustrated in Figure 24, the most common primary collision factors among crashes resulting in a fatal or severe injury were the following::

- Traffic signals and signs (4 severe injury crashes);
- Wrong side of the road (1 fatal, 3 severe injury crashes); and,
- Unsafe lane change (1 fatal, 3 severe injury crashes).

Assigning fault in a crash is up to the reporting officer's discretion and understanding of events as he or she can learn from parties involved and witnesses. Regardless of the party at fault, there could be engineering treatments or education that could help address the issue.

For example, "wrong-way riding" by bicyclists often results in bicyclists being assigned as at fault for a collision. However, the person biking may be "wrong-way riding" on a sidewalk or in a shoulder to be able to reach a destination that would otherwise be infeasible to access due to missing crossings or connections in the street network for bicyclists. Generally, the prevalence of bicyclists being cited at fault can be a result of more than bicyclists needing to be educated on the rules of the road. It can reflect the need for better facilities for them to reach the desired destinations.

Motorists being cited at fault can be indicative of opportunities to make bicyclists more visible to vehicles and provide either more physical space between them or use things like signal phasing and timing to separate their movements that need to occur through the same space (e.g., intersection). As Figure 24 illustrates, the reporting officer cited the bicyclist with a violation in a majority of crashes.

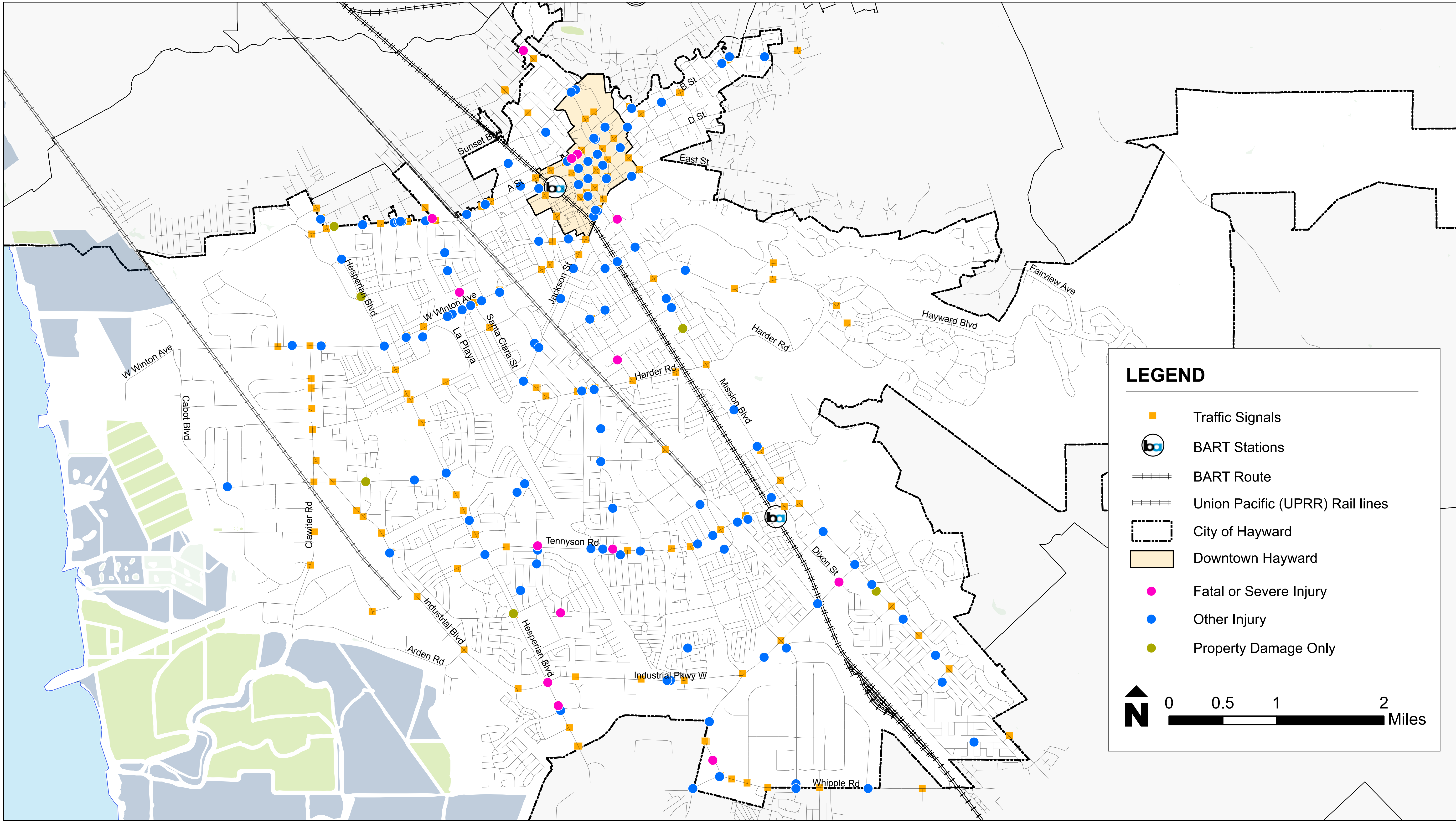
TIME OF DAY

Figure 25 shows bicyclist crashes by time of day. Bicyclist crashes generally occurred on weekdays between 6 a.m. and 11 p.m., with a small spike during the morning peak commute period (7-8 a.m.), and a larger spike during the afternoon and evening peak period, (3-8 p.m.). On weekends when recreational riding is likely more prevalent, with most crashes occurred between 1 and 8 p.m.

On weekdays, the spikes in crashes occurred during times of day with waning daylight during the winter in the mornings and evenings.

[9] *Traffic signals and signs* refers to a crash in which a road user failed to adhere to a regulatory sign (e.g., stop sign) or a traffic signal.

[10] *Automobile right of way* refers to a crash in which one road user failed to yield the right of way to another road user.



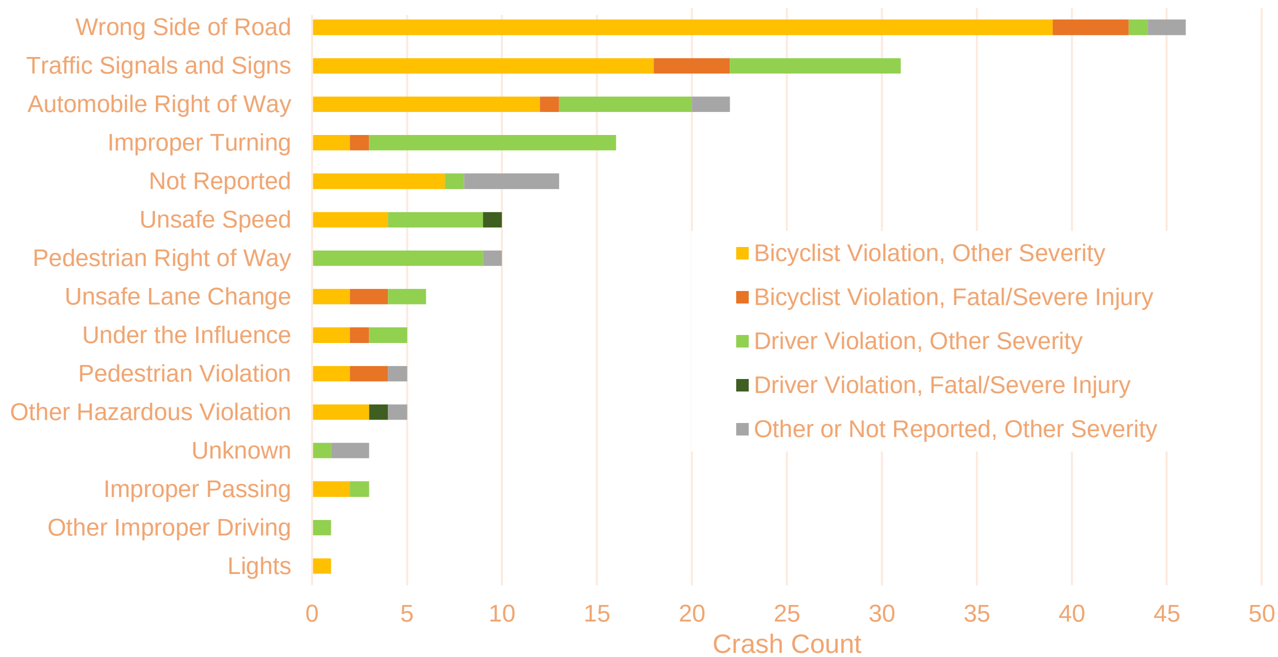
KITTELSON & ASSOCIATES

Bike Crashes
Hayward, California

Figure
23

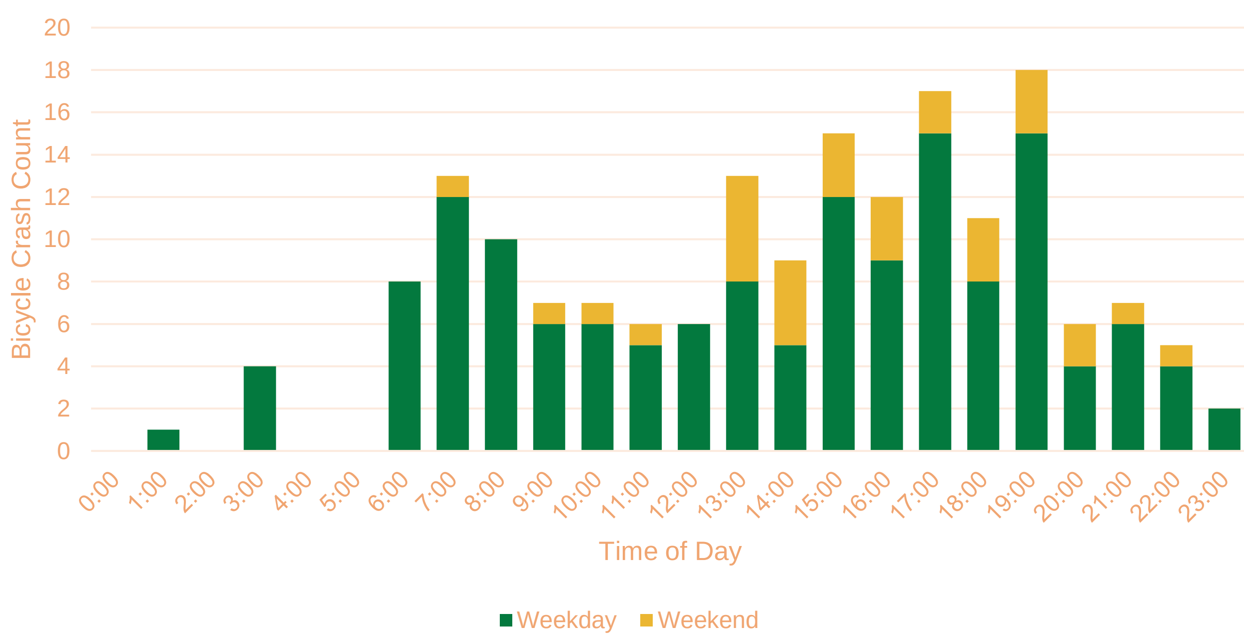
Source : 2012 – 2016 Statewide Integrated Traffic Reporting System Data , 2016 Caltrans Data and UC Berkeley TIMS

Figure 24: Primary Collision Factors in Bicyclist Crashes



Source: SWITRS, Kittelson 2018

Figure 25: Bicyclist Crashes by Time of Day, Day of Week



Source: SWITRS, Kittelson 2018

CRASH PATTERNS AND TRENDS: PEDESTRIAN CRASHES

This section presents descriptive findings among pedestrian crashes citywide. In the five-year period from 2012 to 2016, total pedestrian crashes maintained a steady trend (Table 8).

Table 8: Pedestrian Crashes Year over Year, Hayward, 2012-2016

2012	2013	2014	2015	2016
63	58	51	61	59

Source: SWITRS, Kittelson 2018

As discussed in the bicyclist crash section, direct comparison of crash counts among jurisdictions may be misleading due a number of factors. However, to frame relative safety performance, the California OTS rankings described earlier also include rankings among peer cities in pedestrian-related safety performance. A number 1 ranking in a category is the worst performer relative to peer cities. Table 9 presents annual safety performance among pedestrian-related categories as provided by OTS.

From this data, Hayward's relative safety performance when compared to similarly sized cities has improved from 2012 to 2015. However, pedestrian safety among elderly citizens (ages 65+) continues to be an area in need of focus, given Hayward's 12th-worst ranking among peer cities.

Table 9: Pedestrian Safety Performance in Hayward Compared to Similarly Sized California Cities, 2012-2015. (1=Worst, 56=Best)

Year	2012	2013	2014	2015
Pedestrians	8/56	13/56	23/57	28/57
Pedestrians < age 15	8/56	19/56	40/57	36/57
Pedestrians age 65+	8/56	17/56	27/57	12/57

Green text indicates highest-performing third of peer group.
Red text indicates lowest-performing third of peer group.
Note that there were 56 peer cities in 2012-3 and 57 in 2014-5.
Source: California Office of Traffic Safety, Kittelson 2018

Further analysis includes trends among the following attributes:

- Crash severity;
- Primary collision factors;
- Time of day; and,
- Pedestrian location and actions preceding crash.

CRASH SEVERITY

As illustrated in Table 9, between 2012 and 2016, there were 292 reported crashes involving pedestrians in Hayward in the five years of analyzed data, including 13 fatal crashes and 34 crashes resulting in a severe injury (a combined 16% of pedestrian crashes).

Table 10: Severity of Pedestrian Crashes, 2012-2016

Crash Severity	Crash Count	Crash Share
Fatal	13	4%
Injury (Severe)	34	12%
Injury (Other)	226	78%
PDO	19	7%
Total	292	100%

Source: SWITRS, Kittelson 2018

The 13 fatal pedestrian crashes occurred at the following locations (see Figure 26):

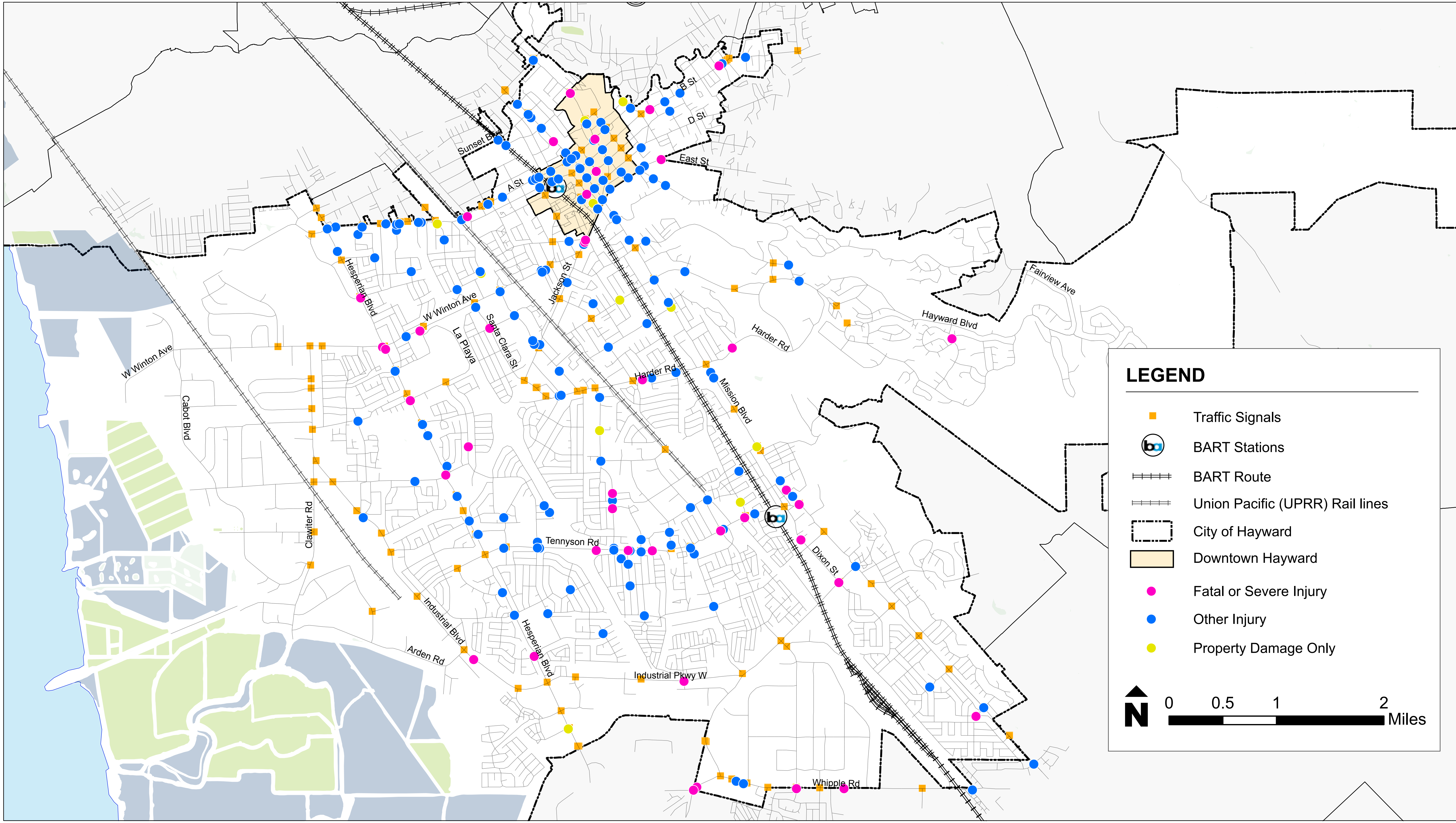
- Whipple Road, approximately 500 feet north of Liston Way;
- West Winton Avenue, approximately 1,000 feet west of Cabot Boulevard;
- Hesperian Boulevard, approximately 200 feet south of West Winton Way;
- Hesperian Boulevard at Tahoe Avenue;
- Industrial Boulevard, approximately 500 feet south of Baumberg Avenue;
- Harder Road, approximately 100 feet west of Franklin Avenue;
- Jackson Street at Silva Avenue;
- Dixon Street at Copperfield Avenue;
- Farm Hill Drive at La Mesa Drive;
- Mission Boulevard at Tennyson Road;
- Santa Clara Street at Elmurst Street;
- Foothill Boulevard at City Center Drive; and,
- West Industrial Parkway at Stratford Drive.

TIME-OF-DAY

As illustrated in Figure 28, crashes involving pedestrians occurred throughout the day, with spikes in crashes occuring during the morning and evening peak periods. The times of increased traffic volume are when many people are going to or leaving work or school.

LOCATION/MOVEMENTS PRECEDING CRASH

Figure 21 presents pedestrian crashes by location and severity. The most common location for pedestrian crashes was on a crosswalk at an intersection, accounting for 51% of crashes. At the same time, 25% of pedestrian crashes involved a pedestrian struck while crossing a street outside of a crosswalk. This trend indicates there may be locations in Hayward where pedestrians' desire lines do not match existing infrastructure, and better infrastructure provision would improve safety outcomes for pedestrians.



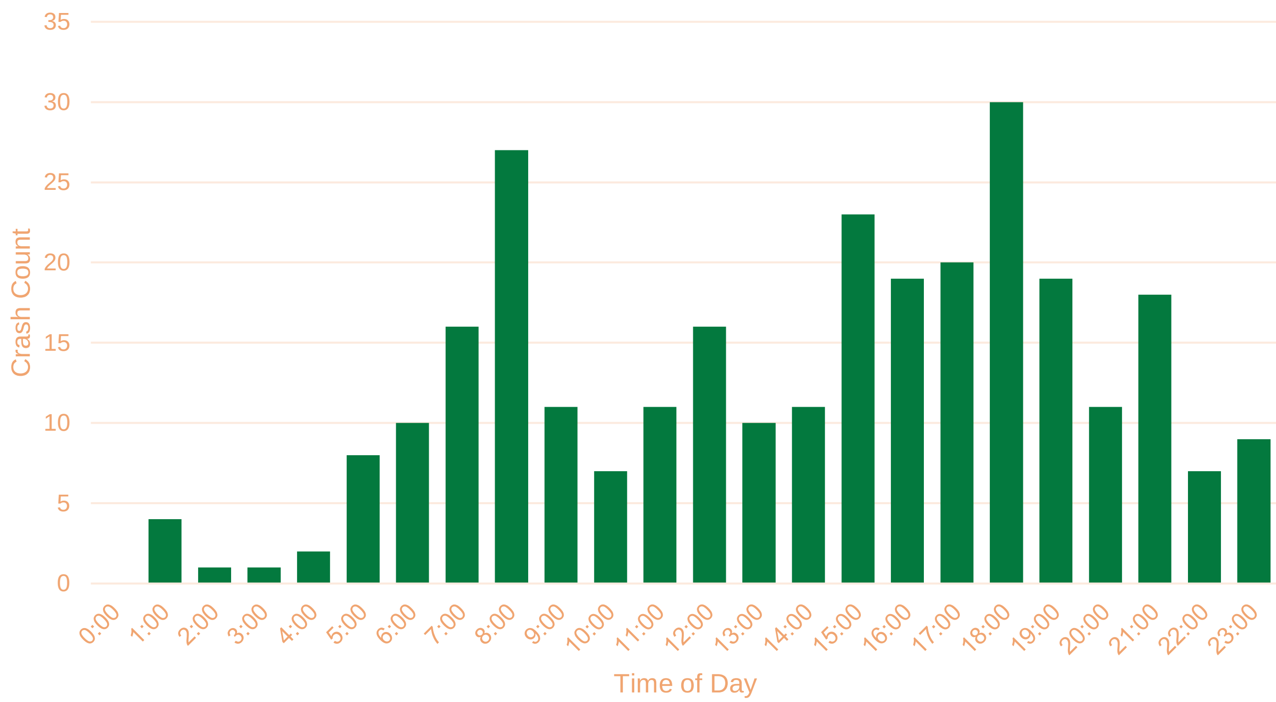
Pedestrian Crashes
Hayward, California

Figure
26

KITTELSON & ASSOCIATES

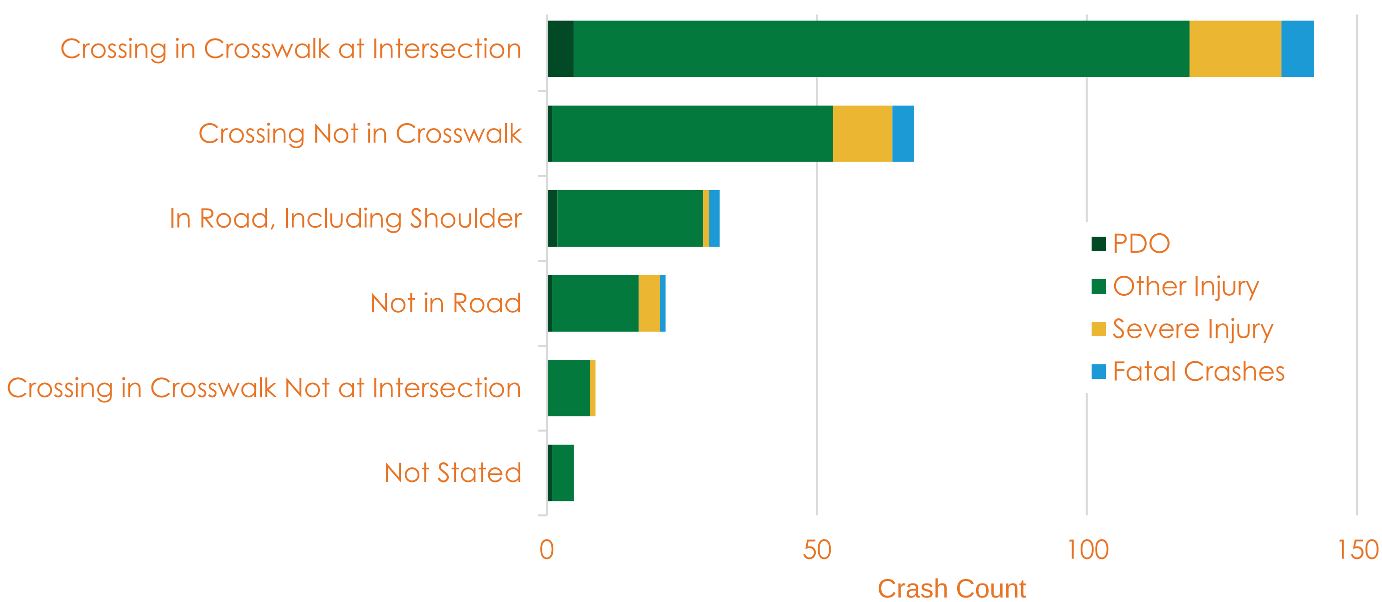
Source : 2012 – 2016 Statewide Integrated Traffic Reporting System Data , 2016 Caltrans Data and UC Berkeley TIMS

Figure 28: Pedestrian Crashes by Time of Day



Source: SWITRS, Kittelson 2018.

Figure 27: Pedestrian Action Preceding Crash, Hayward, 2012-2016



Source: SWITRS, Kittelson 2018.

HIGH INJURY CORRIDOR ANALYSIS

This section describes the results of a high injury corridor analysis conducted on both bicyclist and pedestrian crashes in the city of Hayward. The high injury corridor analysis identifies locations on the citywide road network with a histories of relatively high crash frequency, weighed by severity. The results from this analysis can be used to inform project prioritization that promotes safety for bicyclists and pedestrians.

DATA AND APPROACH

The injury and fatal crashes previously described were geocoded and mapped. Kittelson identified top crash history among intersections and roadway segments using the Equivalent Property Damage Only (EPDO) network screening performance measure from the Highway Safety Manual (HSM). The EPDO performance measure assigns weighting factors used for Caltrans' Highway Safety Improvement Program Benefit Calculator (see Table 11) to weigh crashes by severity relative to property damage only (PDO) crashes. The weights generally reflect an order of magnitude difference between the societal costs of fatal and severe injury collisions versus non-severe injury collisions.

Table 11: Crash Weights by Severity

Fatal	Severe Injury	Other Visible Injury	Complaint of Pain	Property Damage Only
169.49	169.49	10.72	6.09	1.00

Source: Caltrans, Highway Safety Improvement Program, 2018.

Kittelson coded reported crashes by severity and implemented a sliding window screening using a Python script in ArcGIS. This segmented the City street network into one-fourth (1/4) of a mile segments, incrementing the segments by one-tenth (1/10) of a mile. This methodology helps to identify portions of roadways with the greatest potential for safety improvements.

The weighted crashes along each screened roadway segment were summed and annualized by dividing the score by the number of years of crash data (5) to generate an annualized EPDO score.

RISK FACTOR IDENTIFICATION

Kittelson applied a risk-based analysis of the top 5-20% of locations identified screening. Risk is defined in this instance as common traffic or physical characteristics shared by the top corridors and intersections. Based on this commonality, the presence of a risk factor is indicative of a potentially higher risk for bicyclist or pedestrian crashes within Hayward. Risk factors can also be used to identify additional locations where crashes have not yet been reported to make proactive low-cost improvements to those locations to further reduce the potential for future crashes.

SCREENING RESULTS

Kittelson identified segments using the annualized EPDO for segments. The EPDO scores ranged from zero (no crashes occurring during the five-year time frame analyzed) to 71.6 among bicyclist crash segments and zero to 67.8 among pedestrian crash segments. Figure 29 shows the results of the EPDO scoring by selected percentiles for bicyclist high injury locations; Figure 30 shows the results for the pedestrain screening. Segments shown as not falling within one of the percentiles are locations with no associated crashes reported. Bicycle and pedestrian high injiury corridors are shown in Figure 31 and Figure 32 and presented in Table 12 and Table 13.

Table 12: Bicycle High Injury Corridors

Roadway	Extents	Maximum Annualized EPDO Along Roadway
West Tennyson Road	From east of Sleepy Hollow Avenue South to Tampa Avenue	71.6
A Street	From Montgomery Avenue to 2nd Street	70.2
Hesperian Boulevard	From just north of Industrial Parkway/Industrial Parkway West	69.0
Calaroga Avenue	From Ashbury Lane to Bolero Avenue/Miami Avenue	39.4
Mission Boulevard	From Simon Street to Sycamore Avenue	37.6
Industrial Parkway West	From Mission Boulevard to Pacific Street	37.3
West A Street	From just west of 880 Freeway to Meekland Avenue	35.1
Industrial Boulevard/Industrial Parkway West	From Marina Drive to Hall Road	35.1
Industrial Parkway Southwest	From Addison Way to Whipple Road/880 Freeway Intersection	35.1
Fletcher Lane	From dead-end west of Mission Boulevard to just west of Janssen Court	33.9

Source: Kittelson 2018.

Table 12 Continued

Roadway	Extents	Maximum Annualized EPDO Along Roadway
Foothill Boulevard	From Mattox Road/Castro Valley Boulevard to Grove Way	33.9
Florida Street	From Calaroga Avenue to just west of La Porte Avenue	33.9
Hathaway Avenue	From Lansing Way to just south of East/West A Street	33.9

Source: Kittelson 2018.

Table 13: Pedestrian High Injury Corridors

Roadway	Extent	Maximum Annualized EPDO Along Roaway
West Tennyson Road (Western Section)	From just east of 880 Freeway Interchange to Dickens Avenue	108.5
West Tennyson Road (Eastern Section)	From Manon Avenue to Leigid Court/railroad crossing	108.5
Jackson Street	From Park Street to Watkins Street, just west of Mission/Foothill Boulevards	108.1
Huntwood Avenue	From Harris Road/Leidig Court to Panjon Street/Lustig Court	106.4
Meek Avenue	From Alice Street to Jackson Street	74.2
Mission Boulevard	From Sunset Boulevard to B Street	72.1
Whipple Road	From just west of 880 Freeway interchange to Wiegman Road	72.1
Foothill Boulevard	From Rex Road to Mission Boulevard/Jackson Street	68.0
Hazel Avenue/City Center Drive	From Rio Vista Street to Valencia Place	67.8
D Street	From Atherton Street to Foothill Boulevard	42.5
Watkins Street	From B Street to Jackson Street	40.5
Tennyson Road	From Leidig Court/railroad crossing to Mission Boulevard	40.3
Harder Road	From Soto Road/Mocine Avenue to Jane Avenue	40.3
A Street	From Mission Boulevard to just east of 2nd Street	40.3
Hesperian Boulevard	From just north of Lester Avenue to Leonardo Way	40.3
Whitman Street/Beatron Way	From just south of Freitas Drive Tennyson Road	38.4
Creek Road	From Forselles Way to Glad Tidings Way to Tennyson Road	38.2
Main Street	From B Street to D Street	38.2
Elmhurst Street	From Townsend Avenue to Amador Street	38.2
Gomer Street/Tampa Avenue	From Gading Road to Cheryl Ann Circle	38.2
La Playa Drive	From Hesperian Boulevard to just west of Calaroga Avenue	38.2
West Winton Avenue	From just west of Hesperian Boulevard to just east of Southland Drive	38.2
Beatron Way	From Tennyson Road to just east of intersection with Rochelle Avenue	38.2
Dickens Avenue	From Tennyson Road to Thackeray Avenue	38.2
C Street	From Atherton Street to Second Street	38.2
B Street (Western Section)	From 4th Street to 7th Street	36.2

Source: Kittelson 2018.

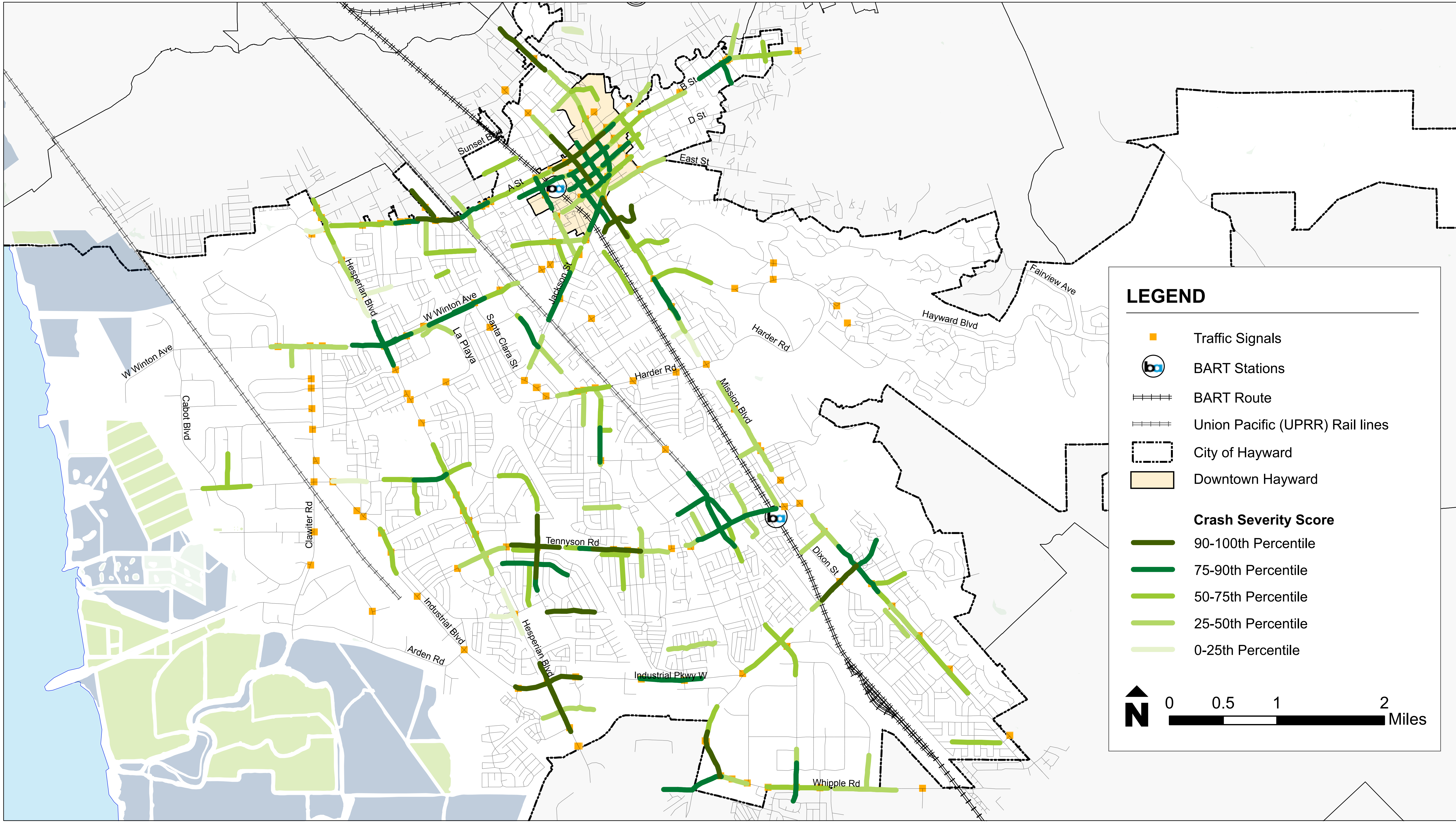
Table 13 Continued

Roadway	Extent	Maximum Annualized EPDO Along Roaway
B Street (Eastern Section)	From just west of Beech Street to Woodridge Drive	36.0
Arrowhead Way/ Dixon Street	From rotary just south of Industrial Parkway to just north of Sea Mist Court	36.0
Depot Road	From Dodge Avenue to Hesperian Boulevard	36.0
Longwood Avenue	From Hesperian Boulevard to Blackwood Avenue	36.0
Industrial Parkway	From Pacific Street to Mission Boulevard	36.0

Source: Kittelson 2018.

ROADWAY RISK FACTORS

Based on the screening results and risk factor identification process previously outlined, arterial roadways with posted speed of 35 mph or higher are associated with risk for pedestrians and bicyclists. In addition to being common among high injury corridors, these roadways may represent other locations that should be safety priorities, even in the absence of historical crash data.

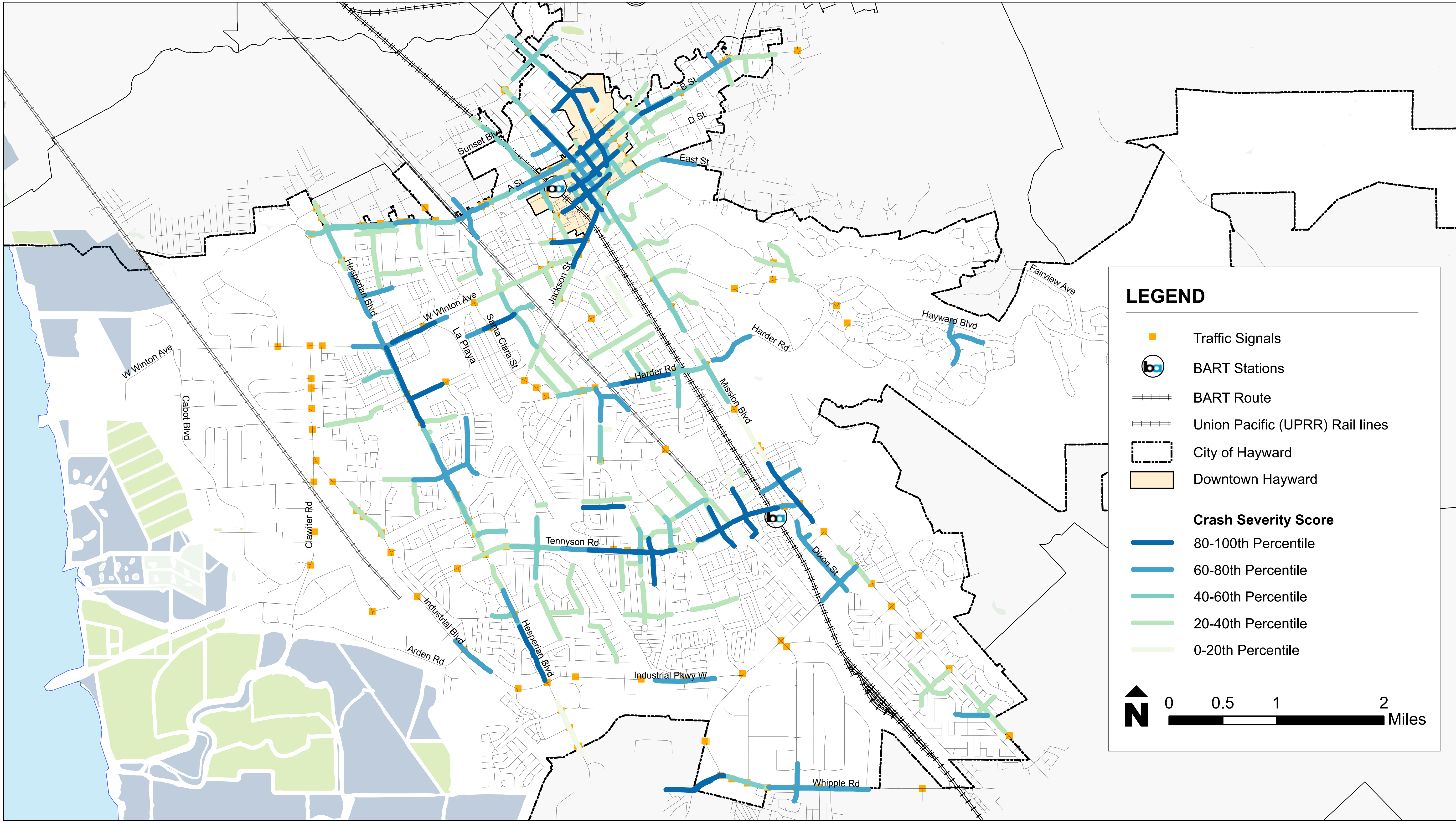


KITTELSON & ASSOCIATES

Bicycle Screening Results by Quintile
Hayward, California

Figure **29**

Source : 2012 – 2016 Statewide Integrated Traffic Reporting System Data , 2016 Caltrans Data and UC Berkeley TIMS

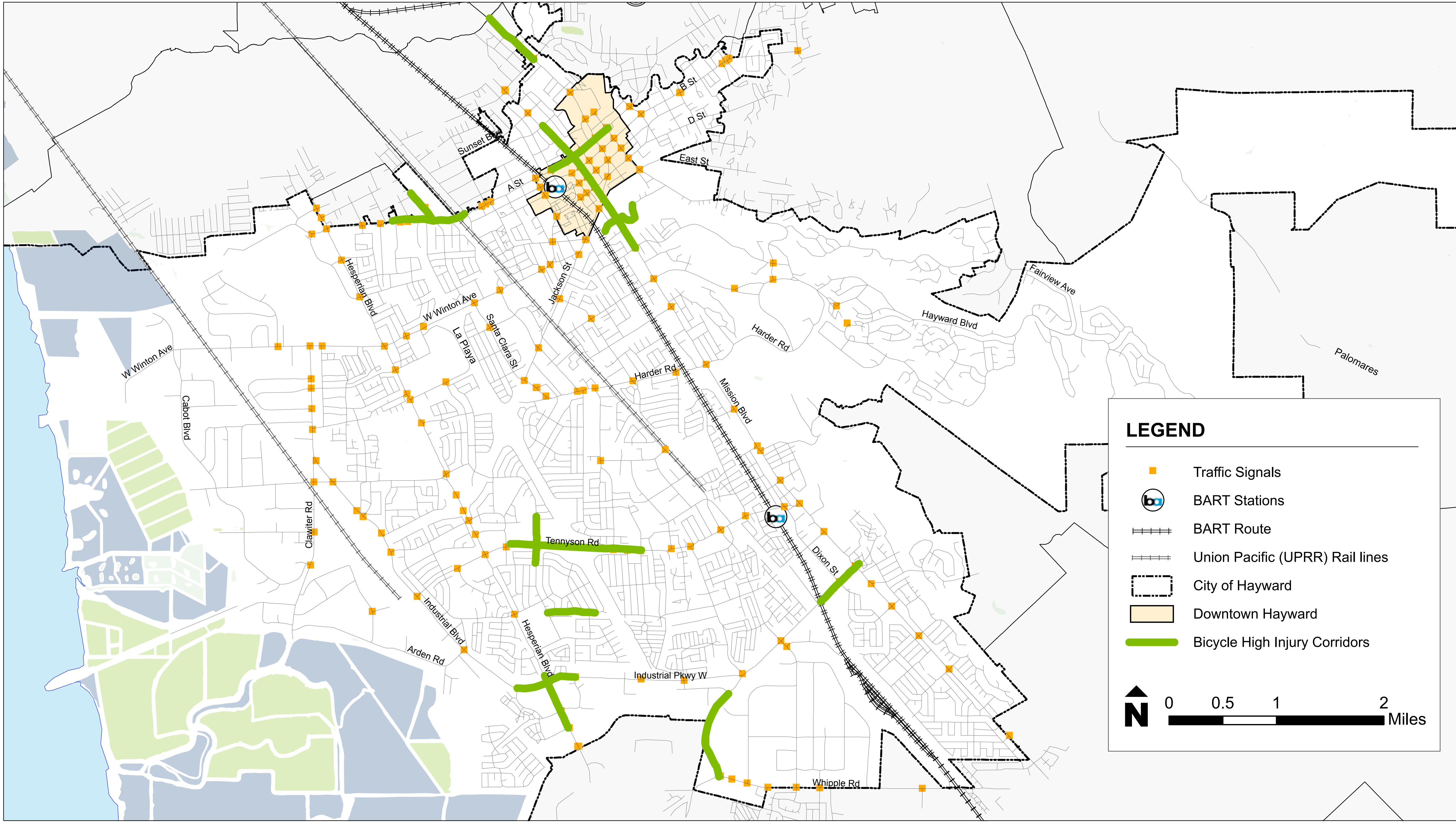


KITTELSON & ASSOCIATES

Pedestrian Screening Results by Quintile
Hayward, California

Figure **30**

Source : 2012 – 2016 Statewide Integrated Traffic Reporting System Data , 2016 Caltrans Data and UC Berkeley TIMS

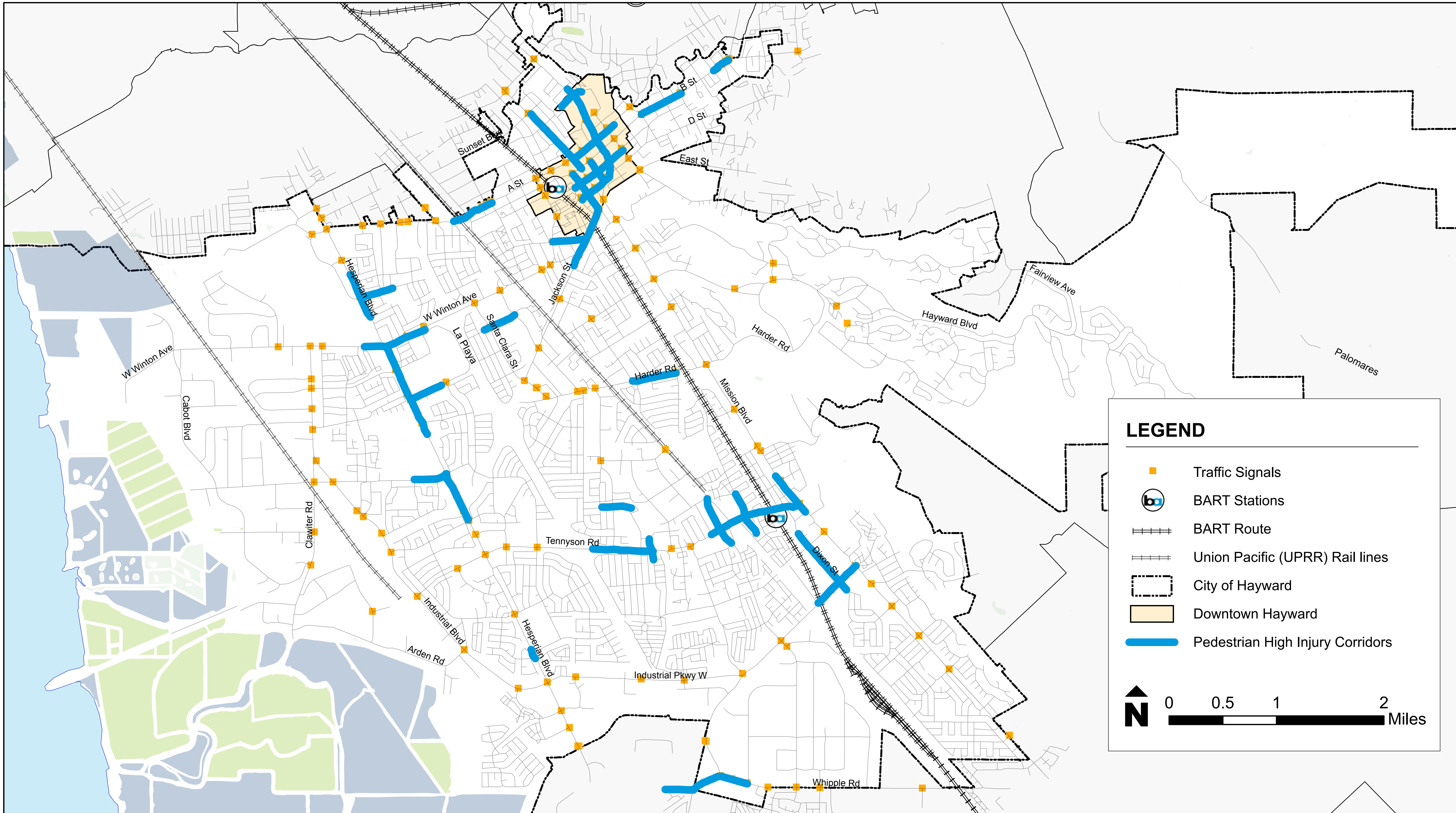


KITTELSON & ASSOCIATES

Bicycle High Injury Corridors
Hayward, California

Figure
31

Source : 2012 – 2016 Statewide Integrated Traffic Reporting System Data , 2016 Caltrans Data and UC Berkeley TIMS



KITTELSON & ASSOCIATES

Pedestrian High Injury Corridors Hayward, California

Figure 32

Source : 2012 – 2016 Statewide Integrated Traffic Reporting System Data , 2016 Caltrans Data and UC Berkeley TIMS

APPENDIX C
PRIORITIZATION FRAMEWORK

KITTELSON & ASSOCIATES
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MEMORANDUM

Date:	May 2, 2019	Project #: 21775
To:	Charmine Solla, P.E., T.E; Liliana Ventura – City of Hayward	
From:	Amanda Leahy, AICP; Mike Alston; Russ Doubleday – Kittelson & Associates, Inc.	
Project:	Hayward Bicycle and Pedestrian Master Plan Update	
Subject:	Prioritization Framework	

SUMMARY

This memorandum describes the prioritization framework proposed to be used in the identification of both pedestrian and bicycle project locations as part of the Hayward Bicycle and Pedestrian Master Plan Update. The prioritization criteria are intended to align with the Plan's goals, which include the following:

1. **Safety.** Increase the safety of people bicycling and walking in the City of Hayward by identifying projects that address the greatest safety needs and prioritizing safety for all modes.
2. **Complete Streets.** Provide complete streets that balance the diverse needs of users of the public right of-way.
3. **Access & Mobility.** Create connected networks and a continuous system of streets and trails that enable people of all ages and abilities to walk and bike to meet their daily needs and incorporate physical activity into everyday activities.
4. **Funding & Implementation.** Maintain sufficient funding to provide for existing and future transportation needs, including supporting programs and operation and maintenance.

This memo includes the following topics:

- **Proposed Factors and Evaluation Criteria** summarizes the factors and evaluation criteria proposed to be used in the evaluation of potential project locations.
- **Framework for Applying the Criteria** describes the evaluation framework.
- **Evaluation Criteria Methodology** provides an explanation of how each criterion will be applied.
- **Possible Weightings** presents options for possible factor weightings in the application of the prioritization methodology.
- **Next Steps** presents subsequent actions for both the City of Hayward and Kittelson & Associates, Inc. (Kittelson).

PROPOSED FACTORS AND EVALUATION CRITERIA

The proposed evaluation process is informed by the framework from NCHRP Report 803: ActiveTrans Priority Tool[1] (APT), the result of a national research effort. The APT methodology was based on an extensive review of existing prioritization processes being used by agencies across the country at the state, regional, and local level. It uses a standard set of terms and definitions to describe the different steps in the process. The following definitions apply within the APT:

- **Factors** are the categories used to express community or agency values considered in the prioritization process and contain groups of variables with similar characteristics. The APT has selected nine primary factors commonly used by agencies across the country that are particularly suited for prioritization of active transportation needs.
- **Variables (or evaluation criteria)** are characteristics of roadways, households, neighborhood areas, and other features that can be measured, organized under each factor. The terms *variables* and *evaluation criteria* may be used interchangeably.
- **Weights** are the numbers used to indicate the relative importance of different factors based on community or agency values. In order to increase transparency and legibility in the weighting step, weights are applied to factors, not to variables (which are often much more technical in nature).
- **Scaling** is the process of making two variables comparable to one another (e.g., number of collisions versus population density.)

The proposed prioritization factors and criteria is informed by NCHRP Report 803 and by the Plan's goals as referenced above.

[1] Lagerwey, Peter A., et al. *Pedestrian and Bicycle Transportation Along Existing Roads—ActiveTrans Priority Tool Guidebook*. NCHRP Report 803. Project No. 07-17. 2015. Available online at http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_803.pdf

Table 1: Proposed Prioritization Factors and Evaluation Criteria

Factor	Criteria	Notes	Ped	Bicycle
Safety	High-Injury Corridors	This criterion will prioritize locations based on network screening analysis of bicycle- and pedestrian-related collisions. The network screening was conducted in Task 2 of the project. This criterion aligns with the **safety goal.**	X	X
Equity	Equity Index	The equity index uses variables from Census data at the block group level as indicators of relative disadvantage and locations where investment would promote socially equitable outcomes.	X	X
Connectivity	Bicycle Level of Traffic Stress	This criterion will prioritize locations based on the presence of high-stress riding facilities. The level of traffic stress for this criterion analysis was conducted in Task 2 of the project. This criterion aligns with the **access and mobility goal**.		X
	Walking Access to Transit	This criterion will prioritize locations within walking distance (0.25-mile) of the 20 highest ridership transit stations within Hayward. This criterion aligns with the **access and mobility goal**.	X	
Public Input	Positive Comments	This criterion will identify *destinations* and *routes I like* identified by respondents on the project website and sum these positive comments back to the individual street segments within each Census block group level.	X	X
	Negative Comments	This criterion will identify *barriers* and *stressful routes* identified by respondents on the project website and sum these negative comments back to the individual street segments within each Census block group level.	X	X
Health	Proximity to schools, parks, community centers, and trails	This criterion will prioritize projects in locations close to schools, parks, community centers, and trails/shared-use paths. *This criterion aligns with the* **access and mobility goal**.	X	X

FRAMEWORK FOR APPLYING THE CRITERIA

For the application of the factors and criteria discussed above, Kittelson will use the process from NCHRP Report 803. This report is accompanied by a pre-programmed spreadsheet tool that can be tailored to project, segment, or geographic area inputs. The spreadsheet tool may be used for the entire process, or it can be supplemented with calculations from GIS or performed manually. Given the spatial nature of pedestrian and bicycle planning, it is common to perform GIS calculations to create input variables—as is proposed for many of the factors identified. The tool's 10-step process is outlined and briefly annotated in *italics* below.

1. **Define purpose.** An agency first determines the purpose of the prioritization process. *This prioritization process will prioritize locations at the Census block group level for both pedestrian and bicycle projects. The block group level aligns with the scale at which data is available and allows for aggregation of roadway-specific factors.*
2. **Select factors**. An agency next selects the factors to be used in prioritization that align with their goals for the prioritization process. *The proposed factors for the Plan are identified in the preceding section.*
3. **Establish factor weights.** Each factor is weighted on a scale of 1 to 10 to indicate its relative importance to other factors. Establishing desired weights is a next step for this process.
4. **Select variables (criteria) for each factor.** For each selected factor, agencies may select one or more variables to measure the factor. *Kittelson has proposed a single variable or indicator for each factor except for the public comment factor, most of which themselves are calculations of several inputs. See more details in the subsequent section.*
5. **Assess data availability.** *For all proposed factors and criteria, the project team has access to the necessary data.*
6. **Assess technical resources.** Agencies assess their existing technical resources and capabilities to determine if existing resources are sufficient. *The project team will use a combination of GIS software and the APT spreadsheet tool to perform calculations.*
7. **Set up prioritization tool.** Having established the purpose, factors, variables, and required data, the next step is to set up a tool to implement the prioritization method. *The project team will use the APT spreadsheet tool, with separate versions for pedestrian and bicycle prioritization.*
8. **Input data.**
9. **Scale variables.** Scaling involves selecting a common numeric scale and adjusting raw values to fit the common scale. Scaling should not be confused with weighting. Scaling is a more objective, technical function, while weighting is based on community/agency values. Scaling is necessary so that variables have a comparable impact on the prioritization score in the absence of weighting. Scaling methods should be chosen carefully depending on the distribution and range of the data points.
10. **Calculate priority scores.** Finally, agencies sum the weighted values for each factor to derive a total score for each location. The segments can then be ranked based on the prioritization score. In some cases, agencies may wish to revisit factors, variables, and/or weighting, and make adjustments to

their prioritization based on additional input or evolving prioritization purposes. *The spreadsheet used for this project will allow for weight adjustment and comparison of results.*

EVALUATION CRITERIA METHODOLOGY

This section discusses the proposed methodology for each proposed criterion.

Safety Factor

Table 2: Safety Criterion

Criterion	High-Injury Network
Description	This measure uses the results of the pedestrian and bicycle high-injury network screening analysis. The screening process used a severity-weighted collision score on the roadway network to identify locations associated with risk for people walking or biking.
Data Needs	The spatial files representing the high-injury network analysis.
Same method?	The same methodology will be used for the bicycle and pedestrian analyses.
Proposed Methodology	Kittelson will use the safety screening results as an input into the prioritization analysis by classifying roadway segments in deciles based on their severity-weighted collision frequency (e.g., 90-100th percentile, 80-90th percentile, …) from the relevant screening analysis for this project (bicycle or pedestrian).
Scoring	Scoring will be placed into tenth-percentile buckets (90-100th percentile, 80-90th percentile, etc.). Segments in the 90-100th percentile will be assigned a score of 10, 80-90th a score of 9, down to one for 0-10th percentile. (Segments with no collision history are not ranked and receive a score of zero.)
Limitations	Pedestrian and bicycle collision data used for this analysis will only include collisions that were reported to the California Statewide Integrated Traffic Records System database. Collisions that do not result in injury, death, or over a sufficient amount of property or vehicle damage are not required to be reported in California and would not necessarily be recorded in the data. As a result, not all pedestrian and bicycle collisions are represented in this data and the quality of collision data is limited by the amount of detail provided by the person completing the collision report form. Pedestrian and bicycle count data are not consistently and completely available; therefore, pedestrian or bicycle exposure could not be accounted for in developing this criterion. Finally, because numbers of pedestrian- and bicycle-involved collisions are typically low relative to all collisions and may represent random and/or behavioral/human factor causes where the specific location is not inherently a factor in the collision,

Criterion	High-Injury Network
	this criterion alone represents only a partial assessment of bicycle and pedestrian safety.

Equity Factor

Table 3: Equity Criterion

Criterion	Equity Index
Description	This measure incorporates a number of demographic and socioeconomic factors to identify areas with overlapping determinants of economic disadvantage.
Data Needs	Most recent available five-year American Community Survey data (2013-2017) at the block group level for the following attributes: 1. Communities of Color 2. Low Income (<200% of Poverty) Population 3. Limited English Proficiency Population 4. Zero-vehicle Households 5. Seniors Over 75 6. Youth Under 10 7. Population with a Disability 8. Single-Parent Families 9. Overburdened Renters
Same method?	The same methodology will be used for the bicycle and pedestrian analyses.
Proposed Methodology	Roadway segments will be evaluated with the use of an equity index. The equity index will use the variables listed above at the Census Block Group level, and roadways will be assigned the highest equity index among the block groups they reside in. These variables are used in the City of Oakland's Disadvantage Index, which can be viewed on the city's online Equity Dashboard.[2] The City of Oakland's Disadvantage Index was developed using the Metropolitan Transportation Commission's (MTC's) Communities of Concern framework, but has the following differences: • It adds *Youth under 10* as an additional variable • Rather than creating a binary of concerned/not concerned, the Disadvantage Index is a score that is scaled continuously from 0 to 1. • The Disadvantage Index is analyzed at the block-group level appropriate for a smaller area instead of census tracts, which are appropriate for MTC's nine-county

[2] http://oakbec.s3.amazonaws.com/MapLanding/maps/Equity_Dashboard_2.html

Criterion	Equity Index
	area. (There are 116 Census block groups partially or wholly located within Hayward, compared to 37 MTC Community of Concern locations.) • It is a population-based index that counts individuals instead of requiring that areal units of analysis meet a concentration threshold as is required in MTC's framework. The equity index will be calculated as follows: • Starting with the variables listed under data sources, Kittelson will convert household, family, and housing unit statistics to person-units using the average size of that grouping for each block group. • The nine population values will be summed and divided by the total population of the block group to generate the preliminary index value. • The preliminary index value will be scaled to a value of one such that the maximum score for the most transportation-disadvantaged block groups receive a score of one and all other values are scaled relatively to the maximum. • Because an individual can have more than one criterion attributed to them (e.g., a person could be living in poverty and be in a single-parent household), the index intentionally counts individuals multiple times to generate an index that evaluates the relative equity disadvantage of the block group. The equation used to develop the segment transportation disadvantaged score is shown below: $Equity\ \ Index = \frac{(Eld + Yth + NH + Pov + (HH(Veh + Fam + Rent + LEP) + Dis)}{Pop}$ where: Eld = # of residents over 75 Yth = # of residents under 10 NH = # of residents who identify as non-white or Hispanic (communities of color) LEP = # of households identified as speak English "not well" or "not at all" Pov = # of residents with income under 200% of poverty level HH = Average California household size Veh = # of households with 0 vehicles Fam = # of single-parent families Rent = Overburdened renters Dis = # of residents with a disability Pop = Total population

Criterion	Equity Index
	Data at the household level is multiplied by the average household size for each block group.
Scoring	Scoring will be continuous, with scores initially ranging from zero to a maximum possible score of eight based on the sum of indices. (Two categories, *seniors over 75* and *youth under 10* are mutually exclusive). A score of eight would indicate that every resident within the block group meets eight of the nine indicators. Each score will then be divided by the maximum score to obtain its index value relative to maximum.
Limitations	This metric calculates an index of a given area for a transportation disadvantaged population, but it does not represent total numbers of people. Therefore, a block group with a lower total number but higher proportion of transportation disadvantaged people would be rated higher than a more populous block group. Additionally, the indicator is based on publicly-available American Community Survey data. There may be other desirable indicators of relative disadvantage for which spatial data are not readily accessible.

Connectivity Factor

Table 4: Connectivity Criterion

Criterion	Bicycle Level of Traffic Stress
Description	This measure incorporates the results of previously-conducted bicycle level of traffic stress (LTS) analysis conducted for this project to assess low-stress bike network connectivity. Bicycle level of traffic stress was developed in 2012 at the Mineta Transportation Institute to estimate the level of stress a bicyclist may feel while riding along a particular roadway. In The method adopts a "worst case scenario" approach whereby the roadway characteristic with the highest stress level determines the score for the segment. Scores range from 1 (a comfortable facility for users of all ages and abilities) to 4 (a facility that only strong and fearless cyclists would feel comfortable using).
Data Needs	The spatial files representing the output of the bicycle level of traffic stress analysis conducted for this project.
Same method?	The methodology will be only be applied to the bicycle analysis.
Proposed Methodology	Similar to the safety methodology, Kittelson will assign the computed LTS score to each roadway segment. If a prioritization segment is connected to multiple LTS analysis segments, it will be assigned the higher (i.e., more stressful) LTS score.
Scoring	Scoring will be binary: 1 = High-stress biking facilities (LTS score of 3 or 4)

	0 = low-stress biking facilities (LTS score of 1 or 2)
Limitations	The LTS analysis was conducted using roadway data provided by the City and supplemented with Open Street Map (OSM) data. In general, OSM data varies in quality and completeness by area. This variation exists because the data are open source and supplied by volunteers. OSM data also typically lacks extensive metadata, making it challenging to assess when the data was last updated.

Criterion	Walking Access to High-Ridership Transit Stops
Description	This measure prioritizes locations within walking distance (0.25-mile network distance) of the 20 highest ridership transit stops/stations in Hayward.
Data Needs	The spatial location of transit (AC Transit and BART) stops within Hayward, along with the average number of daily boardings.
Same method?	This methodology will only be applied to the pedestrian analysis.
Proposed Methodology	The methodology will use the network distance (rather than straight-line distance) from the centroid of each roadway segment to the nearest among the top 20 ridership transit stops. The road segments will be evaluated for whether they are within a ten-minute walking distance to the nearest stop.
Scoring	Scoring will be binary: 1 = Within a ten-minute walk (0.25-mile) of a high-ridership transit stop 0 = Not within a ten-minute walk (0.25-mile) of a high-ridership transit stop
Limitations	This methodology only prioritizes proximity to a select number (i.e., 20) of transit stops within Hayward, to focus on prioritizing high-ridership stops and lines. It is possible that latent ridership demand for walking connections exist for other stops and lines.

Public Input Factor

The public input factor is the only proposed factor to incorporate two criteria. The criteria are (a) positive comments received and (b) negative comments received. The positive and negative comments will be summed as separate criteria (rather than using positive and negative numbers) so that they do not cancel one another out. They will be weighted equally. For example, a block group with a frequently-commented destination and also a frequently-identified barrier will score high in both criteria (and thus in the factor). Each criterion is summarized in the table below.

Table 5: Public Input Criterion – Positive and Negative Comments

Criterion	Comments Received
Description	This measure looks at positive and negative comments submitted at specific locations within the City.
Data Needs	The spatial files resulting from the online web map soliciting community feedback as part of this project.
Same method?	The methods are slightly different, as described below.
Proposed Methodology	Public comments will be evaluated based on the feedback shared via the project's online web map. Based on data summarized from an October 2018 data pull, a total of 104 positive comments had been collected and 214 negative comments had been collected. Respondents either placed points or drew polylines on a webmap of the City of Hayward to identify B*arriers* and *Destinations* (points) or *Stressful Routes* and *Routes I like* (polylines). The *Destinations* and *Routes I Like* are considered positive comments. The *Barriers* and *Stressful Routes* are considered negative comments. a) **Positive Comments**. The pedestrian and bicycle criteria will be calculated as the sum of positive comments within the Census block group. The polylines (*Routes I like*) submitted on the webmap refer exclusively to biking routes. Thus, the bicycle method will incorporate both the point and polyline comments submitted. The pedestrian method will only incorporate the point comments. a) **Negative Comments**. The pedestrian and bicycle criteria will be calculated as the sum of negative comments within the Census block group. The polylines (*Stressful Routes*) submitted on the webmap refer exclusively to biking routes. Thus, the bicycle method will incorporate both the point and polyline comments submitted. The pedestrian method will only incorporate the point comments. Comments will be summed at the block group level; the block group scores will then be assigned back to the roadway segments within that block group. This process allows the comments, which identify destinations and barriers, to apply within the immediate vicinity of the precise location of the comment on the webmap.
Scoring	Scores will be the sum of observed comments within a Census block group. Block groups will be ranked by their percentile of comments received among all block groups (0 to 100th percentile), with continuous scores ranging from zero to one as a result.
Limitations	Public input solicited online can be subject to biases. In particular, online feedback is biased towards responses from those with internet access. Although the online map was advertised through the City's website and other materials

Criterion	Comments Received
	developed and distributed for the project, the distribution of input solicitation may be uneven and skewed towards those with more social capital or direct connections to City processes. Given these limitations, the public comments received should be regarded as useful and informative but incomplete.

Health Factor

Table 6: Health Criterion

Criterion	Proximity to Open Space
Description	This measure will prioritize projects in locations that are close to facilities that promote physical activity.
Data Needs	The spatial location of the following facilities: • Trails of regional significance • Hayward schools • Hayward parks and open space (including Hayward Area Recreation and Park district and East Bay Regional Parks District) • Senior Centers
Same method?	The same methodology will be used for the bicycle and pedestrian analyses.
Proposed Methodology	The methodology will use the network distance (rather than straight-line distance) from the centroid of roadway segment to the nearest of each of the above-listed groups. The segments will be evaluated by this distance, with a lower number representing a better score.
Scoring	The score will be the distance from the roadway segment's centroid to the nearest identified destination as described above. Road segments will be ranked by percentile based on this distance (100th percentile indicating the lowest such distance). The resulting scores will range continuously from zero to one.
Limitations	The proposed method employs publicly available data but is limited with respect to the type of access to healthy destinations. As such, there may be other destinations associated with health outcomes for some residents that are not captured in this methodology (e.g., private gyms).

POSSIBLE WEIGHTINGS

This section revisits the framework with a few considered weightings and the factor weighting ultimately selected by the City. Note that the public input factor is valued at a lower level than all other factors in every scenario. This lower weight is appropriate given the limitations presented with the applied criterion. While public input is important, its subjective nature and biased nature compels the project team to limit its influence in the overall scoring. Also note that the City has provided its feedback and chosen weightings, which are provided in the far-right column.

The city-selected weighting totals 90 percent – the 10 percent for previously identified projects has been removed from the weighting. As a result, everything has been reweighed with a base of 90 instead of 100. For example, the safety factor, which used to be 30 percent (30/100) is now 33 percent (30/90). The final column in **Table 7** displays the updated percentage weights, which reflects the new base of a total of 90 percent.

Table 7: Possible factor Weighting for Prioritization[1]

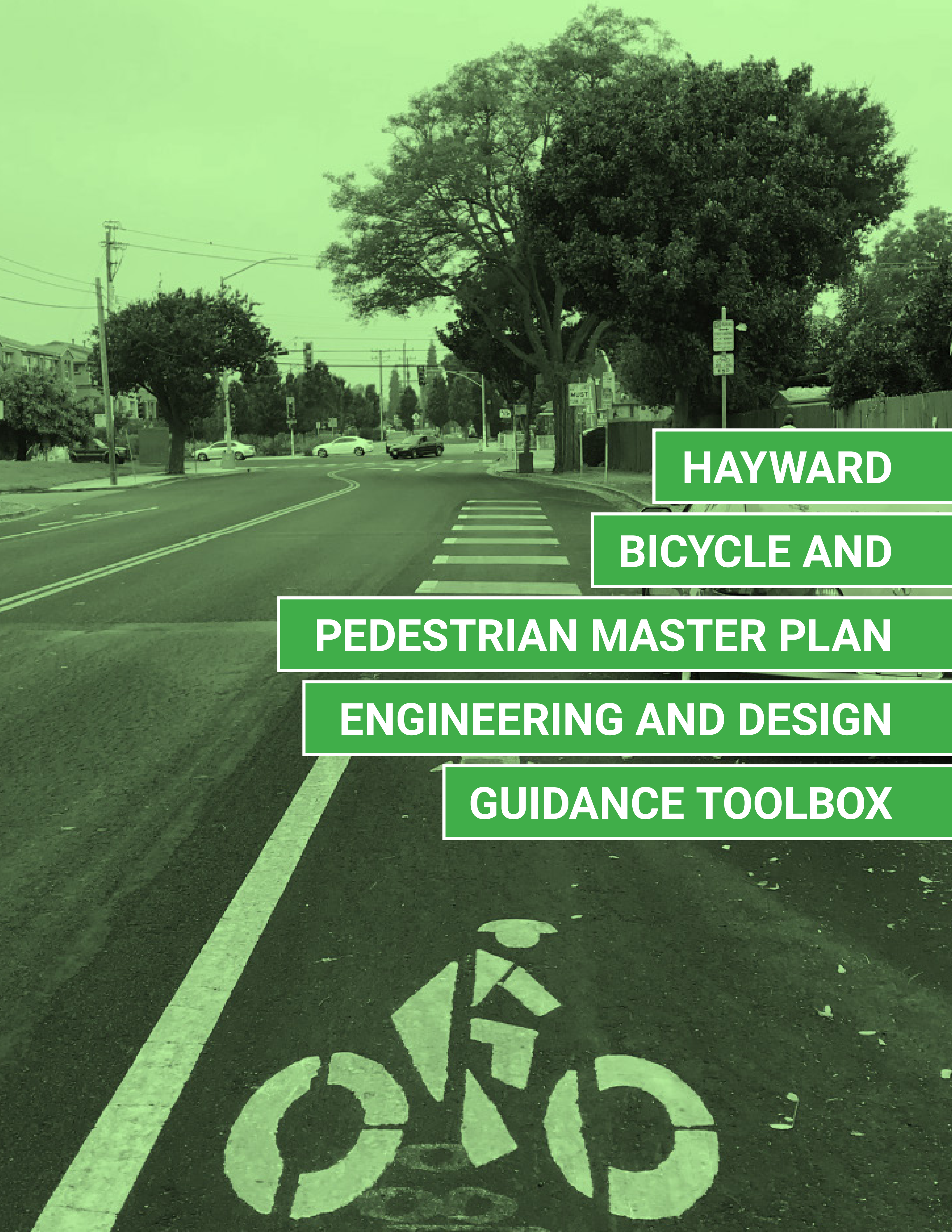
Factor	Criteria	Equal Weights Method	Safety Focus	Connectivity Focus	Equity Focus	**City Selected Weightings**	**Final Weights**
Safety	High-Injury Network	18%	30%	15%	15%	**30%**	**33%**
Equity	Equity Index	18%	15%	15%	30%	**15%**	**17%**
Connectivity	Bicycle Level of Traffic Stress	18%	15%	30%	15%	**20%**	**22%**
	Walking Access to Transit						
Public Input	Positive Comments	10%	10%	10%	10%	**10%**	**11%**
	Negative Comments						
Health	Proximity to Open Space	18%	15%	15%	15%	**15%**	**17%**

[1] The overall score is the sum of weighted scores, which range from 0 to 1

NEXT STEPS

Kittelson will apply the methodology to identify priority streets for pedestrian and bicycle projects for the City of Hayward Citywide Bicycle and Pedestrian Master Plan.

APPENDIX D
DESIGN GUIDE



HAYWARD BICYCLE AND PEDESTRIAN MASTER PLAN ENGINEERING AND DESIGN GUIDANCE TOOLBOX

This guidance toolbox is provided as a supplement to the Hayward Bicycle and Pedestrian Master Plan. It serves as a reference and best practice review, providing a survey of infrastructure design practices and guidance. It is based primarily on the sources listed on page 4. This toolbox is intended to serve as a basis for guidance basis for infrastructure that supports Plan goals. However, subsequent engineering judgment should be employed before implementing any of the elements presented herein.

ACKNOWLEDGMENTS

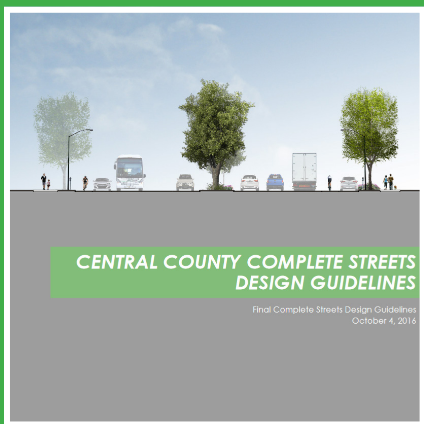
City of Hayward Staff
Charmine Solla, City of Hayward
Fred Kelley, City of Hayward
Liliana Ventura, City of Hayward

Consultant Team
Amanda Leahy, Kittelson & Associates
Laurence Lewis, Kittelson & Associates
Mike Alston, Kittelson & Associates
Kevin Yost, Kittelson & Associates
Claire Casey, Kittelson & Associates

CONTENTS

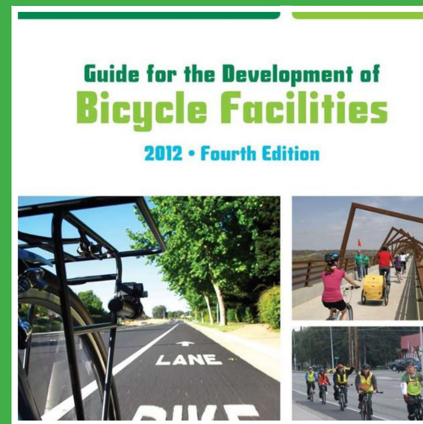
GUIDANCE BASIS

The following guide was developed as a reference document for best practices guidance in planning and designing bicycle and pedestrian facilities. The guidance provided in this document provides high-level and key guidance and relies heavily on the standards and practices provided in the documents listed below. For more and complete information on the design practices and the research informing these practices, consult these sources.

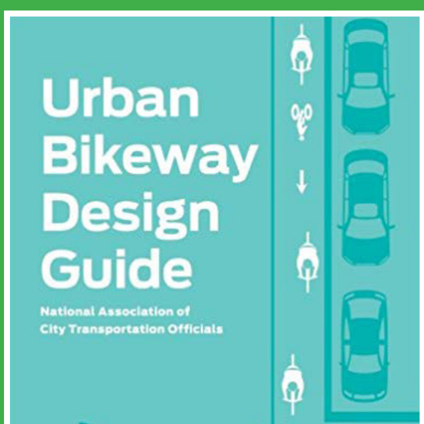


Central County Complete Streets Guidelines (2016)

FHWA Separated Bike Lane Planning and Design Guide (2015)

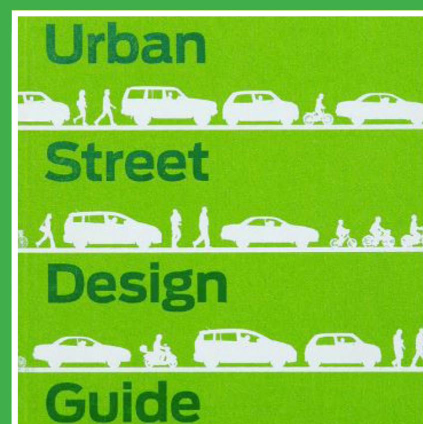


AASHTO Guide for the Development of Bicycle Facilities, Fourth Edition (2012)



NACTO Urban Bikeway Design Guide, Second Edition (2014)

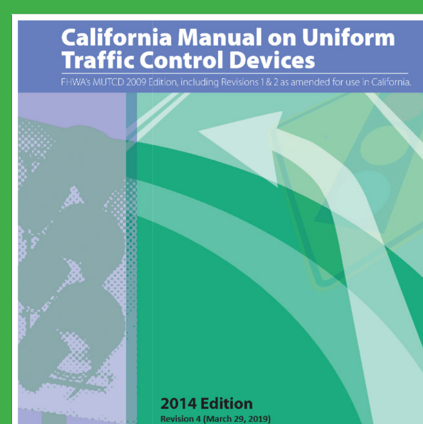
Hayward Green Infrastructure Plan (2019)



NACTO Urban Street Design Guide (2013)

AC Transit Multimodal Corridor Guidelines (2018)

California Department of Transportation



California MUTCD, revision 4 (2019)

BICYCLE ENGINEERING & DESIGN TOPICS

FACILITY SELECTION

Picking the Right Facility for Users

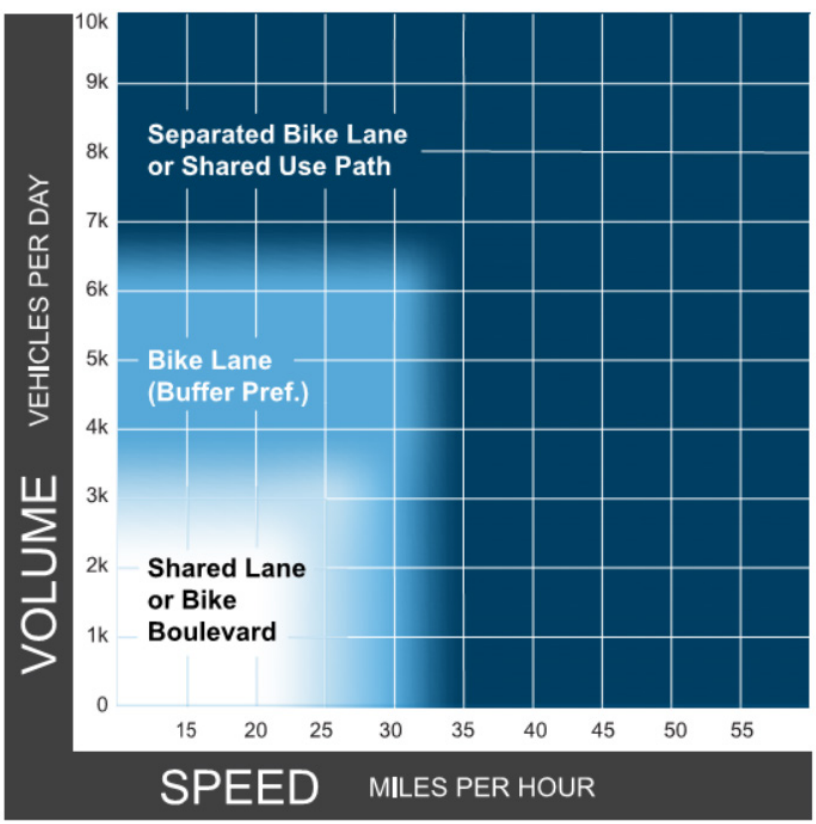
WHOM TO DESIGN FACILITIES FOR?

In general, the appropriate bikeway facility is the one that is suited for the *Interested but Concerned* bicyclist (see *Level of Stress Analysis* in Plan, page 53). If an appropriate facility is provided for this segment of the population, then more confident riders will be comfortable, as well.

WHAT FACILITY TO PROVIDE?

The appropriate facility is ideally matched to the prevailing traffc volumes and speeds. The chart below provides general guidance from the Federal Highway Administration's 2019 *Bikeway Selection Guide* on the appropriate facility to keep people riding bikes comfortable. Right-of-way constraints may make the recommended design infeasibe, in which case parallel route may be identified or altenative options considered.[3]

Designing for the Interested but Concerned *population requires physical separation at certain vehicle volumes (y-axis) and speeds (x-axis). This chart gives general guidance for providing the appropriate facility.*



Notes:
1. Chart assumes operating speeds are similar to posted speeds. If they differ, use operating speed rather than posted speed.
2. Advisory bike lanes may be an option when traffic volume is <3K ADT.
Credit: Bikeway Selection Guide, FHWA, 2019

REFERENCES ON PAGE 55

The Importance of Connectivity

CONNECTIVITY

The chart on the previous page aides with facility selection for a given roadway segment. However, appropriate facilities are only useful if they are part of a connected network. The image below shows a street network with high-stress facilities (Level of Traffic Stress 3 or 4) in grey, illustrating network gaps and the importance of network connectivity.

ROUTE CHOICE

Research has shown that bicyclists select their route based on a number of factors. Route directness is an important factor, so providing low-stress, connected networks that are still relatively direct is key in promoting cycling.

Highlighting high-stress versus low-stress facilities illustrates the presence of low-stress network gaps, or "islands." Below are Hayward's existing streets classified by level of traffic stress.

Credit: Kittelson & Associates, Inc.

BIKEWAY FACILITY TYPE

Overview

Bikeway Class	Facility Name	Description	Context (also consult on chart page 8)	Design Requirements (also consult cross-sections on pages 16-20)
CLASS I	Bike Path/ Shared-Use Path/ Sidepath	Bike paths provide a completely separated facility designed for the exclusive use of bicyclists and pedestrians with minimal or no conflicting motor vehicle traffic –generally, corridors not served by streets (e.g., river paths or converted rail rights-of-way).	Preferred option to on-street facility operating above 35 miles per hour and serving above 6,500 vehicles per day. May be shared-use facility.	Shared-use path preferred 14' (minimum 12') with 2' buffer
CLASS II	Bike Lane	Bike lanes are on-street bikeways that provide a designated right-of-way for the exclusive use of bicycles. This facility type may include bike lanes with a painted buffer but no physical separation from vehicle travel lanes.	Preferred option on facilities operating between 25 and 35 miles per hour, and between 3,000 and 6,500 vehicles per day.	Combined parking and bike lane width of 14.5' (minimum 12') 6' lane from curb face (5' minimum); 4' lane from street edge (3' minimum) If buffered, 2' width preferred (minimum 1.5') Maintain 2' shy distance from any vertical objects adjacent to lane
CLASS III	Bike Route/ Bicycle Boulevard	Bike routes (which may be designated as "bicycle boulevards") provide a right-of-way designated by signs or permanent markings and are shared with motorists, with sufficient width to accommodate motorists and bicyclists together.	Preferred alternative on option operating below 30 miles per hour and below 3,000 vehicles per day.	Center of pavement markings should be at least 4' from face of curb (at least 11' if parallel parking is present)
CLASS IV	Separated Bike Lane/ Cycle Track	Separated bikeways provide a physical separation from vehicular traffic (may include grade separation, flexible posts, planters or other inflexible physical barriers, or on-street parking).	Preferred option to on-street facility operating above 35 miles per hour and serving above 6,500 vehicles per day.	One-way: 7' bike lane (minimum 5') with 3' separation from travel lane or buffer from parked cars (minimum 2') Two-way: 10' bike lane (minimum 8')—consider wider if heavy volumes or along a grade 3' physical separation or buffer from parked cars

BIKEWAY FACILITY TYPE

Class I – Bike Path / Shared-Use Path / Sidepath

DESCRIPTION

Bike paths provide a completely separated facility designed for the exclusive use of bicyclists and pedestrians with minimal or no conflicting motor vehicle traffic. Generally, bike paths serve corridors not served by streets (e.g., river paths or converted rail rights-of-way) or may be parallel to roadways where right of way is available (sidepaths). Bike paths provide both recreational and commute routes for bicyclists.

COST ESTIMATE:

$1,000,000 - $2,200,000 per mile

(High end of cost estimate assumes ADA curb ramps and raised crosswalks at intersections every 600 feet, RRFBs every 1/4-mile, and landscaping.)

Credit: Kittelson & Associates, Inc.

Shared-use path crossing with flashing beacon. Consult CAMUTCD 9C.04 for crossing guidance.

Credit: FHWA Small Town and Rural Multimodal Networks[4]

Alameda Creek Trail Shared-Use Path, Fremont, CA.

Credit: Kittelson & Associates, Inc.

BIKEWAY FACILITY TYPE
- Class I Continued

CONTEXT

- Separated paths are appropriate when an alternative would place cyclists in the presence of high vehicle speeds or high traffic volumes (see page 8).
- Shared-use paths are typically installed along independent rights-of-way (for example, along greenways or abandoned rail trails).
- Where right-of-way or other physical constraints exist, sidepaths may be provided adjacent to the roadway. Sidepaths must be appropriately designed at access points or intersections (see page 30).
- The FHWA Shared Use Path Level of Service Calculator provides guidance for appropriate width or separation of pedestrians and cyclists along a shared-use path.[5]

Class I bike path in Hayward, CA.

Credit: Kittelson & Associates, Inc.

DESIRED ELEMENTS

- Pedestrian-scale lighting improves visibility, particularly at intersection crossings, tunnels, underpasses, trail heads, and rest areas.
- A shy distance of at least one foot allows adequate lateral clearance for the placement of signs or other vertical objects. If objects are shorter than 3 feet tall, they may not present an obstruction for cyclists.

REQUIRED ELEMENTS

- The width of a shared-use path may vary based on expected bicyclist and pedestrian volume and right-of-way constraints, but should not be less than 10 feet wide except in rare cases and for short distances. A 12- to 14-foot path is desirable (see page 18).
- Path crossings may be designed with yield, signal, or stop control depending on path volume and traffic volume on the crossing street. Refer to MUTCD 9C.04 for more.

Shared-use path crossing with a pedestrian hybrid beacon. Consult MUTCD 9C.04 for crossing guidance.

Credit: Fayetteville Flyer

REFERENCES ON PAGE 55

BIKEWAY FACILITY TYPE

Class II – Bike Lanes

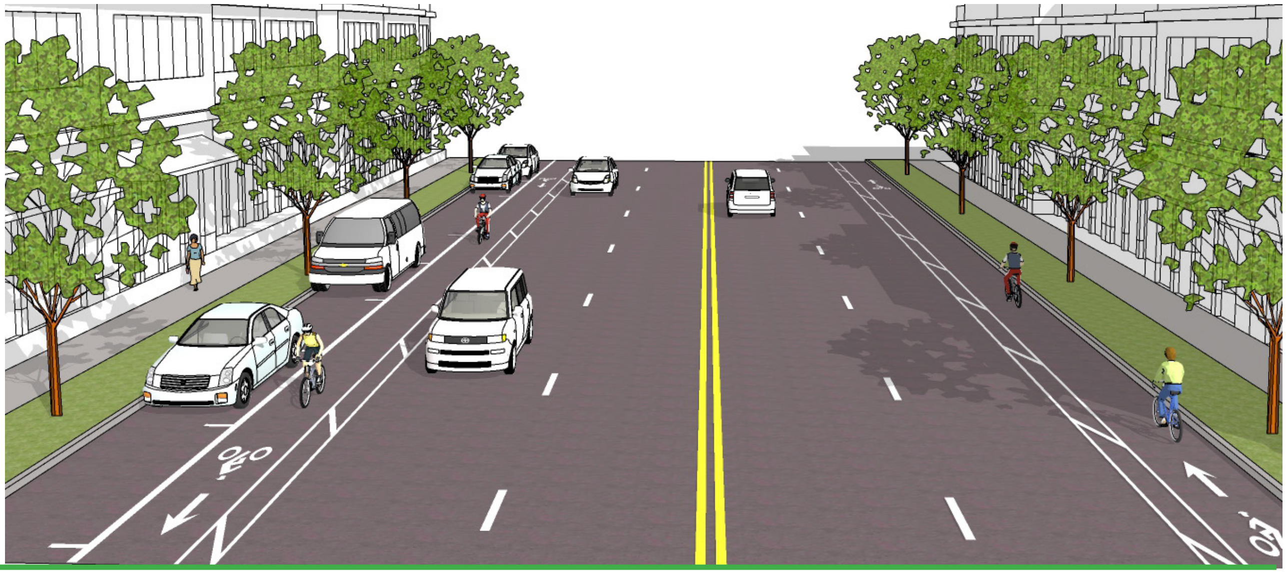
DESCRIPTION

Bike lanes are on-street bikeways that provide a designated right-of-way for the exclusive use of bicycles. Through travel by motor vehicles or pedestrians is prohibited, but vehicle parking may be allowed on either side of the bikeway, and drivers may cross through for turning movements. This facility type may include bike lanes with a painted buffer but no physical (horizontal and vertical) separation between vehicle travel lanes and bicycle travel lanes.

COST ESTIMATE:

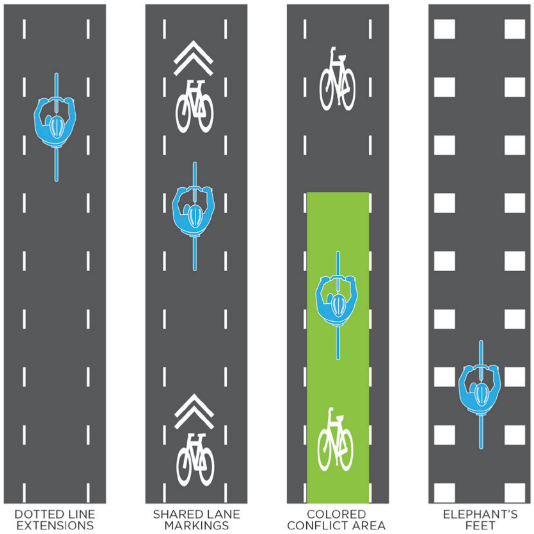
$85,000 - $320,000 per mile

(Low end of cost estimates assumes only thermoplastic lane lines and signage. High end of cost estimates assumes all above and continuous application of green thermoplastic in conflict areas.)



Credit: Kittelson & Associates, Inc.

Various options exist for marking bike lanes through conflict areas. See page 27 for more information.



Credit: NACTO

Different bike facilities can be provided along a steep grade based on expected speed differences. (e.g., Class III downhill and Class II uphill)

Credit: Kittelson & Associates, Inc.

BIKEWAY FACILITY TYPE
- Class II Continued

CONTEXT

- Bike lanes are appropriate on streets with moderate traffic volumes and speeds (see page 8). A buffer is preferred where possible.
- When a bike lane is placed next to active street parking, a parking-side buffer is preferred.
- When steep grades are present, consider providing the next level of separation uphill (i.e., add a buffer, or physically separate the bike lane). It may be appropriate to mix facilities for opposite directions along a steep grade.

DESIRED ELEMENTS

- The desired minimum width of a bike lane is 6 feet. When adjacent to parking, the recommended width from curb face to the far edge of the bike lane is 14.5 feet (12 feet minimum). With high bike volumes, a 7-foot travel area width is recommended.[6]
- At intersections with right-turn vehicle lanes, it is recommended that the bike lane transitioned to the left of the lane (see below) using dotted white lines, appropriate signage, and colored pavement.[6]
- See page 18 for more information.

REQUIRED ELEMENTS

- When buffers are used, they shall be marked with 2 solid parallel white lines, at least 18 inches apart. If the buffer is at least 3 feet wide, use diagonal or chevron hatching inside.[6]

Buffered bike lane provides extra separation on the approach to a roundabout.

Credit: Kittelson & Associates, Inc.

Use dashed lines in the buffer where vehicle turning movements are allowed.

Credit: Kittelson & Associates, Inc.

REFERENCES ON PAGE 55

BIKEWAY FACILITY TYPE

Class III – Bike Route / Bicycle Boulevard

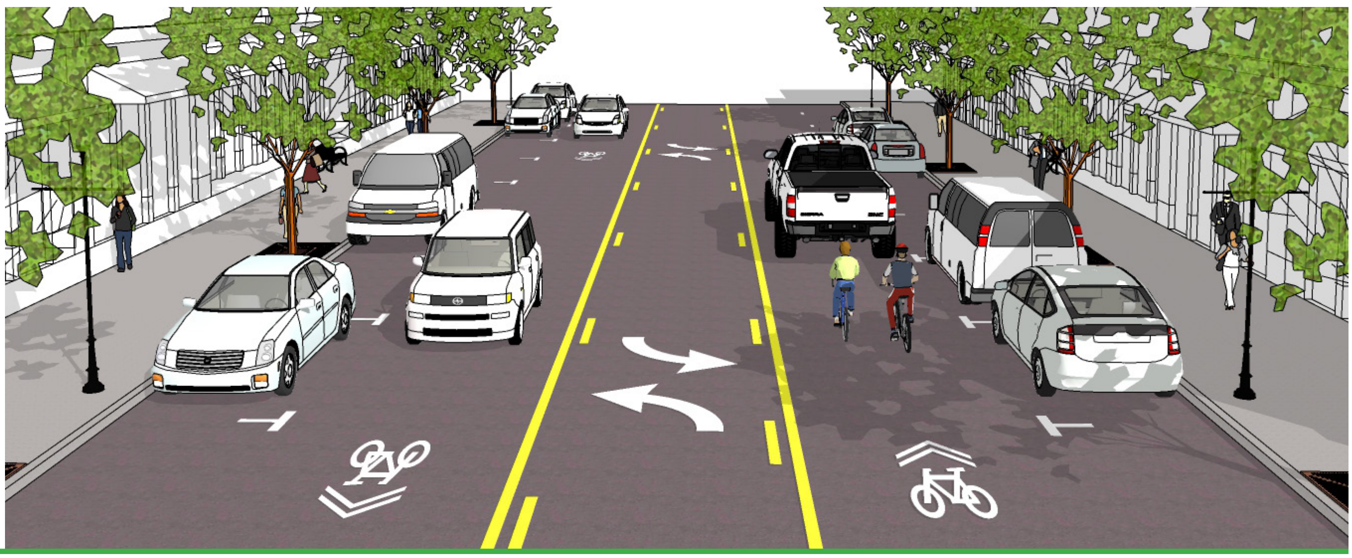
DESCRIPTION

Bike routes (which may be designated as “bicycle boulevards”) provide a right-of-way designated by signs or permanent markings and are shared with motorists. Roadways designated as Class III bike routes should have sufficient width to accommodate motorists and bicyclists together. Shared-lane markings (“sharrows”) can be used to provide an additional alert to drivers of the shared roadway environment. Because the right-of-way is shared, vehicle speeds on Class III bikeways should be managed through the use of traffic calming (see page 52).

COST ESTIMATE:

$30,000 - $260,000 per mile

(Low end of cost estimate includes signage and pavement markings. High end of cost estimate includes the use of custom wayfinding signage and traffic calming elements--four neighborhood traffic circles and four raised crosswalks per mile)



Credit: Kittelson & Associates, Inc.

Treatments like a mini-roundabout are appropriate along bicycle boulevards to reinforce traffic calming.

Credit: Kittelson & Associates, Inc.

A pavement marking on a Class III route in San Jose, California, indicates a bike route and is located away from the door zone.

Credit: Kittelson & Associates, Inc.

BIKEWAY FACILITY TYPE
- Class III Continued

CONTEXT

- Bike routes are typically appropriate only in the presence of low speeds and low traffic volumes (see page 8). Above these speeds and volumes, a designated lane is appropriate.
- To ensure the selected facility retains its low-speed and low-volume character, bicycle boulevards should be supported with traffic calming measures and volume management measures (e.g., restricting vehicle access).
- The level of stress of bicycle boulevards are typically determined by major street crossings, which should be designed to promote the desired level of traffic stress (i.e., controlled).

MUTCD D11-1 is an example of an appropriate bicycle wayfinding sign. Refer to CA-MUTCD Section 9B.20.

A Class III bike boulevard in Berkeley maintains traffic calming by diverting vehicle traffic.

Credit: Reconnect Rochester

DESIRED ELEMENTS

- Bike routes should be direct, as bicyclists are unlikely to adhere to a path that requires significant out-of-direction travel. Ideally a bicycle boulevard would be parallel and proximate to a major vehicle route.
- Signs and pavement markings should be used to identify the bike route. Wayfinding signs are recommended to guide bicyclists to destinations and through any turns in the route (refer to CA-MUTCD 9B.20). Chevron pavement markings can guide bicyclists with lateral positioning in lanes that are too narrow for a motor vehicle and bicycle to travel side-by-side within the same traffic lane, and alert road users of their presence.
- Typically, minor streets along the bicycle boulevard should be controlled to minimize delay for bicyclists and encourage use of the bicycle boulevard.

REQUIRED ELEMENTS

- Place sharrow pavement markings at least every 250 feet and after each intersection.

Wayfinding signage indicates a Class III bike route in Oakland.

Credit: Kittelson & Associates, Inc.

REFERENCES ON PAGE 55

BIKEWAY FACILITY TYPE

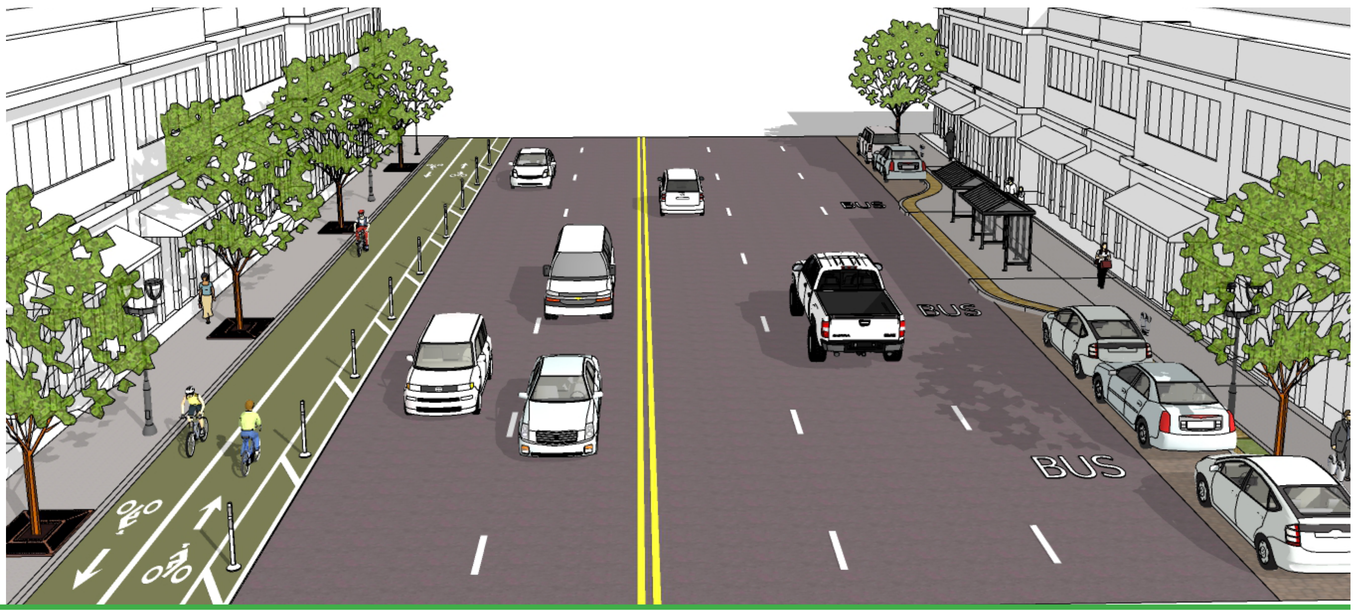
Class IV – Separated Bikeway / Cycle Track

DESCRIPTION

Separated bikeways provide a physical separation from vehicular traffic. This separation may include grade separation, flexible posts, planters or other inflexible physical barriers, or on-street parking. These bikeways provide bicyclists a greater sense of comfort and security, especially in the context of high speed roadways. Separated facilities can provide one-way or two-way travel and may be located on either side of a one-way roadway.

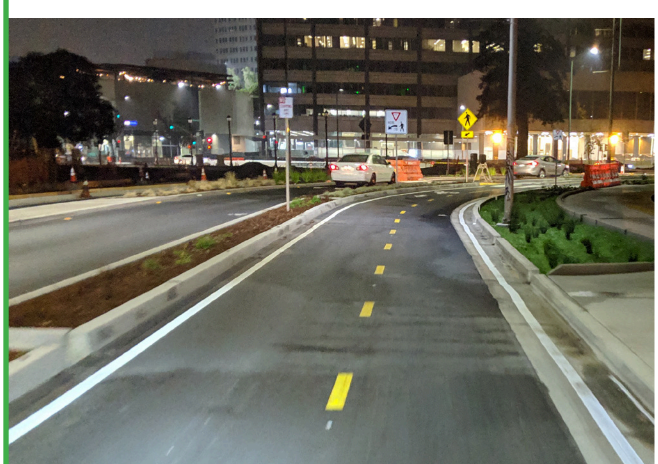
COST ESTIMATE:

$215,000 - $760,000 per mile
(Low end of cost estimates assume parking-separate lanes. High end of cost estimates assumes median separation.)



Credit: Kittelson & Associates, Inc.

Two-way separated bike lanes should provide room for cyclists to pass one another without obstruction.



Credit: Kittelson & Associates, Inc.

A separated bike lane project can provide a shorter pedestrian crossing while maintaining accessibility and safety for all road users.

Credit: AASHTO Separated Bike Lane Planning and Design Guide

BIKEWAY FACILITY TYPE
- Class IV Continued

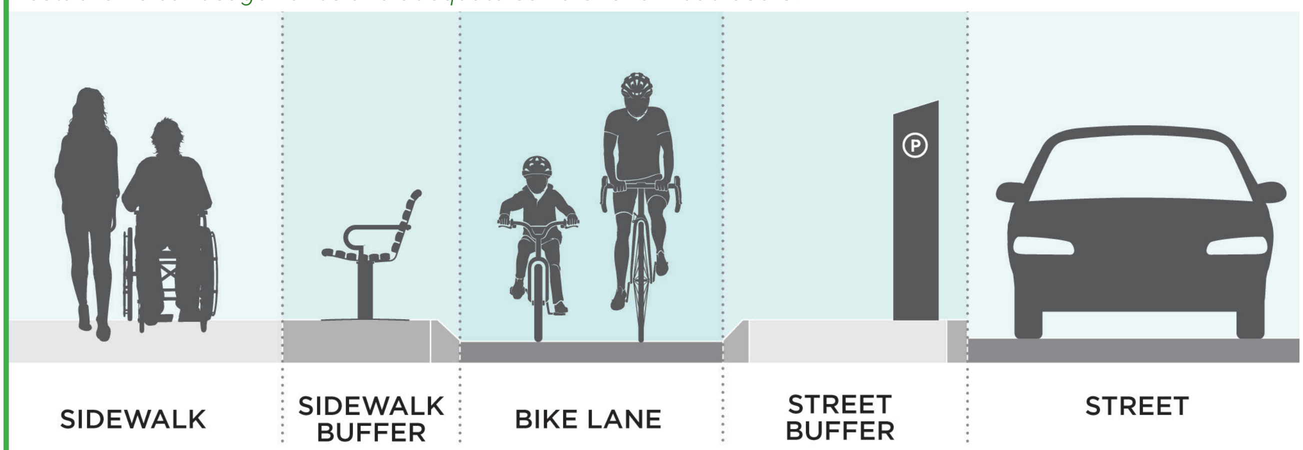
CONTEXT

- Separated bikeways are appropriate at speeds and volumes where bike lanes or buffered bike lanes do not adequately address the comfort needs of the *Interested but Concerned* biking population. These facilities are more appropriate than shared-use paths if pedestrian and bicyclist volumes are expected to be relatively high.
- Two-way separated bikeways are appropriate along routes with incidences of wrong-way riding, along one-way streets, or in locations where they facilitate connection to a shared-use path.

REQUIRED ELEMENTS

- Physical separation may be provided by flexible delineators, parked cars, bollards, planters, or parking stops. When parked cars provide separation, a buffer width of at least 3 feet should be provided for bicyclists to avoid the "door zone."
- The riding area for one-way lanes should be at least 5 feet wide (7 feet if along an uphill grade). For two-way bikeways, the preferred width is 12 feet (10 feet minimum). See page 19 for more information.
- In constrained environments, consider removing a travel lane, reducing the bike lane width, or reducing the sidewalk buffer width (see below). Sidewalk accessibility requirements must be maintained, and adequate street buffer is essential for the safety of bicyclists.

A cross-section shows the essential elements of a separated bikeway to establish clear usage zones and adequate buffers for all road users.



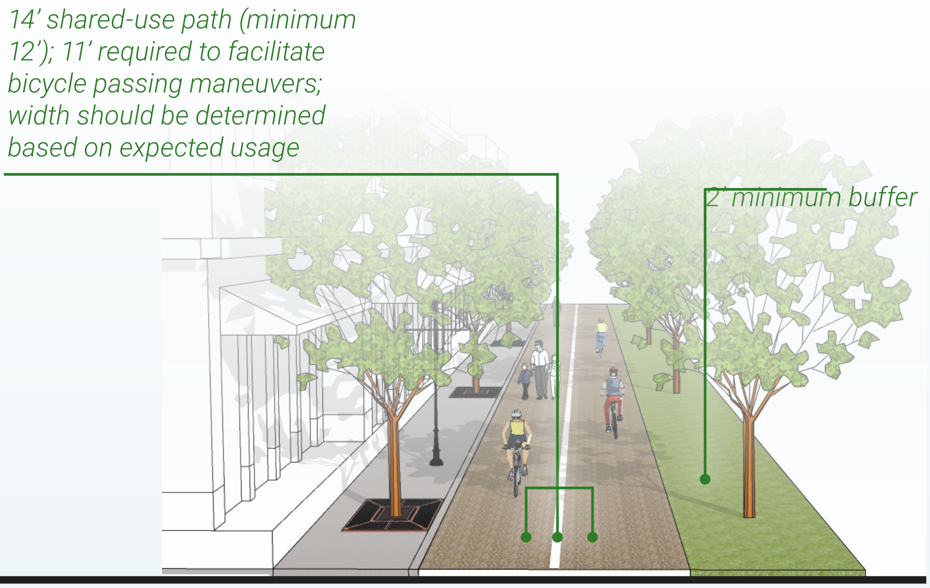
Credit: Adapted by Kittelson & Associates, Inc. from MassDOT Separated Bike Lane Planning & Design Guide, 2015

REFERENCES ON PAGE 55

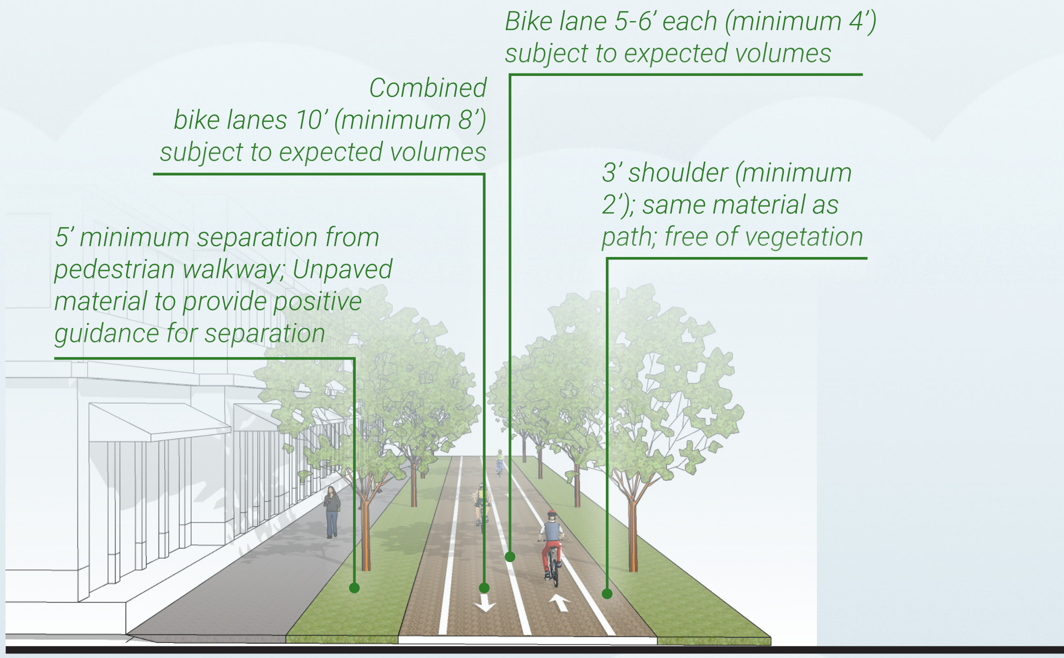
BIKEWAY FACILITY TYPE

Typical Cross-Sections

The following cross-sections represent typical cross-sections for different bikeway types. Preferred lane widths (along with minimums) are provided, along with notes about several such dimensions. Caltrans (*Highway Design Manual*) guidance was used for Class IV and Class I facilities; Caltrans, NACTO, and AASHTO guidance was used for Class II and III facilities.

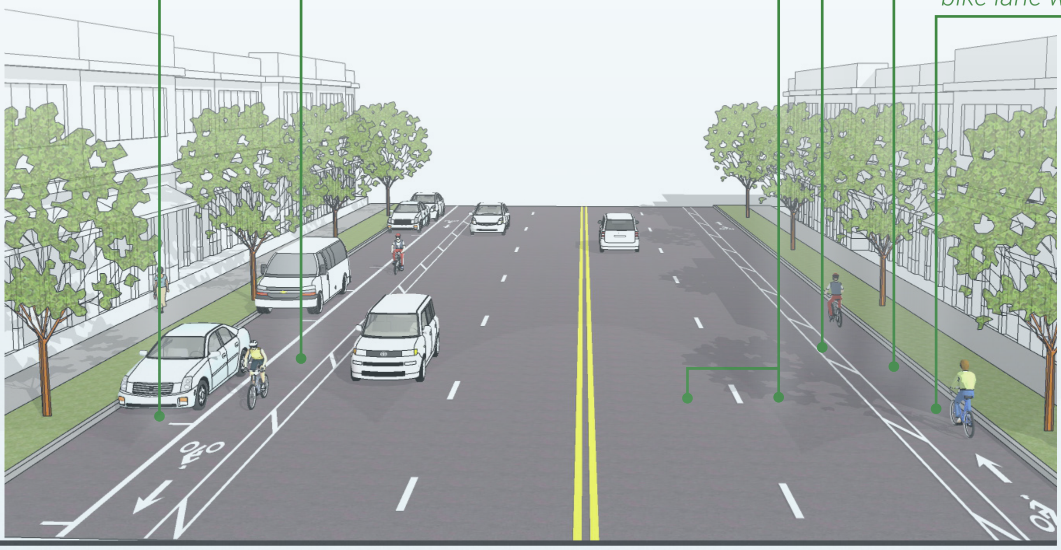


CLASS I – SHARED-USE PATH



CLASS I – TWO-WAY BIKE PATH

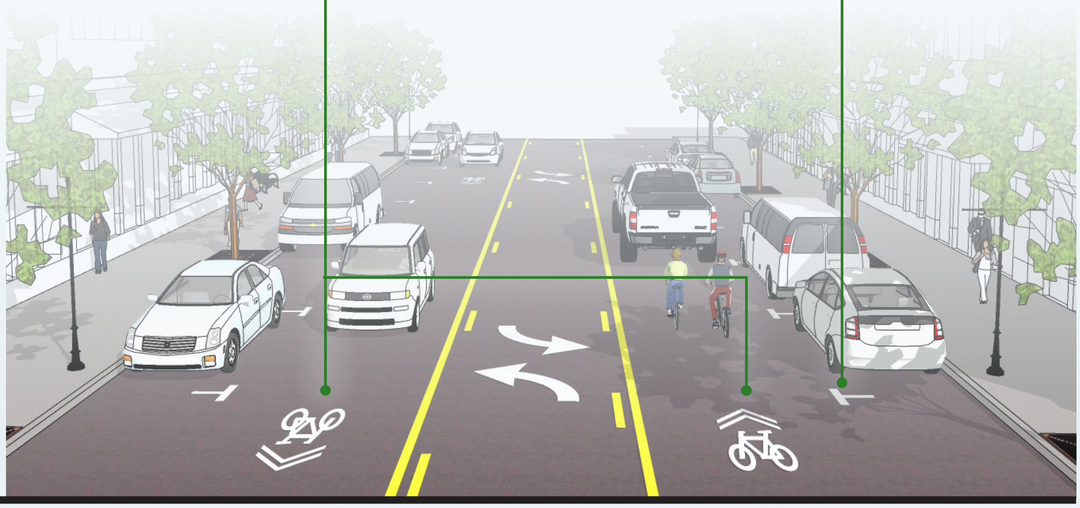
BIKEWAY FACILITY TYPE
- Typical Cross-Sections Continued



CLASS II – BIKE LANE

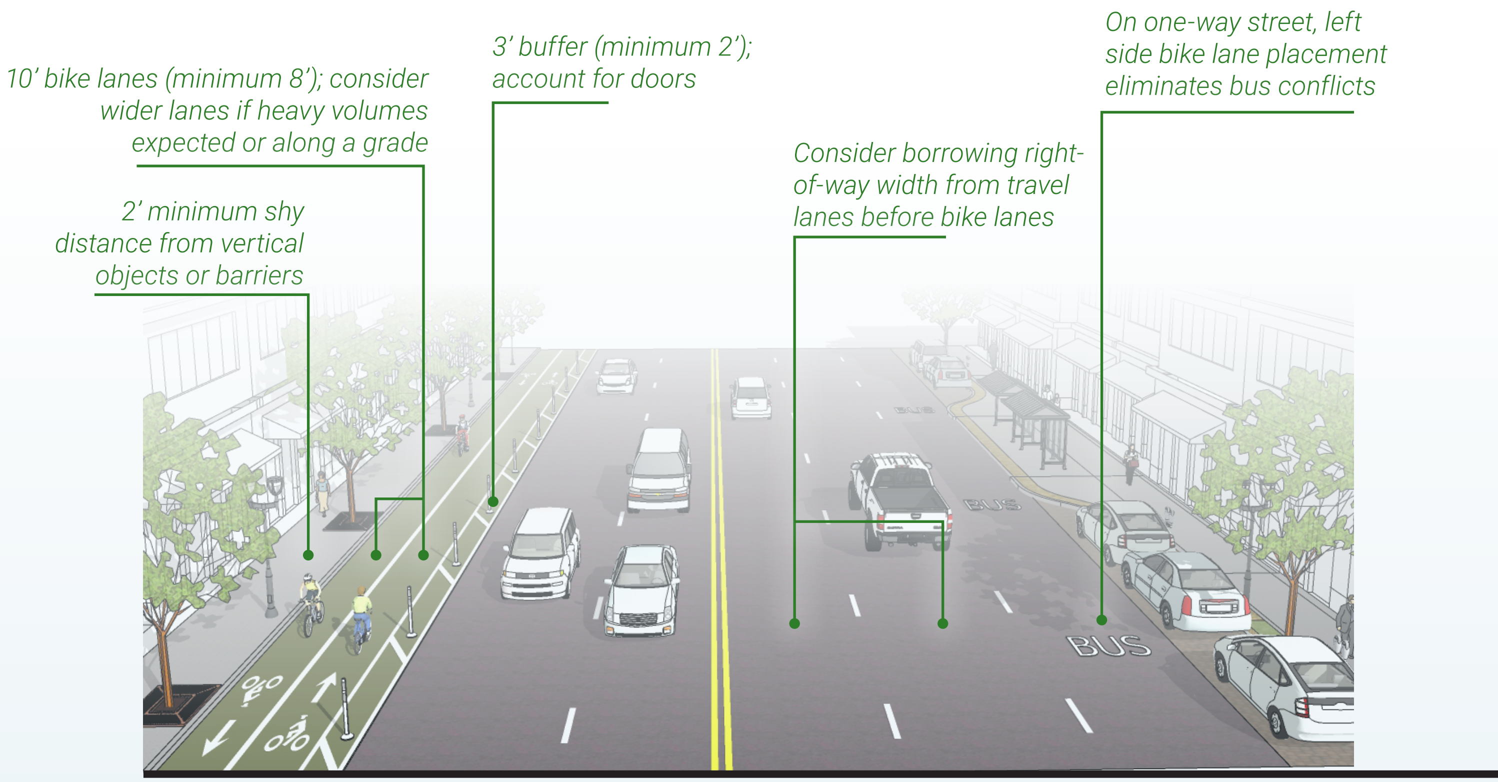
BIKEWAY FACILITY TYPE *- Typical Cross-Sections Continued*

The following cross-sections represent typical cross-sections for different bikeway types. Preferred lane widths (along with minimums) are provided, along with notes about several such dimensions. Caltrans (*Highway Design Manual*) guidance was used for Class IV and Class I facilities; Caltrans, NACTO, and AASHTO guidance was used for Class II and III facilities.

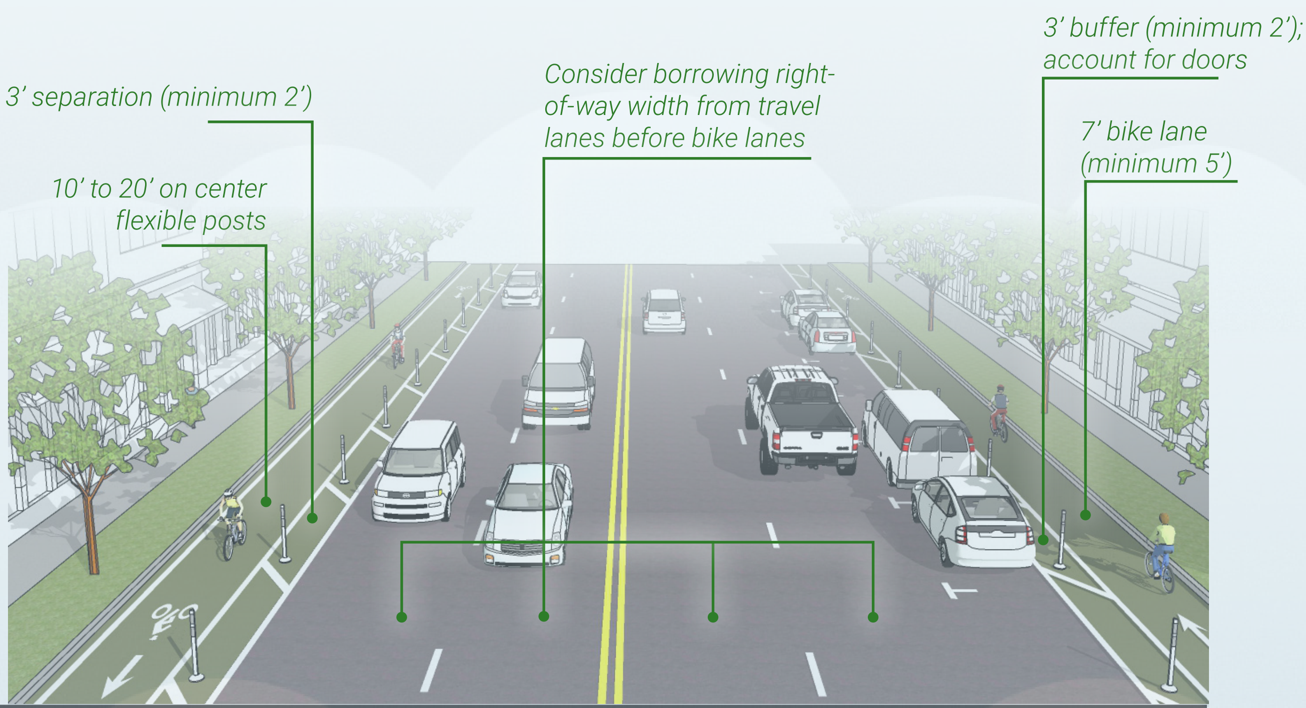


CLASS III – BIKE BOULEVARD

BIKEWAY FACILITY TYPE
- Typical Cross-Sections Continued



CLASS IV - SEPARATED BIKE LANE (TWO-WAY)



CLASS IV - SEPARATED BIKE LANE (ONE-WAY)

DESIGNING WITH TRANSIT

DESCRIPTION

Bicycle, pedestrian, and transit infrastructure may create conflicts where they mix. Bus stops and bikeway-friendly designs can help accommodate people biking, and should retain and promote accessibility and safe transit access.

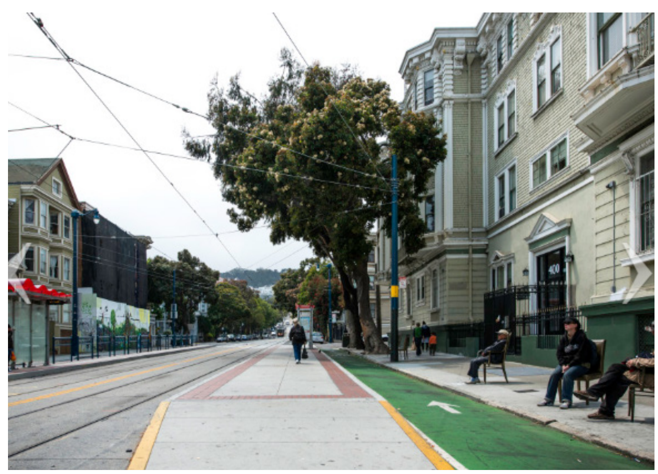
A transit boarding island separates and vehicle and bicycle movements and provides with passenger loading areas between the two.

Credit: NACTO

Transit boarding island adjacent to two-way separated bikeway (Seattle).

Credit: Dongo Chang

A transit boarding island creates space for a bikeway to pass and allows in-lane stops.



Credit: SFMTA

DESIGNING WITH TRANSIT
Continued

CONTEXT

- A bike lane bend is a common way to accommodate both fluid bus operations and low-stress cycling by bending the bicycle lane to the right of a transit stop (see picture below, left).
- Side boarding islands are dedicated spaces for pedestrians to queue at a transit stop while allowing a bikeway to pass, reducing pedestrian-bicycle-transit conflicts among road users.
- Transit boarding islands eliminate most conflicts between buses and bicyclists and also provide a pedestrian refuge, thereby reducing the roadway crossing distance.

DESIRED ELEMENTS

- The key for designing Class IV bike lanes at transit stops is to maintain clear boarding and alighting areas and pedestrian access.
- Consider transitioning a separated bikeway to sidewalk level to keep pedestrian crossings at the sidewalk and boarding island level.
- At bus stop, provide bicycle parking that is clear of the bus's path of travel and the pedestrian through zone.

REQUIRED ELEMENTS

- Pedestrian crossings should always be placed within clear sight-lines of bus stops.
- Where bike lanes are routed behind a bus stop and transit boarding island are provided, access to the boarding island from the crosswalk should include a detectable edge and ample room for waiting, boarding, and alighting passengers.

A bike lane bend separates bicycle movements and allows the bus to move out of the flow of traffic.

Credit: NACTO

Shared cycle track stops are a type of transit stop for constrained streets where the boarding area is shared with a separated bikeway.

Credit: Payton Chung

REFERENCES ON PAGE 55

INTERSECTION TREATMENTS

Bike Boxes

DESCRIPTION

A bike box is a dedicated area at the head of a traffic lane at a signalized intersection that provides bicyclists with a safe and visible way to get ahead of queuing traffic during the red signal phase. Bike box implementation is allowed per FHWA Interim Approval IA-18.

COST ESTIMATE:

$1,000 each

Cost estimate is for a bicycle box on a single intersection approach.

FHWA required bike pavement marking in a bike box in San Francisco.

Credit: Kittelson & Associates, Inc.

A bike box enhances visibility and helps to prevent right hook collisions.

Credit: NACTO

A cyclist approaches a bike box; note also the striping of the bike lane through the intersection.

Credit: DDOT, FHWA Separated Bike Lane Planning & Design Guide

INTERSECTION TREATMENTS
- Bike Boxes Continued

CONTEXT

- Bike boxes are appropriate at signalized intersections with high volumes of bicyclists and right-turning vehicles, typically along a Class II or Class III facility.
- To transition left-turning cyclists across multiple through lanes, consider a two-stage turn queue box instead of a bike box (see page 25).
- Bike boxes reduce instances of bicyclists and drivers encroaching into pedestrian crosswalks when stopped at an intersection.
- Bike boxes only provide benefit for bicyclists who arrive during a red signal phase.

MUTCD R10-6 and R3-7bp.

A bike box provides leading position for cyclists at a signalized intersection in San Francisco.

Credit: Marc Caswell San Francisco Bicycle Coalition

DESIRED ELEMENTS

- "Wait Here" pavement markings can be placed in advance of the bike box as reinforcement for drivers not to impede the bike box.
- A STOP HERE ON RED (MUTCD R10-6 or R10-6a) sign can be used at the advance stop bar, with an EXCEPT BICYCLES (MUTCD R3-7bp) plaque below.
- Green paint highlights the bike boxes for clear visibility.

REQUIRED ELEMENTS

- Right turn on red and bike boxes are not compatible. Use approved MUTCD "NO RIGHT TURN ON RED" signs shall be used (R10-11).
- A bike box shall include an advance stop line at least 10 feet in advance of the intersection stop line, with at least one bicycle pavement marking in the box.
- If a bike box spans multiple approach lanes, use countdown pedestrian signals along that crosswalk to indicate to bicyclists whether they have remaining time to safely reposition themselves.

FHWA required bike pavement marking in bike box.

Credit: FHWA

REFERENCES ON PAGE 55

INTERSECTION TREATMENTS

Two-Stage Turn Queue Boxes

DESCRIPTION

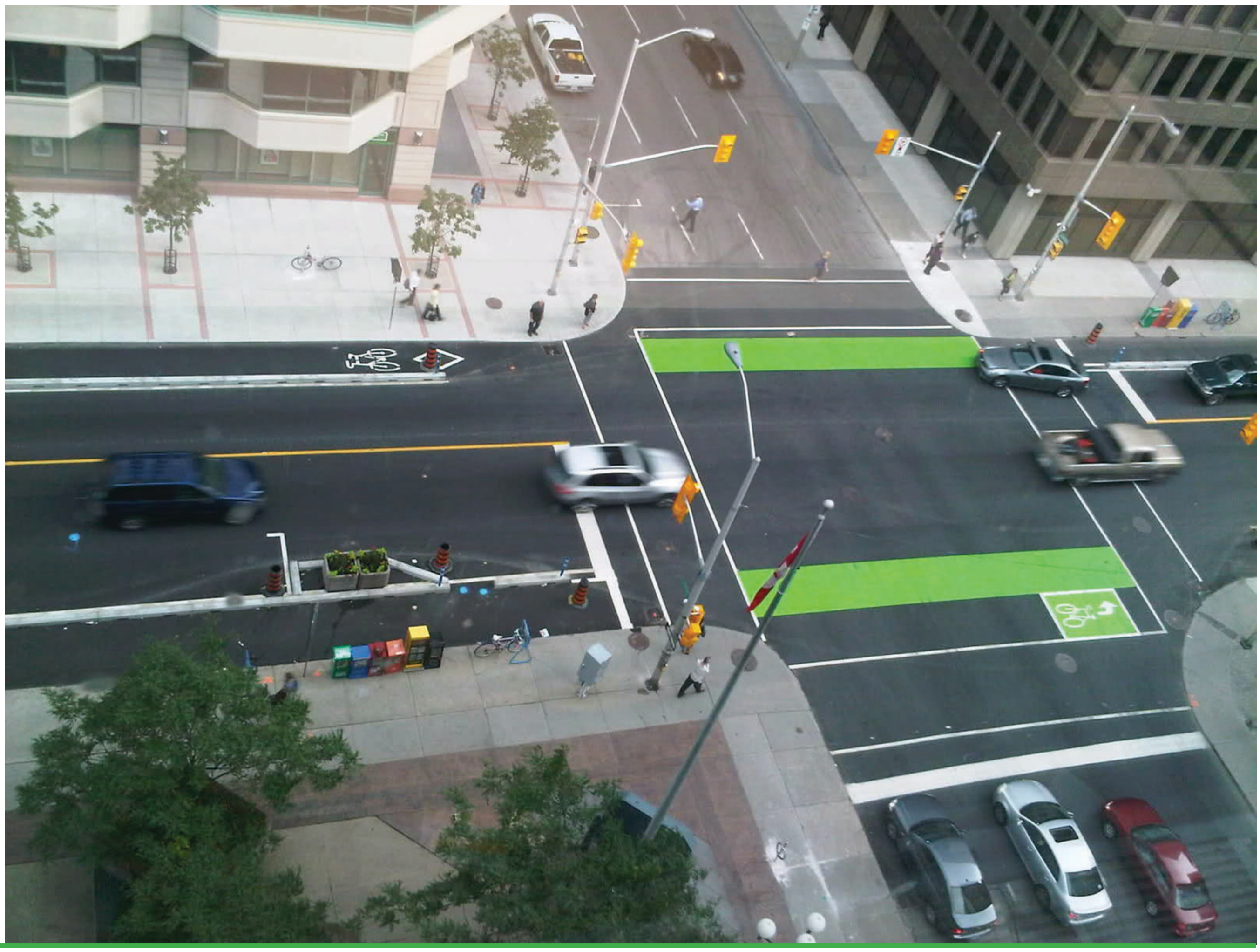
Two-stage turn queue boxes offer bicyclists a dedicated space to make left turns at multi-lane signalized intersections from a right side cycle track or bike lane (or right turns from a left side cycle track or bike lane). Two-stage turn queue box implementation is allowed per FHWA Interim Approval IA-20.

COST ESTIMATE:

$1,000 each

Cost estimate is for a bicycle box for a single intersection approach/turn movement.

Aerial view of recommended two-stage turn box application.



Credit: NACTO

REFERENCES ON PAGE 55

CONTEXT

- Two-Stage Turn Queue Boxes are commonly used to facilitate a left turn across multiple lanes of traffic at a signalized intersection. They may also be used for turns at midblock crossing locations or for right turns from a left-side bike lane.
- Two-Stage Turn Queue Boxes may also be used to facilitate proper angles for crossing tracks (e.g., streetcar tracks).
- The two-stage turn box may still not be naturally intuitive for users, and will increase travel time for left-turning cyclists (who must use two signal phases to clear the intersection).
- Two-Stage Turn Queue Boxes are typically used for cycle tracks at intersections. (See bottom photo).

DESIRED ELEMENTS

The turn box should be sized to provide room for waiting cyclists, up to 10 feet wide and 6.5 feet deep but not less than 3 feet deep. [11]

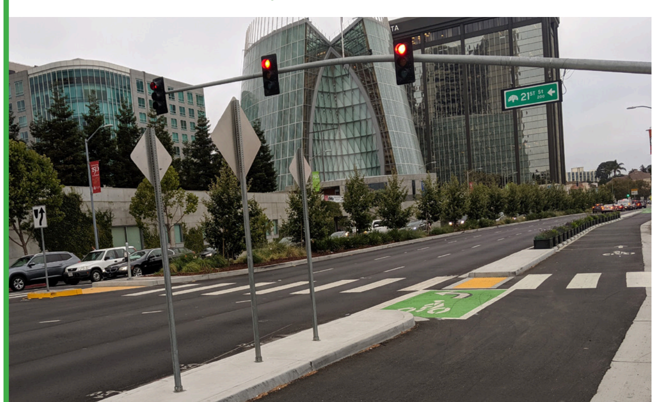
- Appropriate signage may be used to indicate the two-stage turn is provided (MUTCD D11-20L or D11-20R, see below).
- Two-stage turn queue boxes should be located out of the way of through cyclists (see below).

REQUIRED ELEMENTS

- The bicycle symbol and left-turn arrow marking shall be provided within the box, which shall be bounded by solid white lines on all sides (see below).
- An exhaustive list of requirements can be found online at the FWHA's *Interim Approval for Option Use of Two-Stage Bicycle Turn Boxes* (IA-20).

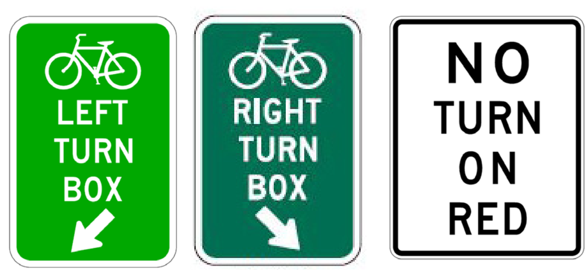
A two-stage turn queue box used to facilitate a left turn at a signalized intersection in Oakland.

A two-stage turn box is used with a signal to transition from a Class IV facility to a Class II bike lane.



Credit: Kittelson & Associates, Inc.

MUTCD D11-20, D11-20r, and R10-11.



Credit: MUTCD

INTERSECTION TREATMENTS

Intersection Crossing Markings

DESCRIPTION

Intersection crossing markings clarify the intended use of space, enhance cyclist comfort, increase motorist yielding behavior, and highlight conflict zones for all road users.[12, 13, 14] The markings presented here are typically relevant at intersections and other conflict points, including driveway access locations. The use of green paint in bike lanes and through conflict areas is allowed per FHWA Interim Approval IA-14.

COST ESTIMATE:

$4,000 per approach

Cost assumes 100 foot length through intersection

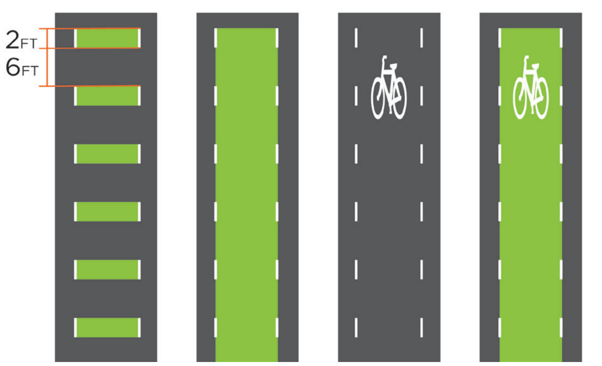
CONTEXT

- The use of dotted white lines and shared lane markings through an intersection can clarify space within the intersection and can also identify conflict areas (e.g,. at a through bike lane - see page 27).
- Green paint can also be used to denote the continuation of a bike lane through an intersection, subject to MUTCD Interim Approval IA-14.[15]

REQUIRED ELEMENTS

- When colored paint is used for bicycle facilities, it must be green to avoid confusion with other traffic control markings (MUTCD 3A.05).

Various intersection crossing treatments. As presented in these examples, green paint used to denote conflict zones or striped through an intersection shall fill the area between dotted white lines.



Credit: Adapted by Kittelson & Associates, Inc. from FHWA Separated Bike Lane Planning and Design Guide

Conflict zone markings highlight the crossing location for a channelized turn lane.

Credit: Kittelson & Associates, Inc.

Green paint denotes the bike lane through an intersection.

Credit: NACTO

REFERENCES ON PAGE 55

INTERCESSION TREATMENTS

Through Bike Lanes

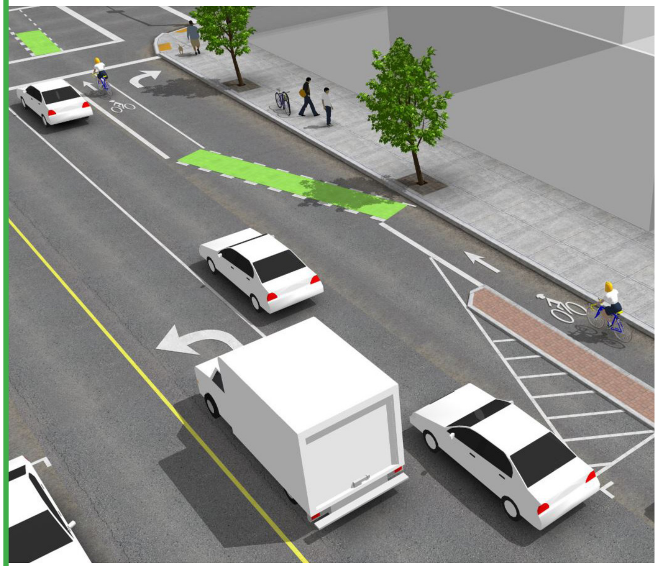
DESCRIPTION
For bicyclists travelling in a conventional bike lane, the approach to an intersection with vehicular turn lanes can present a significant challenge. For this reason, it is vital that bicyclists are provided with an opportunity to correctly position themselves to avoid conflicts with turning vehicles. A through bicycle lane provides a dedicated lateral space between vehicle traffic streams at an intersection (compare with combined lane examples on page 29).

CONTEXT
- Through bike lanes are applied at intersections with Class II or Class IV bikeways and an added turn only lane, or where parking lanes transition to right-turn lanes to the right of bike lanes.
- Through bike lanes are appropriate with greater than 13 feet of clearance to provide separate facilities for bicycles and motor vehicles. With less clearance, consider a combined bike lane/turn lane (see page 28).

DESIRED ELEMENTS
- The merge/conflict area can be highlighted with markings, including green paint (see page 27).
- The right turn lane should be as short as practical to encourage slow vehicle speeds when merging across the bike lane. The merge area should also be no more than 100 feet long for the same reasons.

REQUIRED ELEMENTS
- Use "BEGIN RIGHT TURN LANE YIELD TO BIKES" (MUTCD R4-4) at the beginning of the right turn lane and merge area.
- A through bicycle lane shall not be positioned to the right of a right-turn lane (MUTCD 9C.04).

Aerial view rendering of typical through bike lane application for separated bike lane at an intersection. Note the use of dotted lines, green paint, and a straight travelled way through the vehicle crossover for cyclists.



Credit: NACTO

MUTCD R4-4.

INTERSECTION TREATMENTS

Combined Bike Lane / Turn Lane

DESCRIPTION

Combined bike lane/turn lanes provide a shared space serving through cyclists as well as right-turning vehicles at an intersection. The designation is provided with pavement markings and signage and is provided as an alternative to dropping a bike lane on an intersection approach.

CONTEXT

- Combined bike lane / turn lanes are appropriate in locations with a high right-turning vehicle volume but not enough lateral space to provide a through bike lane (less than 14 feet total).
- With a Class IV approach and/or a very high right-turning volume, consider providing a bicycle signal phase (see page 35) or a separated bikeway intersection approach (see page 31).
- Mixing zones are generally appropriate as an interim solution or in situations where severe right-of-way constraints make it infeasible to provide an alternative.

DESIRED ELEMENTS

- Bicycle pavement markings should provide guidance for lateral bicyclist positioning within the lane.
- The combined lane should be between 9 and 13 feet; at 14 feet, a separate through bicycle lane can be considered (see page 27).
- Either a dotted 4-inch line and bicycle marking should clarify a minimum 4 feet of width for bicyclist positioning (below, left); or a shared lane marking (MUTCD Figure 9C-9) may be used (below, right). The latter is referred to as a “mixing zone.”

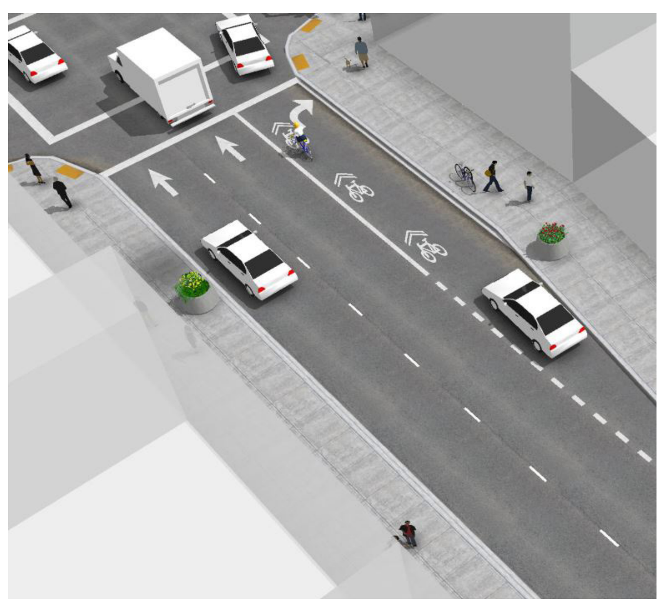
REQUIRED ELEMENTS

- The merge area should be as short as practical (no more than 100 feet long) to encourage low vehicle speeds. Use “BEGIN RIGHT TURN LANE YIELD TO BIKES” (MUTCD R4-4) to denote the beginning of the merge area.

MUTCD R4-4.

Two options exist for denoting the use of space in combined bike lane/turn lanes, depending on lateral clearance available. Both options include denoting the space for cyclists within the lane.

Credit: NACTO



Credit: NACTO

INTERSECTION TREATMENTS

Protected Intersection

DESCRIPTION
A protected intersection provides physical separation for bicyclists up to and through an intersection. The physical separation is intended to control speeds, promote visibility, and reduce conflicts among motorists, cyclists, and pedestrians at an intersection.

CONTEXT
- Protected intersections are a preferred design where Class IV bikeways are present on one or both streets approaching a signalized intersection.

DESIRED ELEMENTS
- Corner refuge islands should be designed to provide at least 6 feet of width, with enough room for a cyclist to wait at a red light. The corner island should also have a radius that encourages slow vehicle turning speeds (10 – 15 feet).

REQUIRED ELEMENTS
- Pedestrian crossing islands shall be at least 6 feet wide and should comply with ADA guidelines.

Protected intersections include the use of corner refuge islands to clarify the use of space and manage vehicle turning movements. Note this location, a partial protected intersection, includes a two-way separated bike lane and pavement markings to alert crossing pedestrians to look both directions for cyclists.

Credit: People for Bikes

REFERENCES ON PAGE 55

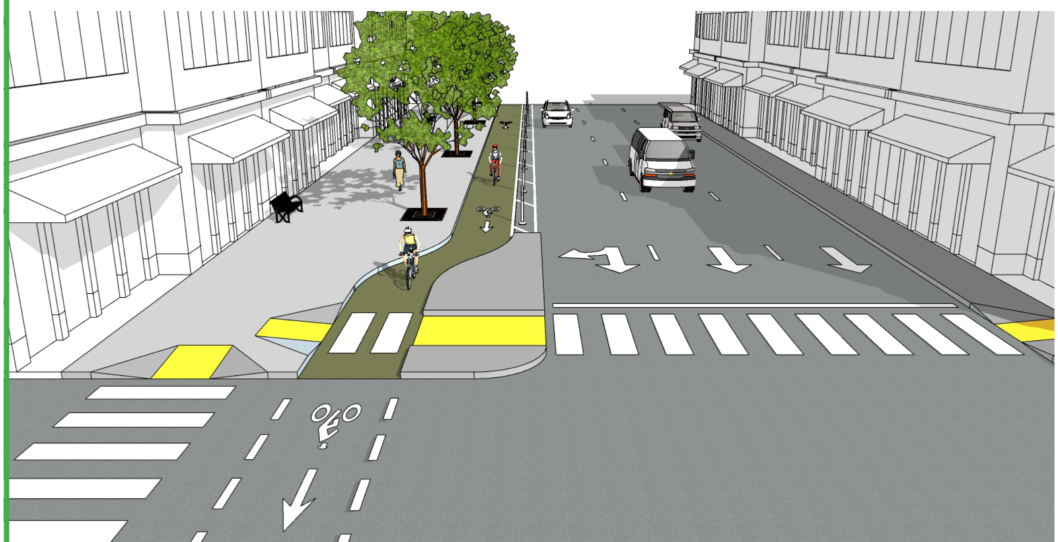
INTERSECTION TREATMENTS

Separated Bikeway Intersection Approach

DESCRIPTION

As an alternative to shifting traffic, a Class IV bike lane approach can maintain separation for through cyclists (i.e, keep them to the right of right-turning traffic). The design may either bend cyclists "in" (toward vehicles) or "out" (away from vehicles). The strategies both maintain the physical separation into the intersection but treat turning conflicts differently.

Diagram of the typical application of the bend out design.



Credit: Kittelson & Associates, Inc.

Diagram of the typical application of the bend in design

Credit: Kittelson & Associates, Inc.

CONTEXT

- A bend-in requires less lateral space but comes at the expense of on-street parking on the intersection approach; it is preferred to pair this with a corner extension (a protected intersection element) to extend the motor vehicle yielding zone.
- A bend-out increases the separation between cyclists and right-turning vehicles to improve visibility and reinforce the right-of-way for through cyclists.
- A bend-out may be raised and paired with a raised crossing on a low-volume side street.
- Both options may be cheaper than providing a bicycle signal with bicycle phase.

DESIRED ELEMENTS

- In both designs, a sufficient curb return and distance should be established to manage speeds (10 – 15 feet) and provide right-turning drivers adequate sight distance.
- MUTCD R10-15 (see below) may be used on the development of either intersection approach.

REQUIRED ELEMENTS

- In the bend-out design, adequate refuge space for pedestrian storage and ADA compliance should be retained on the intersection corner.

MUTCD R10-15.

Two-way parking protected Class IV cycle track with "bend in" design.

Credit: NYC Streetsblog

GRADE-SEPARATED CROSSINGS

DESCRIPTION

Grade-separated crossings provide connectivity for Class I paths across system barriers including rail right-of-way, highways, or water barriers. Grade-separated crossings, while expensive, deliver safety and comfort benefits by eliminating conflicts with motor vehicle traffic.

CONTEXT

- Grade-separated crossings are generally appropriate when an at-grade crossing would be challenging or infeasible (e.g., freeways or bodies of water).
- Grade-separated crossings are most appropriate where there is a sense of perceived crossing risk for pedestrians or cyclists and where the path does not involve burdensome out-of-direction travel.[17]
- Grade-separated crossings should only be located where crossing is extremely challenging or infeasible.

DESIRED ELEMENTS

- The crossing (especially an undercrossing) should be well lit to promote increased personal safety.
- Overcrossings should include barriers or railings and should be designed subject to the Class I facility guidance (width, centerline striping, separation of pedestrians and cyclists).

REQUIRED ELEMENTS

- Because most grade-separated crossings are along shared-use paths, the grade should not exceed 5% maximum in consideration of PROWAG (Advisory R302.5). Grades steeper than 5% may be used in extenuating circumstances but are undesirable because they are difficult for many path users and descents may be too steep for some users.

The Schroder overcrossing in Pleasant Hill, California, provides a connection between the Iron Horse multi-use path and the Pleasant Hill BART station.

Credit: SFGATE (www.sfgate.com)

REFERENCES ON PAGE 55

BIKES AT ROUNDABOUTS

DESCRIPTION

Generally, roundabouts provide appropriate speed management for mixing modes, and single-lane roundabouts have historically accommodated bicyclists in-lane. Design standards for multilane roundabouts have evolved and now provide guidance for separating bicyclist movements through the intersection.

Mini-roundabouts are single-lane roundabouts with fully traversable central islands and/or splitter islands. Neighborhood traffic circles include a central island as a traffic calming element but do not observe roundabout operational characteristics (i.e., all approaches yield upon entry).

CONTEXT

- At mini-roundabouts or traffic circles, cyclists may navigate the roundabout using a shared-lane, with pavement markings helping to guide bicyclists through the intersection.
- Separated bike lanes can be accommodated at roundabouts by providing a separated path parallel to the sidewalk following the contour of the intersection crossing across each leg of the intersection with a crossing adjacent to the pedestrian crossing.

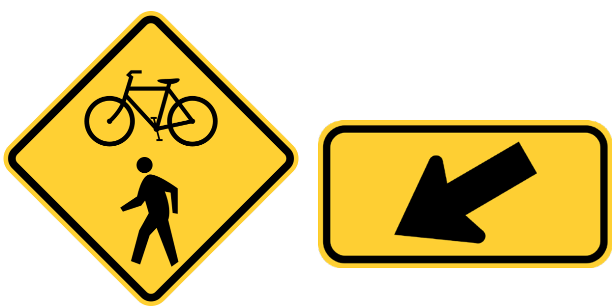
DESIRED ELEMENTS

- MUTCD sign W11-15 and W16-7P (Bicycle/ Pedestrian Warning) should be placed close to the crossing as possible.
- At multi-lane roundabouts with separated bicycle crossings, other traffic control devices should be considered to improve yielding compliance such as an RRFB.

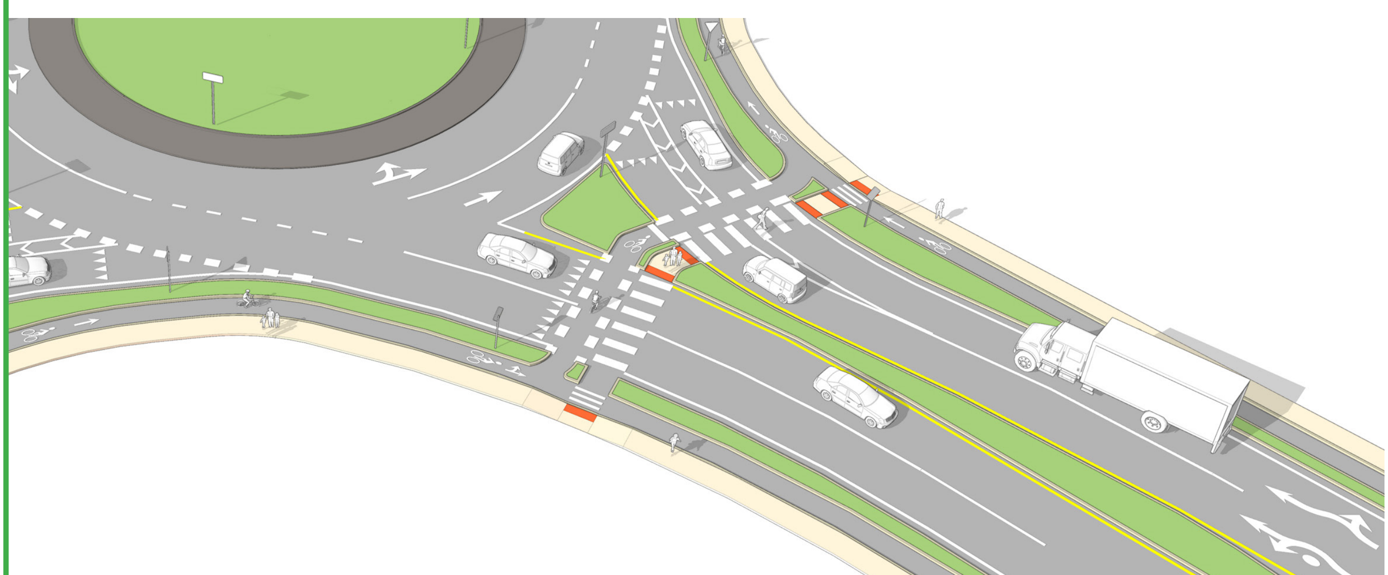
REQUIRED ELEMENTS

- Per the MUTCD, Class II bicycle lanes shall not be provided on the circular roadway of a roundabout and should be terminated at least 100 feet in advance of the circulatory roadway (MUTCD 9C.04).

MUTCD W11-15 and W16-7P.



Separated bicycle crossing at a multilane roundabout with markings and signage.



Credit: MassDOT

BICYCLE SIGNALS

DESCRIPTION

Bicycle signals offer a bicycle-exclusive phase at signalized intersections. Bicycle signals can improve safety and operations at intersections by removing bicycle and vehicle time conflicts in time, or defining different needs from other road users.

COST ESTIMATE:

$27,000 - $78,000

Low end of cost estimate includes bicycle detection loops; high end of cost estimates includes video detection

Bicycle Signal with "Bicycle Signal" Plaque.

Credit: NACTO

The bicycle signal may be triggered through in-pavement loop detectors.

Credit: NACTO

Push-buttons can also be used to trigger bike signals.

Credit: NACTO

BICYCLE SIGNALS
Continued

CONTEXT

- Bicycle signals are most appropriate at locations with high bicycle and right-turning vehicle volumes.
- The bicycle signal phase can be triggered either through push-buttons, in-pavement loop detectors, or video detection. Automatic bike detection can reduce delay for people biking and discourages red-light running. Typically, a bicycle must come to a complete stop on the bike detection marking to trigger the bike signal phase.
- A feedback device emits a blue LED when a bicyclist is positioned over the in-pavement loop detector. This communicates to the bicyclist that the signal will be triggered. This feedback can reduce red-light running behavior. The blue light allow greater flexibility in intersection design and are cheaper than push-buttons.

A bicycle signal with video detection provides transition between Class I and Class II Facilities in Oakland, CA.

Credit: Kittelson & Associates, Inc.

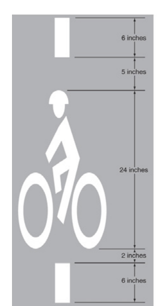
DESIRED ELEMENTS

- The addition of a “Bike Signal” sign plaque below the signal can increase awareness and visibility of the bike signal.
- Although standards to determine the bicycle crossing interval do not exist at this time, they should generally be longer than intervals for motor vehicles due to slower acceleration time.

REQUIRED ELEMENTS

- At intersections with right-turning vehicles, right-turns on red should also be prohibited to prevent conflict with the bicycle movement.
- MUTCD Figure 9C-7 provides guidance on bicycle detector pavement markings.
- In general, consider MUTCD Section 4D.08 through 4D.16 guidance on signal placement. Some existing bicycle signal designs shields the bicycle signal from drivers’ line of sight to avoid potential confusion. NACTO recommends that bicycle signal heads be separated laterally from motor vehicle signal heads by at least two feet to increase road user comprehension.
- Section 4D.105(CA) Bicycle/Motorcycle Detection Standard: 01 All new limit line detector installations and modifications to the existing limit line detection on a public or private road or driveway intersecting a public road (see Section 1A.13 for definitions) shall either provide a Limit Line Detection Zone in which the Reference Bicycle-Rider is detected or be placed on permanent recall or fixed time operation. Refer to CVC 21450.5.

MUTCD plaque R10-22 “To Request Green Wait on” can supplement detector in-pavement markings.



MUTCD 9C-7.

Credit: MUTCD

REFERENCES ON PAGE 55

BIKE PARKING

DESCRIPTION

Short-term and long-term bike parking is an essential part of the bicycle network. A lack of secure and convenient bicycle storage can discourage people from bicycling.

CONTEXT

- Short-term bike parking is intended to be used for a few hours at most and is in public space.
- Long-term bike parking is intended for longer-term (i.e., all-day) use and should be sheltered or indoors to provide greater security.
- Multi-space on-street bike parking is referred to as a bike corral and can store up to 12 bicycles in a single vehicle parking space.[18]

Bike Lockers (like those pictured here at the Hayward BART Station) can provide outdoor long-term bicycle parking.

Credit: Pedro Xing, wikimedia commons

An inverted U bike rack with crossbar is recommended. Note that the crossbar helps to prevent theft in the event that the rack is removed from the ground.

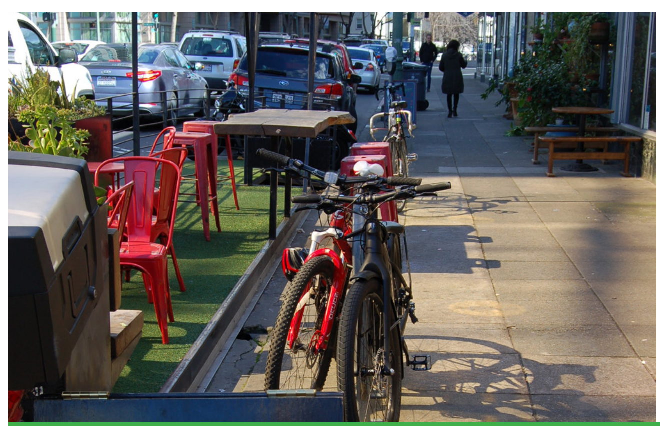
Credit: cyclesafe.com

DESIRED ELEMENTS

- Bike racks should be securely fastened to the ground to prevent a bike from being stolen by removing the rack.
- Bike racks should accommodate U-shaped bike locks to and support the bicycle at two points above its center of gravity to allow the frame and both wheels to be locked (see bottom left).
- Access-controlled facilities improve the security of long-term bicycle parking.

A bike corral in San Francisco provides parking for up to 18 bicycles within the parking lane.

Well-located and abundant short-term bicycle parking provides access and prevents bicycle obstructions into the sidewalk.



Credit: Kittelson & Associates, Inc.

REFERENCES ON PAGE 55

OUTREACH AND COMMUNITY ENGAGEMENT

DESCRIPTION

Community engagement for active transportation projects is critical to solicit feedback on planning and design and to coordinate with stakeholders. Community engagement should be a two-way process, with the opportunity for public input to shape a project early.

A walking tour can help to collect feedback and provide on-the-ground observations about existing conditions.

Community engagement for a proposed project can occur along the project's corridor. Here, the side of a rented van was used to display project plans and solicit feedback.

Credit: Kittelson & Associates, Inc.

CONTEXT

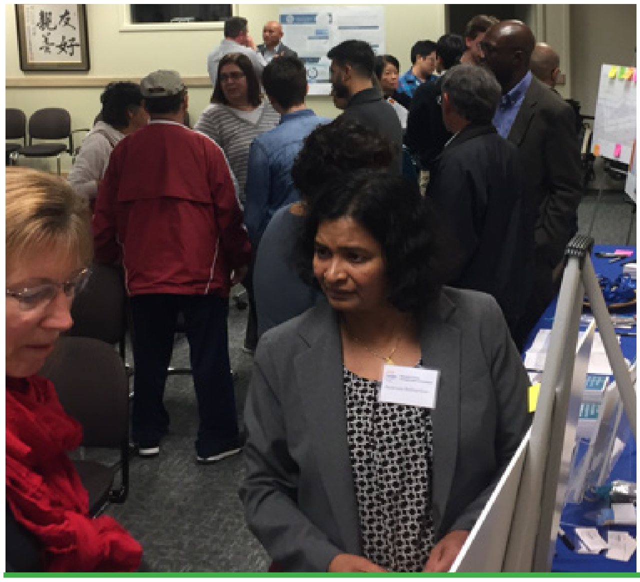
Outreach and engagement can take many forms, including:

- Smaller projects may conduct community engagement at a city council meeting.
- Larger projects should engage the public through multiple methods and gather feedback over a longer period of time (especially early in the project's development).

DESIRED ELEMENTS

- Involving the public early is essential and should include the general public, community-based organizations, the business community, and advocacy groups.
- Public involvement may be done through a Citizen Advisory Committee.
- Target nontraditional locations for meetings to increase the opportunity for participation (see image below).
- Project coordination and outreach may include transit agencies, local fire and police departments, the state DOT, and local maintenance divisions – they may form an Interagency Working Group.
- Providing childcare or transportation can improve opportunities for community engagement.

Community engagement meetings are a great opportunity to solicit feedback and should be held early in the process when input can help shape the project.



POP-UP / TEMPORARY FACILITIES

DESCRIPTION

"Pop-up," or temporary, facilities provide a short-term demonstration of a project's intended purpose. Pop-up projects allow for evaluation of the intended project on a quicker timeline and with a feedback loop that would otherwise not be possible. In general, they provide interim safety measures or a reallocation of road space.

CONTEXT

- Streets can be temporarily shut down to provide a bike- and pedestrian-only shared space .
- Pop-up separated bikeways can show the benefits of the facility to the community.
- Temporary and portable bike parking allows bike parking to be moved around to the locations that are most in demand, such as at events or concerts.

DESIRED ELEMENTS

- Consider implementing a pop-up design during the planning and community engagement phase of project development, both to help the public understand the project and to help refine the design.
- If a road reconfiguration is planned, reallocating existing parking spaces along a single block or a few parking spaces to other uses (e.g., parklet, bike parking, curbside bike lane) can show the benefits of having space devoted to purposes other than vehicle parking.
- Pop-up projects are not appropriate in all contexts; community engagement should be conducted before, during, and after a demonstration to provide information and gather feedback from the public and local business owners.
- Use cost effective materials such as epoxied gravel, planters, bollards, traffic cones, green carpets, and retroreflective tapes, or flexible hit posts that can be deployed and maintained relatively easily.
- Using volunteers with installations can help reduce installation costs and create a sense of community investment.

REQUIRED ELEMENTS

- Temporary projects or facilities should provide the same or better level of safety and should meet ADA and MUTCD requirements.

Community involvement can make temporary installations quick and low cost.

Credit: Kittelson & Associates, Inc.

Temporary separated bike lanes can use any number of items intended to physically separate the space.

Credit: Kittelson & Associates, Inc.

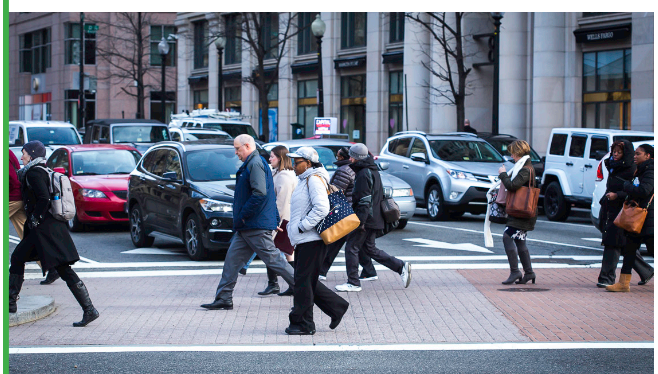
PEDESTRIAN ENGINEERING & DESIGN TOPICS

DESIGNING FOR PEDESTRIANS

DESCRIPTION

There are many types of people who choose to travel by foot or mobility assistive device, including the elderly, youth, and those with mobility impairments. The elements that make up a pedestrian street network (crosswalks, sidewalks, etc) must serve the needs of these users, and the design of these elements must reflect this need.

In areas with high levels of pedestrian activity, crosswalk width may need to be expanded to accommodate pedestrian flow.



Credit: Kittelson & Associates, Inc

Curb ramps are essential to provide access for people crossing with walkers or in wheelchairs. Directional curb ramps as shown are preferred to a single corner ramp.

Credit: Kittelson & Associates, Inc

CONTEXT

Pedestrian-focused design should prioritize the following outcomes:

- Improve safety for people walking.
- Improve comfort and quality of service for people walking.
- Reduce vehicle speeds.
- Minimize out-of-direction walking required.
- Provide accessible infrastructure.

Planters, benches, and other amenities enhance the walking environment by providing separation from motor vehicle traffic but reduce the effective sidewalk width.

Credit: NACTO

Landscape separation between the sidewalk and the street provides cues to pedestrians who are blind and guides them to curb ramps and intended crossing locations.

Credit: NCHRP Report 834: Crossing Solutions at Roundabouts and Channelized Turn Lanes for Pedestrians with Vision Disabilities

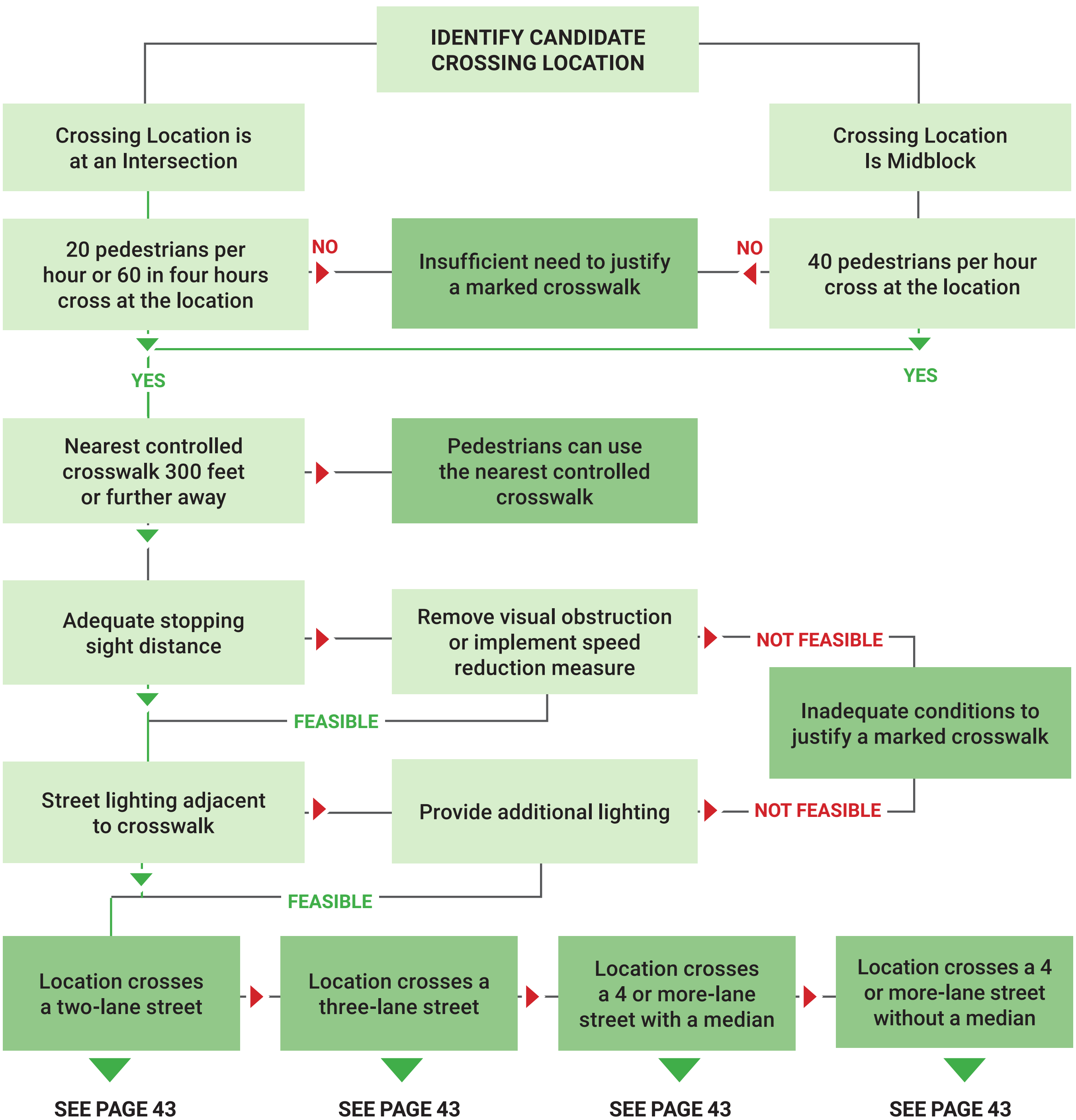
REFERENCES ON PAGE 55

WHERE TO MARK CROSSWALKS

DESCRIPTION

The determination of the location to install a pedestrian crossing and what type of crossing to install, is a factor of several criteria. Pedestrian demand, land-use context, intersection control type, and pedestrian and vehicle volume all factor into the type of pedestrian crossing at a candidate location.

The following flow chart is adapted from SFMTA guidance.



WHERE TO MARK CROSSWALKS *Continued*

	<=30 MPH	35 MPH	40+ MPH
<=9000	All configurations: Consider Level 1 device	**Two-lane, three-lane, 4+ lane w/ median:** Consider Level 1 device **4+ lane w/o median:** Marked crosswalk and additional Level 1 device	**Two-lane, three-lane:** Marked crosswalk plus additional Level 1 device and consider Level 2 device **4+ w/ raised median:** Marked crosswalk plus additional Level 1 device and/or Level 2 devices. Evaluate location for traffic signal.
9,000-12,000	**Two-lane:** Consider Level 1 device **Three-lane:** Consider Level 1 device **4+ w/ Median:** Consider Level 1 device **4+ w/out median**: Marked crosswalk and Additional Level 1 device	**Two-lane:** Consider Level 1 device **Three-lane:** Marked crosswalk plus additional Level 1 device, and consider Level 2 device	**Two-lane, three-lane:** Marked crosswalk plus additional Level 1 device and consider Level 2 device **4+ w/ raised median, 4+ w/o median:** Marked crosswalk plus additional Level 1 device and/or Level 2 devices. Evaluate location for traffic signal.
12,000-15,000	**Two-lane:** Consider Level 1 device **Three-lane:** Marked crosswalk, additional Level 1 device, and consider Level 2 device **4+ w/ Median:** Marked crosswalk, additional Level 1 device, and consider Level 2 device **4+ w/out median:** Evaluate location for pedestrian signal. If no signal, marked crosswalk, additional Level 1 device, and 2 devices	**Two-lane:** Marked crosswalk and additional Level 1 device **Three-lane, 4+ with raised median:** Marked crosswalk plus additional Level 1 device, and consider Level 2 device **4+ w/o median:** Evaluate location for pedestrian signal. If no signal warranted, mark crosswalk plus additional Level 1 and 2 devices	**All configurations:** Marked crosswalk plus additional Level 1 and/or Level 2 devices. Evaluate location for traffic signal.
>15,000	**Two-lane:** Consider Level 1 device **Three-lane:** Marked crosswalk, additional Level 1 device, and consider Level 2 device **4+ w/ Median**: Marked crosswalk, Marked crosswalk, additional Level 1 device, consider Level 2 devices, evaluate location for traffic signal using MUTCD warrants **4+ w/out median:** Evaluate location for pedestrian signal. If no signal, marked crosswalk, additional Level 1 device, and 2 devices	**Two-lane:** Marked crosswalk and additional Level 1 device **Three-lane, 4+ w/ raised median, 4+ w/o median:** Marked crosswalk plus additional Level 1 device, and consider Level 2 devices. Evaluate the location for a traffic signal.	

LEVEL 1 DEVICES:

Signage
Advance stop and yield lines
Refuge islands
Pavement markings
Parking prohibitions
Speed limit signs or changes

LEVEL 2 DEVICES:

Flashing beacons
In-road warning lights
Curb extensions
Road diets
Traffic calming
Pedestrian hybrid beacon
Rectangular rapid flashing beacon

LEVEL 3 DEVICES:

Traffic signal

CROSSING ENHANCEMENTS

Curb Extensions

DESCRIPTION

Curb extensions are traffic calming devices that visually and physically narrow the roadway at pedestrian crossing locations and provide additional space to wait at street corners while reducing crossing distances for pedestrians.

COST ESTIMATE:

$6,500 each

Cost estimate is based on construction and painting of a curb and gutter the approximate size of a curb extension.

Curb extension at a midblock crossing with Rectangular Rapid Flashing Beacon (see page 47). Note the space maintained for a Class II bike lane.

Credit: Kittelson & Associates, Inc.

Curb extensions provide space for green infrastructure

Credit: City of Hayward Green Infrastructure Plan

Curb extensions may act as a traffic calming device and narrow the roadway.

Credit: FHWA

CROSSING ENHANCEMENTS
- Curb Extensions Continued

CONTEXT

- Curb extensions increase visibility of pedestrians by bringing the crossing further into the roadway. This is especially beneficial with the presence of on-street parking at the approach to the crossing.
- Curb extensions are recommended when there is on-street parking.
- Curb extensions can mark the transition to a lower speed roadway. For example, at the entrance to a low-volume residential or local street.
- Curb extensions increase space for pedestrians to wait, which is especially beneficial at intersections with a high pedestrian volume.
- Curb extensions tighten the curb radius and encourage slower speeds on right-hand turns (see below).

DESIRED ELEMENTS

- Curb extensions may impact drainage on some roadways. In this case, curb extensions should be designed as edge islands with a gap between the island and the curb (see below, right).
- The length of a curb extension is recommended to be at least equal to the width of the crosswalk.[20]
- A curb extension should generally be 1–2 feet narrower than the parking lane, except where the parking lane contains materials that integrate it into the sidewalk.

Temporary curb extensions designed using flexible hit posts and paint to reduce curb radii. These are also referred to as "painted safety zones."

Credit: City of Minneapolis

Curb extension designed with gap between island and curb to support drainage.

Credit: Kittelson & Associates, Inc.

REFERENCES ON PAGE 55

CROSSING ENHANCEMENTS

Median Refuge Islands

DESCRIPTION

Median refuge islands are physical crossing enhancements that allow for pedestrians to cross the road in two stages—one direction of travel at a time. Median refuge islands reduce the exposure time for a pedestrian crossing the street.

COST ESTIMATE:

$7,500 each

Cost estimate is based on construction of a curb and gutter the approximate size of a median refuge island.

CONTEXT

- Median refuge islands are most suitable for locations where pedestrians must cross three or more vehicle travel lanes (but may also be considered in other locations, space permitting).
- Medians may also act as a traffic calming feature on high-speed roadways.
- FHWA recommends consideration of median refuge islands when there is a mixture of significant pedestrian and vehicle traffic (greater than 12,000 AADT) and roadways with intermediate or high travel speeds.[21]

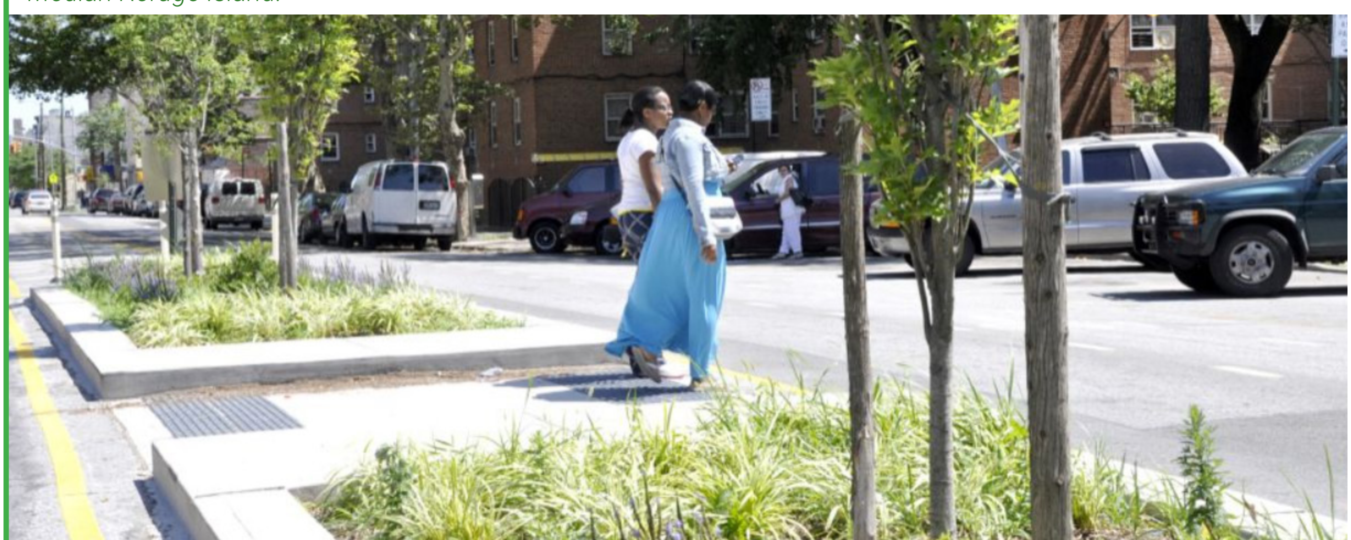
DESIRED ELEMENTS

- A median "nose" extending beyond the intersection protects crossing pedestrians and slows turning vehicles.
- The cut-through or ramp on the median island should be equal in width to the marked crossing leading to it.

REQUIRED ELEMENTS

- Islands are preferably 8-10 feet wide but should be 6 feet wide minimum, based on the length of a bicycle or a person pushing a stroller.
- Where a 6-foot median cannot be achieved, a narrower median may still provide benefit.

Median Refuge Island.



Credit: NYC DOT

REFERENCES ON PAGE 55

CROSSING ENHANCEMENTS

Rectangular Rapid-Flashing Beacons

DESCRIPTION

Rectangular rapid-flashing beacons (RRFBs) are warning signs supplemented with high-visibility LED lights. When activated, RRFBs flash a high-visibility strobe-like light warning drivers when pedestrians are crossing. Installation of RRFBs have shown a reduction of pedestrian collisions by up to 47%.[23]

COST ESTIMATE:

$53,000

Cost estimate includes a base unit cost of $80,000 and soft costs.

CONTEXT

- RRFBs are most suitable for locations with vehicle speeds between 25-35 MPH, vehicle volume greater than 9,000 AADT, and one travel lane in each direction.[19]

DESIRED ELEMENTS

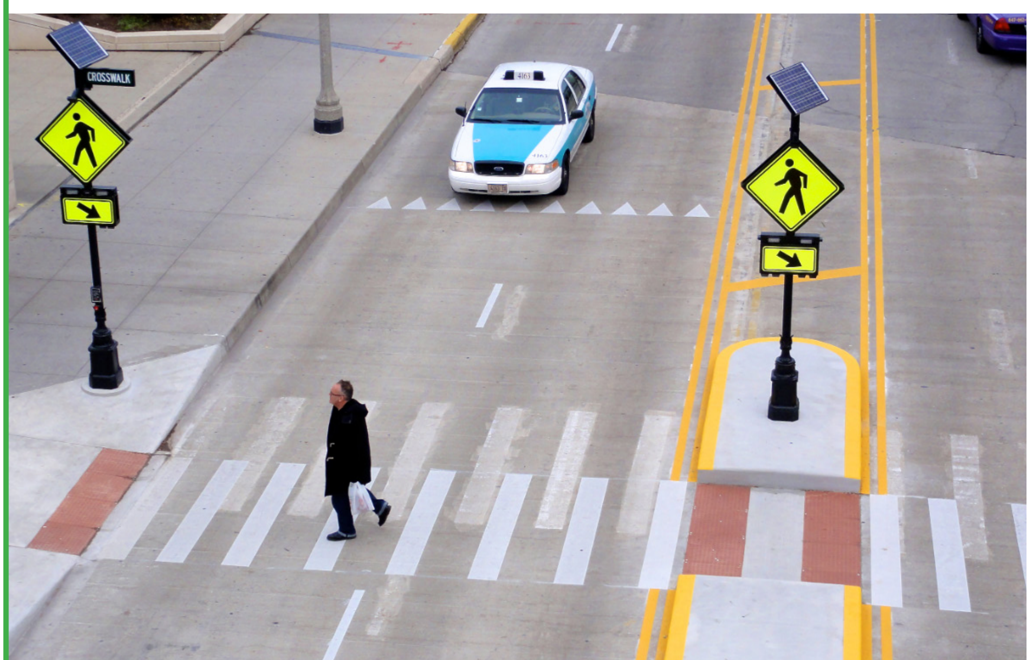
- Installing median pedestrian islands with RRFBs can also provide greater safety for pedestrian crossings with more than two lanes.

- RRFBs are typically activated using push-buttons.

REQUIRED ELEMENTS

- Per FHWA Interim Approval 21, an RRFB shall only be used to supplement a post-mounted W11-2 (Pedestrian), S1-1 (School), or W11-15 (Trail) crossing warning sign with a diagonal downward arrow (W16-7P) plaque, or an overhead-mounted W11-2, S1-1, or W11-15 crossing warning sign.[22]

RRFB Device and Markings.



Credit: FHWA

REFERENCES ON PAGE 55

CROSSING ENHANCEMENTS

Pedestrian Hybrid Beacons

DESCRIPTION

Pedestrian hybrid beacons (PHBs) are traffic control devices that provide dedicated time for pedestrians to cross the street. PHBs can increase safety for pedestrians by requiring vehicles to stop at a crossing location, and they have been shown to reduce pedestrian collisions by up to 55%.[23]

COST ESTIMATE:

$170,000 each

Cost estimate includes a base unit cost of $25,000 and soft costs.

CONTEXT

- PHBs should be considered for locations that do not meet the traffic signal warrant based on vehicle or pedestrian volume criteria, or locations where a traffic signal warrant is met but is chosen to not be installed.
- PHBs are most suitable for high-speed and/or high-volume roadways. Figure 4F-01 and 4F-02 from the MUTCD provide guidance on thresholds to install PHBs for low-speed and high-speed roadways.
- PHBs are suitable for locations where major street volume or speed limits inhibit safe pedestrian crossing, or if pedestrian delay is excessive.

REQUIRED ELEMENTS

- Pedestrian hybrid beacon indications shall be dark (not illuminated) during periods between actuations.
- MUTCD Figure 4F-3 provides the phasing sequence for a pedestrian hybrid beacon.

Pedestrian Hybrid Beacon. Note use of MUTCD R10-23 on the mast arm.

Credit: Kittelson & Associates, Inc.

REFERENCES ON PAGE 55

CROSSING ENHANCEMENTS

Traffic Signals

DESCRIPTION

Traffic signals are pedestrian crossing treatments for previously uncontrolled locations that have significant pedestrian volumes. Traffic signals provide an exclusive signal phase that stops all conflicting vehicular movements. Traffic signals may be activated by a push-button or actuated through pedestrian detection.

COST ESTIMATE:

$525,000 each

Cost estimate includes a base unit cost of $250,000 and soft costs.

CONTEXT

- Traffic signals are appropriate at locations where there is high pedestrian activity, a history of collisions, and motorist compliance at crossings is a high priority.
- If a location is considered for a traffic signal, it should meet CA MUTCD Warrant 4, Pedestrian Volume. The Warrant considers major street pedestrian volume and major street vehicle volume. The minimum pedestrian volume to meet Warrant 4, Pedestrian Peak Hour is 133.[24]

REQUIRED ELEMENTS

- MUTCD Chapter 4E provides engineering guidance for traffic signal heads and other signal elements such as push buttons.
- MUTCD Chapter 4E.06 states that an average walking speed of 3.5 feet per second should be used when determining the traffic signal phase. Using this walking speed establishes the minimum allowable clearance time—depending on expected user characteristics or performance goals, the clearance times can be extended.

Traffic signal for pedestrian crossing, with curb extensions, in Oakland, CA.

Credit: Kittelson & Associates, Inc.

REFERENCES ON PAGE 55

SIGNAL TIMING

DESCRIPTION

Signalized intersections can be modified to prioritize pedestrian safety and improve their experience. For example, shorter signal cycles reduce wait time for pedestrians, extended crossing times allow more time for slower walkers to cross the intersection, and signal phasing can be adjusted to prioritize people walking.

Pedestrian pushbutton at a signalized intersection.

Credit: NACTO

Leading pedestrian interval in Austin, TX.

Credit: NACTO

Controlled crossing with pedestrian signal heads.

Credit: pedbikesafe

CONTEXT

- Leading Pedestrian Intervals (LPIs) give pedestrians a head-start when making crossings and improve safety by making pedestrians more visible to right- or left-turning vehicles. LPIs should be considered at all signalized intersections and especially those with significant pedestrian volumes and motor vehicle right turns.
- Leading pedestrian intervals will increase vehicle delay.
- Pedestrian scrambles, or the Barnes Dance, allows pedestrians to make all crossings (including diagonally) by giving all motor vehicle phases a red indication (see picture below). These are appropriate near college campuses or in areas with heavy pedestrian presence.
- Where the Barnes Dance is used, pedestrian movements are typically restricted for all motor vehicle phases. This may be appropriate for short cycle lengths but may result in compliance concerns.

DESIRED ELEMENTS

- In urban areas, cycle lengths should be targeted between 60-90 seconds. Longer cycle lengths can create burdensome delay for pedestrians.[20]
- Actuated signals should be considered in a suburban environment or where pedestrian and vehicle volumes vary throughout the day.
- Leading pedestrian intervals should be accompanied by accessible signals for blind pedestrians as a cue to being crossing.

REQUIRED ELEMENTS

- Provide a minimum of 3-7 seconds of leading interval for pedestrians.
- Any pushbutton-controlled signals should include accessible pedestrian signals (APS), which communicate WALK/DON'T WALK intervals via audible tones or vibrotactile surfaces. See page 54 for more.

Diagonal crossings and pedestrian-only phases ("pedestrian scrambles") can provide enhanced accessibility in pedestrian-rich environments.

Credit: Santa Monica Next

Curb extensions can shorten the crossing distance and relax signal timing requirements.

Credit: Gina Coffman 2012

REFERENCES ON PAGE 55

TRAFFIC CALMING

DESCRIPTION

Traffic calming is a technique that prioritizes managing or reducing vehicle speed through physical roadway enhancements. Reduced traffic speeds create a safer environment and may encourage more people to choose to walk or bike. Engineers may employ a suite of traffic calming features, including speed humps, chicanes, or curb extensions.

Chicane provided along a Class III bike facility in Berkeley, CA.

Credit: Kittelson & Associates, Inc.

Transverse rumble strips provide a cue to drivers and help to reduce speeds in changing contexts.

Credit: Kittelson & Associates, Inc.

TRAFFIC CALMING
Continued

STRATEGIES

- A chicane combines and alternates curb extensions with parking or additional sidewalk space to force the driver to need to turn slightly on an otherwise straight roadway. This encourages the driver to maintain a safe speed.
- Speed humps are vertical speed management devices that can reduce speeds to 15-20 MPH.
- Speed tables are flat-topped, vertical devices that can be designed to reduce excessive speeding but can allow for much higher target speeds (25 – 45 MPH) than speed humps.
- Raised crosswalks bring the crosswalk to the level of a curb and provide pedestrians with greater visibility. Raised crosswalks are generally applied where low-volume streets or pedestrian and shared-use paths intersect with high-volume streets.
- Lane narrowing is a strategy for managing speed by restriping lanes to decrease their width. This causes drivers to drive more cautiously and at a slower speed.
- Diverters are physical barriers placed at intersections that restrict drivers from through movements but leave the intersection open for people walking and biking. Diverters are most effective in residential areas where cut-through traffic is viewed as a problem. Diverters may reduce connectivity for vehicles.

Pavement markings clarify a bicycle through movement with vehicle movements restricted at an unsignalized intersection.

Credit: Kittelson & Associates, Inc.

DESIRED ELEMENTS

- Chicanes can be paired with street parking that alternates on both side of the street to create a checkered parking effect.
- In urban areas, lane widths can be as low as 10 feet can be suitable. On designated truck and bus routes, consult with AC Transit before making roadway cross-section changes. Lane widths greater than 11 feet may cause unintended speeding.

A warning sign accompanies a speed hump on a residential street in Seattle.

Credit: NACTO

Diverters close off through-movements to vehicles but leave the intersection open to cyclists.

Credit: Kittelson & Associates, Inc.

REFERENCES ON PAGE 55

ACCESSIBILITY

DESCRIPTION

Public facilities and rights-of-way should be accessible to all users, including those with disabilities. The Access Board has proposed accessibility guidelines for pedestrian facilities in the public rights-of-way (PROWAG). At present, PROWAG serves as best practices; once adopted, PROWAG will become mandatory under the Americans with Disabilities Act (ADA).[25] The Access Board also develops the ADA Accessibility Guidelines (ADAAG), which is used by the Department of Justice and United States Department of Transportation in setting standards.

CONTEXT

- Any pushbutton-controlled signals should include accessible pedestrian signals (APS), which communicate WALK/DON'T WALK intervals via audible tones or vibrotactile surfaces.
- When on-street parking is provided, accessible parking must be included. Access aisles across Class IV or Class I bike facilities are required –the full length of the parking space, with a crosswalk and curb ramp connecting to the aisle. Refer to PROWAG for more details.

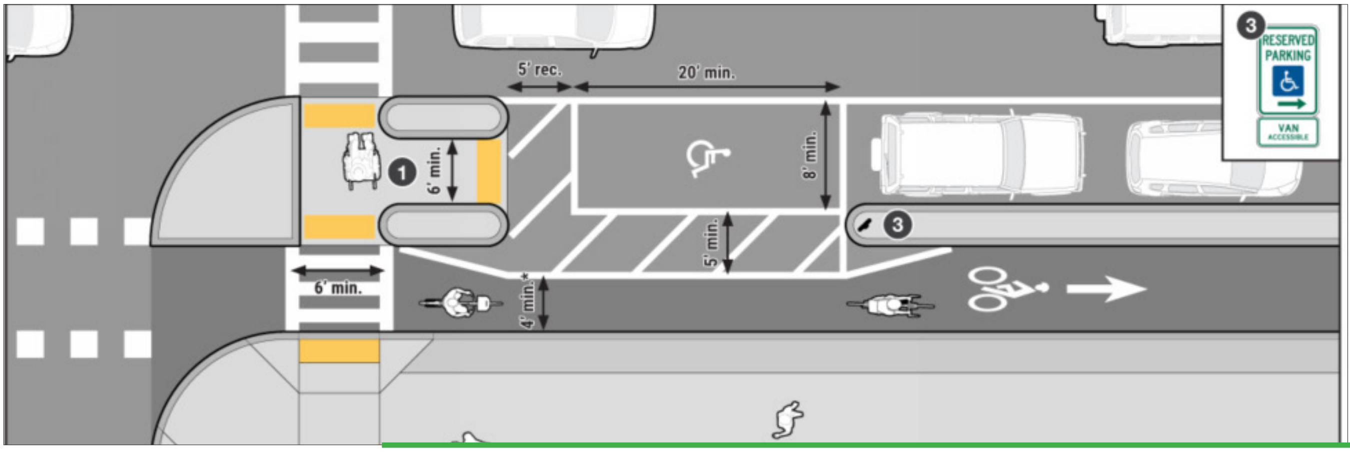
DESIRED ELEMENTS

- Curb ramps should be oriented so that the running slope is in the same direction as the crosswalk; the far side of any crosswalk should be aligned with the nearside ramp and include tolerance for expected deviation from the crossing angle.[26]

REQUIRED ELEMENTS

- Detectable warning surfaces (truncated domes) shall be placed to denote the boundary between pedestrian and vehicular routes. They should be placed at curb ramps, blended transitions at street crossings, pedestrian refuge islands, at-grade rail crossings, transit boarding platforms, and street-level transit stops (PROWAG R208, R305).
- Detectable warning strips should be placed logically (PROWAG R209.1). They should be placed logically near the crossing and provide an accessible route to the crossing (MUTCD Section 4E.08).

Providing accessible parking stalls adjacent to a separated bike lane includes pedestrian crossing islands, cut throughs, and detectable warning strips.



Credit: MassDOT Guide, Exhibit 5C

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KITTELSON
& ASSOCIATES

APPENDIX E

BIKE AND PED CONSTRUCTION ZONE DESIGN GUIDE

PEDESTRIAN AND BICYCLE WORK ZONE ACCOMMODATIONS DESIGN GUIDE

HAYWARD BICYCLE & PEDESTRIAN MASTER PLAN

2019

Quick Guide: Prioritization of Accommodation Treatments

Work zones are unique and dynamic environments and understanding when accommodations are needed is critical to compliance. The Quick Guide below helps you to know when to provide different types of treatments for people walking and biking in a construction zone. Refer to the individual sections in this guide for specific details on each topic.

For both pedestrian and bicycle accommodations, the level of separation between road users provided in the work zone accommodations shall meet or exceed the level of separation under existing conditions. Pedestrian accommodations shall also meet or exceed the level of accessibility and detectability present under existing conditions.

For pedestrians, safe accommodations should be prioritized in the following manner:

1. If possible, the best option is to use the existing pedestrian route by protecting it from the worksite activities.
2. If the existing pedestrian route must be closed for worksite activities, consider the following options:
    a. If a parking lane is available, provide a pedestrian access route in the parking lane.
    b. If there is a two-way left turn lane or other auxiliary lane in the roadway that can be temporarily closed, shift vehicular traffic into the two-way left turn lane and provide pedestrian facilities that are protected from both vehicular traffic and worksite activities.
    c. If there is no auxiliary lane, but there are multiple lanes of traffic in one direction, consider merging the vehicular lanes through the work zone and using the outer vehicular lane for bicycle and pedestrian use.
    d. If there is no parking, auxiliary, or second vehicular lane, but there is an existing bike lane, provide protection from traffic to widen the bike lane and mark it for bicycle and pedestrian use.
    e. If under option 'd' above there is not enough space to widen the bike lane, consider merging bicycles with traffic and using the bike lane for exclusive pedestrian use (protecting it from worksite activities). In this case provide speed controls (signs and channelization devices) to bring vehicular speed down to 25 mph through the work zone.
3. As a **last option** when none of the above options are available, provide a pedestrian detour route. This option should only be considered when all other options are not viable for technical or safety reasons. When used, pedestrian detours should minimize the added distance and added number of street crossings to the route.

For bicyclists, safe accommodations should be prioritized in the following manner:

1. If possible, the best option is to use the existing bicycle route by protecting it from worksite activities.
2. If the existing bicycle route must be closed for worksite activities, consider the following options:
    a. If a parking lane is available, provide a bicycle route in the parking lane.
    b. If there is a two-way left turn lane or other auxiliary lane in the roadway that can be temporarily closed, shift vehicular traffic into the two-way left turn lane and provide bicycle facilities that are protected from both vehicular traffic and worksite activities.
    c. If there is no auxiliary lane, but there are multiple lanes of traffic in one direction, consider merging the vehicular lanes through the work zone and using the outer vehicular lane for bicycle and pedestrian use.
    d. If there is no parking, auxiliary, or second vehicular lane, but there is an existing bike lane, provide protection from traffic to widen the bike lane and mark it for bicycle and pedestrian use.
    e. If under option 'd' there is not enough space to widen the bike lane, consider merging bicycles with traffic and using the bike lane for exclusive pedestrian use (protecting it from worksite activities). In this case provide speed controls (signs and channelization devices) to bring vehicular speed down to 25 mph or lower through the work zone.
3. As a **last option** when none of the above options are available, provide a bicycle detour route. This option should only be considered when all other options are not viable for technical or safety reasons. When used, bicycle detours should minimize the added distance and added number of street crossings to the route.

Table of Contents

Introduction

Pedestrian and bicyclist safety are important concerns in and around work zones in Hayward. Interruptions to vehicular, pedestrian, and bicycle traffic patterns are common around construction sites, and the unfamiliar conditions and lane and sidewalk shifts can be confusing to vehicle operators and particularly hazardous to pedestrians and bicyclists. Specific accommodations for pedestrians and bicyclists are needed because these populations travel at slower speeds than motor vehicles and are more exposed to the safety concerns created by work zones. Characteristics of work zones that can affect these road users more than motorists include lack of through-access, excessive noise, dirt, construction material storage, fumes, and physical lack of protection from construction activities and debris. This document seeks to provide guidance regarding appropriate accommodations for pedestrians and bicyclists as these users transition into, through, out of, or around work zones; it does not replace the guidance provided in the California Manual on Uniform Traffic Control Devices and instead serves as supplemental guidance.

The guidance presented in this document applies to construction, maintenance, and utility work and provides information to aid in developing Temporary Traffic Control (TTC) Plans for pedestrians, bicyclists, and persons with disabilities. Part 6 of the California Manual on Uniform Traffic Control Devices (CA-MUTCD) provides the fundamental principles of Work Zone traffic control, including the design of signs, pavement markings and devices.

Additional requirements for pedestrian access around construction work zones is found in pertinent ADA guidance, including the California Department of Transportation’s *Temporary Pedestrian Facilities Handbook* (2014). The applicable guidance varies according to whether the work is on private property or public right-of-way, although many projects encompass both circumstances.

The information in this document should be understood by all workers who perform maintenance or construction operations in Hayward.

Glossary and Acronyms

ADA – The Americans with Disabilities Act of 1990 is a law that prohibits discrimination based on a disability. It forms the basis for PROWAG.

CA-MUTCD – California Manual on Uniform Traffic Control Devices

PROWAG – The Public-Right-of-Way Accessibility Guidelines are design guidelines that should be applied to all street and building projects to ensure that these, and other facilities are compliant with the Americans with Disabilities Act.

ROW – Right-of-way

TTC – Temporary Traffic Control

TTCP – Temporary Traffic Control Plan

Bikeway – Dedicated bicycle facility, including bike lanes, separated bike lanes, and multi-use paths.

Crashworthy channelization devices – Channelization devices that have been successfully crash tested in accordance with a national standard such as the National Cooperative Highway Research Program Report 350, *Recommended Procedures for the Safety Performance Evaluation of Highway Features.*

Detectable warning strip - A texturally unique, standardized surface feature built in or applied to walking surfaces or other elements detectable by cane or underfoot that alert people with visual impairments of their approach to street crossing hazardous drop-offs. They are used to indicate the boundary between pedestrian and vehicular routes where there is a flush instead of a curbed connection.

Shared roadway – A travel lane where bicyclists and vehicular traffic share the travel lane (i.e., there is no dedicated bicycle-only facility). A shared roadway may or may not be marked with shared-lane markings ("sharrows").

Traffic stress – A measurement indicating the level of stress posed to bicyclists while riding on a given roadway or in a bicycle facility. Higher speed and higher traffic streets are considered more stressful than streets with lower vehicle speeds and/or less vehicular traffic. Separation of bicycle facilities from motorized traffic can also reduce traffic stress.

Shall: A mandatory condition or action, per CA-MUTCD guidelines.

Should: The standard under normal conditions, per CA-MUTCD guidelines.

May: A permissive condition where no requirement for design, application, or standard is intended, per CA-MUTCD guidelines.

General Considerations and Key Principles

CONTEXTUAL CONSIDERATIONS

Appropriate work zone accommodations for pedestrians and bicyclists will vary depending on the context. The eight items listed below should be considered both individually and in combination when determining the appropriate accommodation for a work site.

1. Land use

Construction projects will likely have the highest impact on pedestrians and bicyclists in urban areas, where pedestrian and bicyclist volumes are highest. In dense urban areas, higher volumes of pedestrians and bicyclists should be expected, and work zone accommodations should provide sufficient widths to accommodate these higher volumes. Downtown Hayward has shorter block sizes than the rest of the city; this suggests that the out-of-direction travel may be shorter in Downtown and detours may be a more viable option than in other parts of the city.

2. Roadway right-of-way

The amount of space available in the right-of-way heavily influences the types of accommodations that can be made. Work zones in areas with limited rights-of-way may require creative solutions to provide appropriate accommodations. In areas with limited rights of way, detours may be the best option. Limited right-of-way is not a justification for failing to provide safe accommodations or for defaulting to detours without considering other options.

3. Existing pedestrian/bicyclist volumes

Existing pedestrian and bicyclist volumes can impact the type of accommodation used and the width of the treatment. For example, in areas with high volumes of pedestrians and bicyclists, a narrow multi-use path will likely not provide enough protection for bicyclists and pedestrians, and separate accommodations or wider facilities will be better suited for these areas.

4. Existing vehicle volumes and speeds

The existing vehicle volumes and speeds impact the type of channelization barrier needed to safely accommodate bicyclists and pedestrians. Higher vehicle volumes and/or speeds means that greater separation is needed. In general, high-visibility crashworthy channelization devices (see **Channelizing Devices**) should be used to protect pedestrians and bicyclists from vehicular traffic. For example, if a bike lane on a higher speed/high volume road will be obstructed due to construction, it may not be appropriate to direct bicyclists to share a lane with the motor vehicles. Instead, bicyclists will need to be provided with their own channelized lane or directed to use an alternate route. See **Bicycle-Specific Accommodations** for more detailed on guidance on when to separate bicyclists from motor vehicle traffic.

5. Presence of transit

The presence of transit either in the adjacent travel lane or at a transit stop will influence the type of accommodations made. Where transit stops are present, the transit stop may need to be shifted and a temporary platform built; in other situations, transit stops will need to be temporarily relocated or closed. Regardless of whether the transit stop is moved, pedestrians must be able to access the transit stop and wait at the transit site without a gap in protection from work zone hazards. For instances where access to the existing transit stop will be obstructed or completely blocked by work zone activities, TTCP applicants must coordinate with Alameda-Contra Costa Transit District (ACTC) to determine whether the transit stop should be shifted to a different location or closed, and if the former, what level of access must be maintained. Visit the following website to notify ACTC about planned construction that may interfere with bus service: http://www.actransit.org/customer/contact-us/detour-notification/#constructionevent

6. Proximity of alternate routes

Ideally, detour routes will not be needed to safely accommodate pedestrians and bicyclists, but in some cases, they will be necessary. It is important to consider the proximity of alternate routes for both pedestrians and bicyclists. For pedestrians, it may be reasonable to provide a detour that results in 500 feet to 1,000 feet of out-of-direction travel, but it may not be reasonable to expect pedestrians to travel more than this. For bicyclists, the limit for out-of-direction travel may be longer – 1,500 feet to 2,000 feet may be an acceptable limit. More detailed discussions of appropriate pedestrian- and bicycle-specific detour treatments are discussed in their respective sections of this guide.

7. Existing traffic control treatments (e.g., signs, signals, and pavement markings)

The existing traffic control environment should be used to help determine the appropriate accommodation. If there is a crossing, pedestrians and bicyclists must be able to access the crossing and use the signals as intended. If the work zone obstructs this use, accommodations must be provided. Every effort should be made to maintain the existing level of control and separation between roadway users. If pedestrians are separated from bicyclists under existing conditions, the same level of separation (or more) should be maintained throughout the work zone accommodations. The same holds true for separating pedestrians and bicyclists from vehicular traffic.

8. Duration/time of construction and extent of disruptions

Work zone activities and accommodations should be planned with the duration of the construction and extent of disruptions in mind. Detours in areas with medium to high pedestrian or bicyclist volumes should not last more than one week. Longer projects (lasting more than one week) should strive to use accommodations that maintain existing facilities or realign existing facilities.

References

1. Portland Bureau of Transportation, Traffic Design Manual, Volume 2: Temporary Traffic Control, 2017.

KEY DESIGN PRINCIPLES

- Work zone signs, construction vehicles, and other related construction materials should not be stored or placed within bicycle or pedestrian facilities that are open for use.
- Do not lead pedestrians or bicyclists into conflicts with traffic, construction vehicles, equipment, operations, or hazardous materials. Ensure protection when holes or trenches are adjacent to existing pedestrian or bicycle facilities. Pedestrians and bicyclists should be able to safely navigate through (or around) the construction area without any additional assistance, on-site workers should never guide pedestrians through a work area.
- Provide a convenient, continuous and accessible path and/or bikeway that meets or exceeds, to the maximum extent possible, the accessibility and detectability standards of the existing pedestrian and/or bicycles facilities.[1]
- All surfaces, including temporary walkways, shall be firm, stable, and slip resistant. Routes shall be free of dirt, gravel, construction debris, and protruding objects that prohibit passage (signs, hoses, barriers, materials, vehicles or equipment.)
- If closing a pedestrian or bicycle route, sign the closure in advance at the nearest crossing or diversion point.
- Projects should maintain ADA compliant access throughout the entire duration of the work project. For example, when trenches are plated, asphalt must be used to create a smooth transition so as not to create a tripping hazard.
- Avoid creating a pathway closure in which pedestrians must retrace their steps after reaching the detour sign to continue onto the detour route. Avoid detours that send pedestrians in directions significantly out of their way.
- On-road bicyclists should not be directed onto a path or sidewalk intended for pedestrian use except for shared-use paths of adequate width or where no practical alternative is available.
- If possible, the preferred treatment is to provide separate roadway space for bicyclists through work zones.
- Work zone signage and accommodations should have adequate illumination and use retroreflective materials for signs.

References

1. Federal Highway Administration, University Course on Bicycle and Pedestrian Transportation, Lesson 21; Bicycle and Pedestrian Accommodation in Work Zones, FHWA-HRT-05-125, 2006.

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[1] If the TTC zone affects the movement of pedestrians, adequate pedestrian access and walkways shall be provided. If the TTC zone affects an accessible and detectable pedestrian facilities, the accessibility and detectability shall be maintained along the alternate pedestrian route. Section 6D.01, CA-MUTCD

Pedestrian-Specific Accommodations

Pedestrians have slower travel speeds than bicyclists and motor vehicles and can be put in uncomfortable situations if the appropriate infrastructure is not there to support their movement. This also makes them more sensitive to situations that require out-of-direction travel compared to other roadways users. Pedestrian work zone accommodations should protect pedestrians from work zone activities and ensure that they are separated from vehicular and bicycle traffic to the same degree as pre-work zone conditions.

CONSIDERATIONS

In order to ensure that pedestrians of all ages and abilities can safely travel next to, or around, a work zone, accommodations must meet ADA standards. A detailed discussion of ADA design principles for work zones is provided at the end of this section. Additional design considerations include:

- When affected by an activity, a continuous unobstructed pathway connecting all existing accessible elements (e.g., parking lots, bus stops) through the project must be maintained.
- Pedestrians should be provided with a convenient and accessible path that replicates or improves the characteristics of the existing sidewalk or footpath.
- Pedestrians should not be led into conflicts with work site vehicles, equipment, and operations.
- Pedestrians should not be led into conflicts with vehicles moving through or around the work site.

Figure 1. Detectable warning strip clearly marking the start of the exposed crossing to pedestrians with vision disabilities.

GUIDANCE

Work zone accommodations for pedestrians should include treatments to warn pedestrians of the beginning and end of the work zone. Barriers and other treatments should be used to protect the pedestrians from work zone hazards. Signs should be used to provide direction and warnings to pedestrians and other road users.

- Provide a smooth, continuous, hard surface throughout the entire length of the temporary pedestrian pathway.
- Make sure accessible pathways are free of sharp edges, uneven grading, and obstructions that can cause tripping, falling hazards or be a barrier to the use of mobility aids, such as wheelchairs or scooters.
- When affected by an activity, a continuous unobstructed pathway connecting all existing accessible elements (parking lots, bus stops) through the project must be maintained.

- A barrier, detectable by a person with a visual disability traveling with the aid of a long cane, must be placed across the full width of the closed sidewalk they would normally use. This barrier must be detectable at foot and hand levels through the entire length of the closure.
- Work zone and detour notifications should be clear and placed in advance of the work zone (in all directions).
- Detours and accommodations should provide an appropriate amount of protection and require the smallest amount of out-of-direction travel.
- To discourage mid-block crossings, place advance signs at intersections rather than mid-block locations.

Figure 2. Sidewalk closed sign (R9-11, CA-MUTCD) should be used to show pedestrians where to cross when a sidewalk is closed.

- Work zone signs, construction vehicles, and other construction materials should not be stored or placed within the sidewalk or other pedestrian pathway that are open for use (see Signs on page 29).
- Both sidewalks on a block should not be closed simultaneously.
- Only one crosswalk may be closed at an intersection at one time.
- Where feasible, the existing pedestrian throughway should be maintained. Closure of a sidewalk or pedestrian pathway shall be deemed the last resort. This can be achieved through narrowing the sidewalk to minimum ADA standards (4 feet) or removing a travel lane or parking lane.
- Pedestrians should remain separated from worksite activity and vehicular traffic with appropriate, crashworthy channelization devices. Where this is not possible (e.g., no parking lanes to remove and there is only one travel lane), a pedestrian detour may be the safest option.
- A reasonably safe route that does not involve crossing the roadway must be provided. If this is not possible, advance signing should direct pedestrians to cross to the opposite side of the roadway. In urban and suburban areas with high vehicular traffic volumes, place these advanced pedestrian signs at intersections.

Figure 3. Pedestrian detour sign (M4-9b, CA-MUTCD) should be used to communicate when pedestrians should follow a detour route.

References

1. California Department of Transportation, Manual on Uniform Traffic Control Devices, 2018.

Transition Areas

- In transition areas, signs must be used to give pedestrians advanced warning of a nearby work zone.
- Tapers and channeling devices should be used to direct pedestrians to the alternate route, if the normal route is obstructed. In some cases, flaggers may be necessary to guide pedestrians to the appropriate location.
- At the end of the work zone, pedestrians should be directed to their normal pathway using tapers, channelizing devices, and signs.
- Transitions should be kept as short as possible. This may require construction of temporary curb ramps to transition pedestrians to a street.
- Warning signs should be used at both the near side and far side of the intersection(s) preceding the disrupted right-of-way.
- Warning signage should be accessible to pedestrians who are visually impaired. Broadcast signage and flashing beacons with an audible tone are examples of signage that could be used to raise awareness of the work zone.
- Tapers and channelizing devices should be used to help pedestrians navigate to the appropriate travel path. Where appropriate, ramps should be used to help pedestrians with mobility challenges navigate grade changes. Ramps are needed when the change in running or cross slope are greater than 8% or 2% respectively.

Table 1. Materials needed for work zone transition areas

Work Zone Transition Area	Materials
Advanced warning area upstream of work zone	▪ Warning signs to inform pedestrians of work zone activity and detour (if applicable)
Transition area upstream of work zone	▪ Warning signs to inform pedestrians of work zone activity ▪ Regulatory signs to denote closed areas (if applicable) ▪ Directional signage to indicate how bicyclists should travel to their temporary facility (if applicable) ▪ Tapers, channelizing devices, flaggers, and ADA accommodations (if applicable)
Termination area downstream of work zone	▪ Transition area with tapers, channelizing devices, and ADA accommodations (if applicable) ▪ Signage indicating the end of the work zone ▪ Directional signage to indicate how pedestrians should travel back to the permanent facility (if applicable)

Prioritization

Pedestrian accommodations should be prioritized in the following way:

1. Where feasible, the best option is to maintain the existing pedestrian pathway.
2. If option one is not feasible, consider adjusting adjacent facilities in the right-of-way to provide a pedestrian diversion adjacent to the existing pedestrian pathway.
3. Where options one and two are not feasible, provide a pedestrian detour as an alternate route.

1. MAINTAIN PEDESTRIAN PATHWAY

Where feasible, the existing pedestrian pathway should be maintained. The pathway may be narrowed to the minimum width of four feet. Pedestrians should remain separated from worksite activity with appropriate, crashworthy channelization devices and ADA compliant accommodations. This may require the addition of **Channelizing Devices**, **Covered Pathways**, or **Ramps.** Error! Reference source not found.

2. ADJUST ADJACENT FACILITIES AND REPLICATE EXISTING PEDESTRIAN PATHWAY

Where it is not possible to maintain the existing pedestrian pathway and ensure pedestrians are protected from work site activities, adjacent facilities in the right-of-way should be altered to create space for a pedestrian route. The following is a list of alterations to adjacent facilities that can completed to provide space for a pedestrian route.

- **Remove on-street parking:** If a parking lane is available, provide a pedestrian access route in the parking lane.
- **Temporarily close a two-way left turn lane or other auxiliary lane:** If there is a two-way left turn lane or other auxiliary lane in the roadway that can be temporarily closed, shift vehicular traffic into the two-way left turn lane and provide pedestrian facilities that are protected from both vehicular traffic and worksite activities.
- **Merge travel lanes:** If there is no auxiliary lane, but there are multiple lanes of traffic in one direction, consider merging the vehicular lanes through the work zone and using the outer vehicular lane for bicycle and pedestrian use.
- **Widen bike lane:** If there is no parking, auxiliary, or second vehicular lane, but there is an existing bike lane, provide protection from traffic to widen the bike lane and mark it for bicycle and pedestrian use.
- **Merge bikes and vehicles:** If there is not enough space to widen the bike lane, consider merging bicycles with traffic and using the bike lane for exclusive pedestrian use (protecting it from worksite activities). In this case, provide speed controls (signs and channelization devices) to bring vehicular speed down to 25 mph through the work zone.

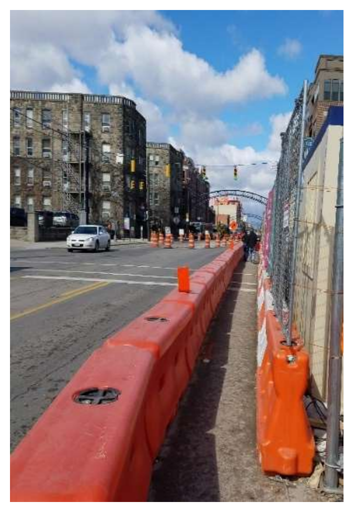

Figure 4. Detectable and crashworthy channelization devices used to mark either side of pedestrian detour constructed in travel lane.

Under all circumstances, pedestrians should remain separated from worksite activity with appropriate, crashworthy channelization devices and ADA compliant accommodations.

3. CREATE PEDESTRIAN DETOUR

When maintenance of existing pedestrian pathways or diversions onto temporary alignments are not feasible, a pedestrian detour should be used to keep pedestrians safe from work zone activities and vehicular traffic. It is highly recommended to keep at least the existing sidewalk on one side of the street and provide a detour or channelized treatment for the other side.

- Wherever possible, keep temporary pedestrian pathways as simple as possible and minimize the necessity for road crossings.
- Design a temporary path as close as possible to the original path—minimize the added travel distance created by the detour.
- Avoid creating a pathway closure in which a pedestrian must retrace their steps after reaching the detour sign to continue onto the detour route. Avoid detours that send pedestrians in directions significantly out of their way.
- Use signs to direct pedestrians to intersection crossings ahead of sidewalk closures to discourage mid-block jaywalking or walking on the closed sidewalk adjacent to the work site.
- Signal timing modifications or addition of temporary crosswalks may be used to accommodate temporary pedestrian crossing movements.
- Access to transit stops should be maintained, unless the stop is temporarily relocated outside the work area or closed.
- Accessibility and detectability guidance should be maintained along the entire detour/diversion, this includes the use of the following treatments: continuous hard surface, minimum widths, temporary curb ramps, tactile warning devices, detectable edges, audible information devices.

Figure 5. Detectable barrier used in combination with pedestrian detour sign (M4-9b, CA-MUTCD) to denote closed crossing and pedestrian detour.

Figure 6. Example of a loading zone used as pedestrian detour while a sidewalk is temporarily closed.

References

1. Portland Bureau of Transportation, Traffic Design Manual, Volume 2: Temporary Traffic Control, 2017.
2. Vermont Agency of Transportation, Vermont Bicycle and Pedestrian Work Zone Traffic Control Guide, 2018.
3. Federal Highway Administration, University Course on Bicycle and Pedestrian Transportation, Lesson 21; Bicycle and Pedestrian Accommodation in Work Zones, FHWA-HRT-05-125, 2006.
4. California Department of Transportation, Manual on Uniform Traffic Control Devices, 2018.

Covered Pathways

Where work activities are planned to take place above a pedestrian walkway (i.e. bridge work or on a building with little or no setback from the sidewalk) for an extended period, the TTCP shall include means to provide a covered walkway, or protective overhead covering, to protect pedestrians from falling or dripping debris. Where this is not feasible, pedestrians should be provided a detour route.

Figure 7. Covered pathway built with detectable, crashworthy channelization devices and detectable warning strip.

DESIGN DETAILS

- Roofs of covered walkways shall be water tight and designed to protect pedestrians from falling objects.
- Covered walkways shall have a clear and unobstructed ceiling height of no less than 8 feet.
- Covered walkways shall have a clear unobstructed width of no less than 5 feet.
- Covered walkways shall not allow unprotected passage along the sidewalk on either side of the covered walkway.
- The interior of the covered walkway shall be adequately lit for nighttime use. Lights shall be installed on the ceiling and provide an adequate level of illumination. Lights must be left on overnight. Lighting should be inspected nightly and burned out or inoperative lights shall be replaced or repaired by the next business day.
- The structural members of the covered walkway shall be adequately braced and connected to prevent displacement or distortion of the frame work.

Figure 8. Covered pathway made of an old shipping container with added lighting and window cutouts.

Areas with No Sidewalk

In cases where a new sidewalk is being installed, and no pedestrian facility is being closed, it is still important to be aware that pedestrians may utilize the area and may need some level of accommodation. At a minimum, if the project area is known to have pedestrian traffic, the overall Temporary Traffic Control Plan should discuss how pedestrian travel through the work zone is to be treated. While not required when there is no existing facility, designers should consider providing a temporary walkway through the work area so that pedestrians know where to go and are protected from construction activities and adjacent traffic.

References

1. California Department of Transportation, California Manual on Uniform Traffic Control Devices, 2018.
2. Vermont Agency of Transportation, Vermont Bicycle and Pedestrian Work Zone Traffic Control Guide, 2018.

Intersections and Crossings

Where work activities extend the entire length of a block, appropriate treatments should be provided to ensure that pedestrians can safely access existing crossings. The following guidelines should be followed:

- At intersections, avoid closing crosswalks.
- At signalized intersections, maintain access to pedestrian push buttons.
- Mark temporary crosswalks if they are relocated from their previous location.
- Include pedestrian phases in temporary signals.
- Place advanced signing at intersections to alert pedestrians of mid-block work sites and direct them to alternate routes.
- Where practical, when directing pedestrians across a roadway, use existing intersection corners and crosswalks – marked or unmarked.
- Avoid creating temporary mid-block crossings if possible. An existing marked mid-block crossing may be used to shorten alternate pedestrian routes. The location of crosswalks must include adequate sightlines for motorists and pedestrians.

Figure 9. Crashworthy channelization devices are appropriately used to delineate a safe pedestrian pathway but leave room for pedestrians to access the existing crosswalks.

Transit Stops

If work activities displace transit stops and other pedestrian access points, the TTCP shall address how pedestrians access those points. However, if the situation will exist during times when workers are not present, the project engineer or supervisor will need to establish a proper diversion path to the transit stop, or relocate the transit stop to a more pedestrian-accessible location and provide sufficient signing/wayfinding information to the new location. This will require that agencies and contractors work with the transit agency to relocate the stop. Pedestrians should not be forced to cross active work spaces to reach bus stops or access points.

Figure 10. Example of a temporary transit platform created to maintain transit access while the sidewalk and roadway immediately in front of the transit stop are temporarily closed.

References

1. Portland Bureau of Transportation, Traffic Design Manual, Volume 2: Temporary Traffic Control, 2017.
2. Vermont Agency of Transportation, Vermont Bicycle and Pedestrian Work Zone Traffic Control Guide, 2018.

TECHNICAL STANDARDS

Minimum and preferred dimensions

This section presents the minimum and preferred dimensions for pedestrian treatments such as sidewalks, curb ramps, and other ADA requirements and best practices. Design standards for pedestrian accommodations such as barriers are listed in **Traffic Control Devices** .

ACCESSIBILITY REQUIREMENTS AND BEST PRACTICES

When existing pedestrian facilities are disrupted, closed, or relocated in a Temporary Traffic Control area, the temporary facilities shall be detectable and include accessibility features consistent with the features present in the existing pedestrian facility. Pedestrian facilities in this instance refers to sidewalks, temporary walkways, street crossings, refuge islands, curb ramps, detectable warning surfaces, pedestrian signals and push buttons, and pedestrian route signage.

The pedestrian work zone accommodations must comply with the CA-MUTCD and *shall meet or exceed* the level of accessibility present on the current circulation route. Recommendations made by the US Access Board in the Public Right-of-Way Accessibility Guidelines (PROWAG) shall be considered when developing the TTCP for any work zone activity that affects pedestrian facilities within the right-of-way. These considerations include, but are not limited to, the provision of curb ramps, detectable barriers, and detectable warning surfaces. Refer to **Appendix B** for Caltrans' work zone area ADA checklist.

- The route should be continuously detectable and free of obstructions such as temporary fence support legs or feet, signposts, and scaffolding.
- The route shall be firm, stable, and slip resistant.
- When an accessible route is transitioned to a surface with a different elevation, such as from the sidewalk to the parking lane, both parallel and perpendicular ramp options are permitted (See **Error! Reference source not found.**).
- At a minimum, 4 feet of unobstructed width shall be provided for pedestrians. For busy streets and non-busy streets, the preferred minimum pathway widths are 6 feet and 5 feet, respectively. Where pathways are narrowed to less than 5 feet, a 5-feet by 5-feet passing space should be provided at least every 200 feet. The width of the existing pedestrian facility should be provided for the temporary facility if practical.
- Eight-feet minimum unobstructed widths should be provided where bicyclists are expected to share space with pedestrians.
- Maximum allowable grades: 8.3% running slope, 2% cross slope.
- Maximum ½-inch vertical deflections and horizontal gaps.
- Same-side travel is preferred because it does not increase ped exposure and risk of accident consequent upon street crossings.

References

1. California Department of Transportation, Manual on Uniform Traffic Control Devices, 2018.

2. Portland Bureau of Transportation, Traffic Design Manual, Volume 2: Temporary Traffic Control, 2017.
3. United States Access Board, Public-Right-of-Way Accessibility Guidelines, 2011.

Detectable Surfaces

- Detectable warning surfaces should be a minimum width of 2 feet in the direction of pedestrian travel.
- It should extend the full width of the flush sidewalk/street interface at pedestrian street crossings, or crosswalks, and its color must contrast with the adjoining surface, either light on dark or dark on light.
- When used in public rights-of-way, detectable warning surfaces should be used in pairs that identify the beginning and ending of a crosswalk.
- Detectable warning surfaces shall meet the requirements of PROWAG section R305 (see **Appendix D**).
- Side detection shall be provided when the route is channelized and changes direction.

Figure 11. A barricade with a detectable edge and a curb ramp with detectable warning strip.

- Do not use caution or warning tape to delineate the path of travel or create a barricade. Tape is not detectable by people with low vision, and they will not be able to detect the message intended by the tape.
- Use only approved pedestrian channelizing devices (PCDs) or barricades and other devices meeting the requirements of a PCD to close a pedestrian route or prevent pedestrians from entering an area.
- Install detectable edging or PCDs between accessible routes and travel lanes along streets with operating speeds 30 mph or less. Consider barriers to provide positive protection to pedestrians along streets with operating speeds greater than 30mph.
- Accessible routes should be continuously detectable and safely guide pedestrians back to the original sidewalk or walkway.
- Detectable edges should be provided along the bottom of any barriers with gaps at the bottom, such as fencing or scaffolding. Bottom edges of barriers such as signs and barricades are considered detectable as is.

References

1. Portland Bureau of Transportation, Traffic Design Manual, Volume 2: Temporary Traffic Control, 2017.
2. United States Access Board, Public-Right-of-Way Accessibility Guidelines, 2011.

3. Federal Highway Administration, Accessible Shared Streets, FHWA-HEP-17-096, 2017.

Audible warnings

The most desirable way to provide information to pedestrians with visual limitations is a speech message provided by an audible information device. Those devices deliver speech messages equivalent to visual signs, for notification of sidewalk closures.

- Devices that provide speech messages in response to passive pedestrian activation are the most desirable.
- Other devices that continuously emit a message, or that emit a message in response to use of a pushbutton, are also acceptable.
- Audible information devices might not be needed if detectable channelizing devices make an alternate route of travel evident to pedestrians with visual disabilities.

Figure 12. Detectable barricade with an audible warning.

References

1. California Department of Transportation, Temporary Pedestrian Facilities Handbook, 2018.

SAMPLE PEDESTRIAN ACCOMMODATIONS

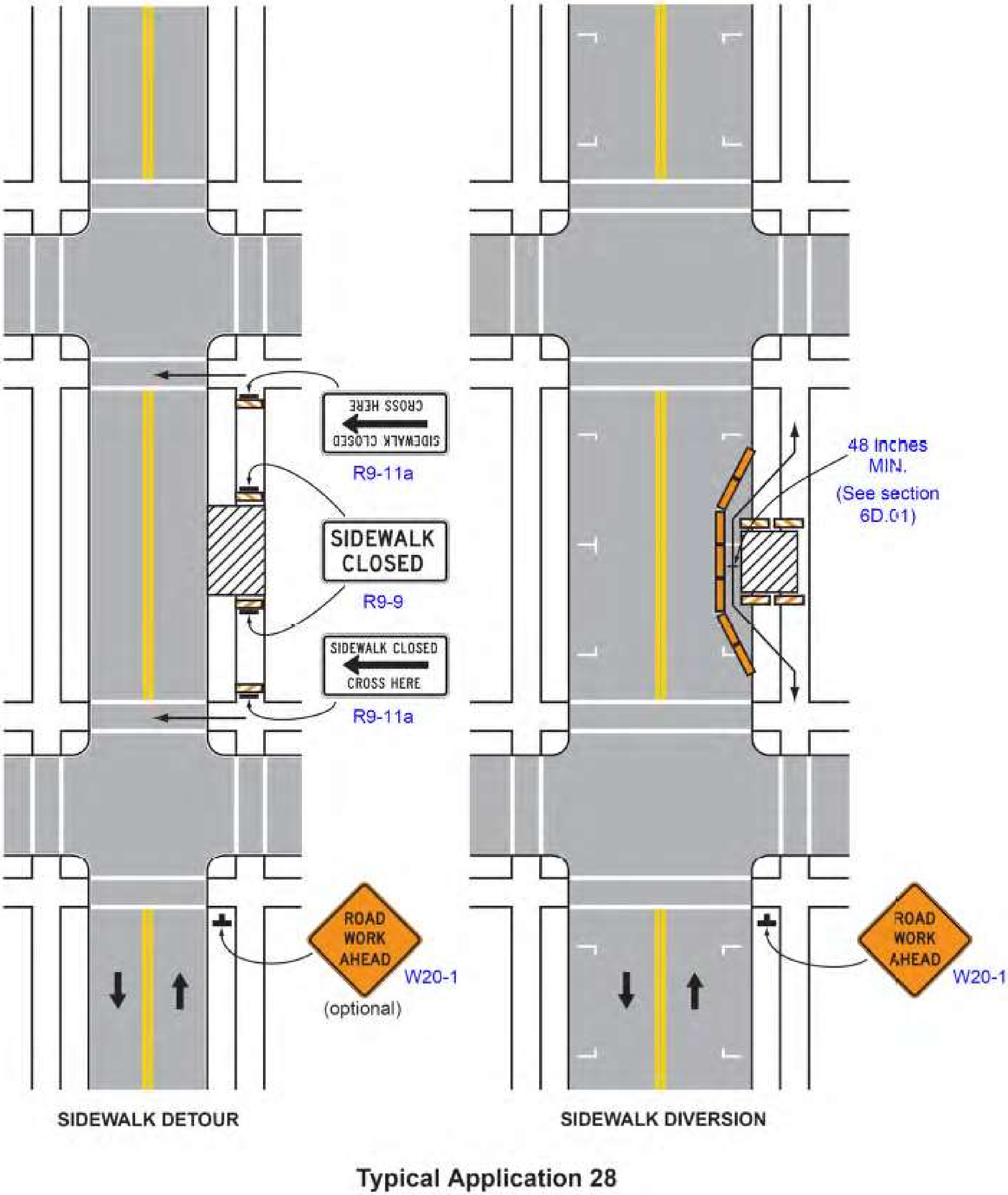

Figure 13. Examples of a sidewalk detour and diversion.
Source: CA-MUTCD, Figure 6H-28

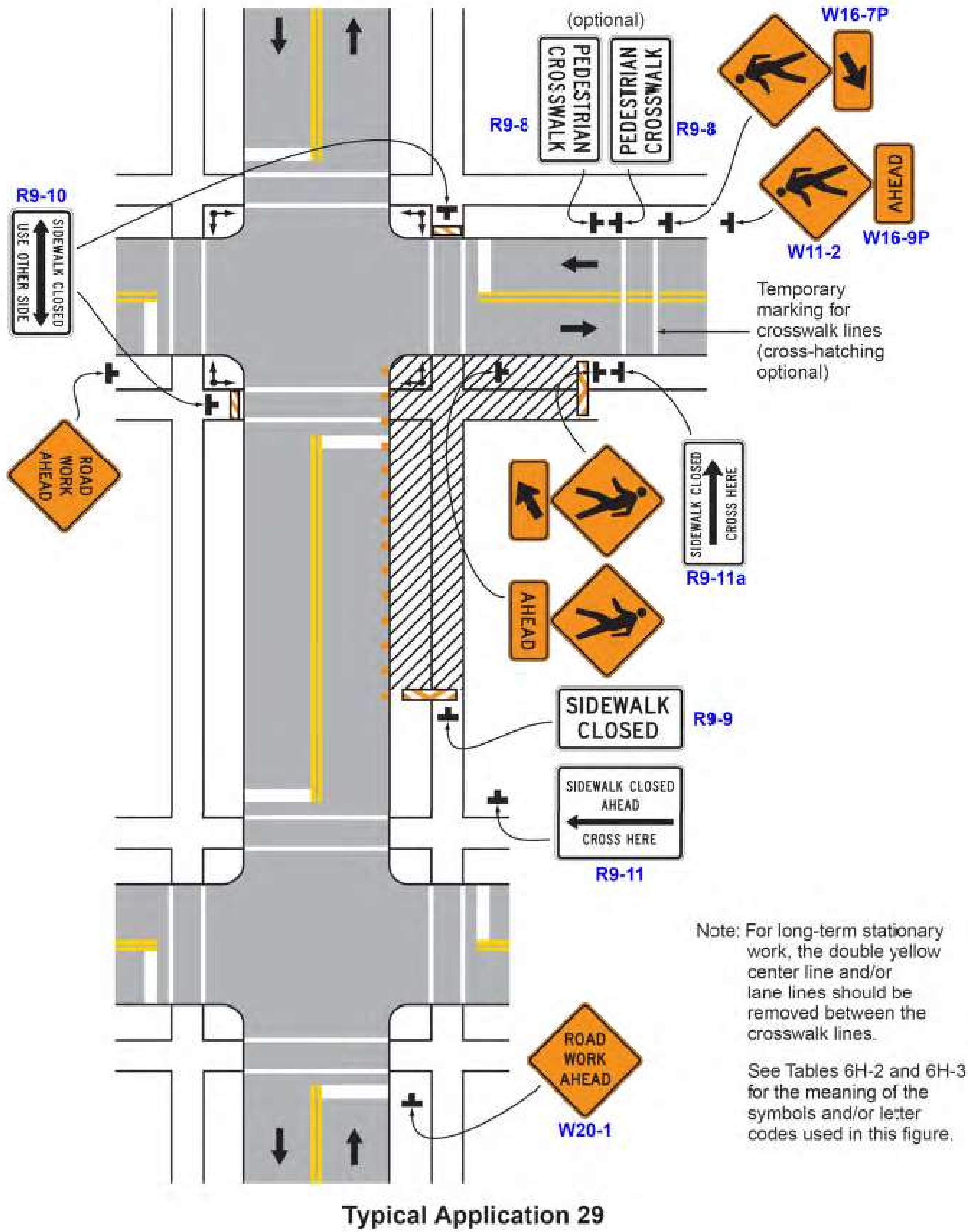

Figure 14. Example of a Crosswalk closure and pedestrian detour.
Source: CA-MUTCD, Figure 6H-29

Bicycle-Specific Accommodations

Bicyclists must be able to safely navigate into, through, and out of work zones. Work zone concerns for bicyclists may include road or path closures, sudden changes in elevation, construction equipment or materials, and other unexpected conditions. Accommodation in the work zone may result in the need for the construction of temporary facilities, including paved surfaces, channelization, temporary lane restrictions, detours, signs, and signals. Bicycle work zone accommodations should protect bicyclists from work zone activities and ensure that they are separated from vehicular and pedestrian traffic to the same degree as under pre-work zone conditions.

CONSIDERATIONS

The needs of bicyclists should be considered when determining whether to close an existing bicycle route and provide an alternative treatment. Closing a bike lane requires the same signage and traffic control as a motor vehicle use lane. In addition to the factors listed in **Contextual Considerations**, the following factors should be considered before closing a bicycle route:

- Existing vulnerability to work zone hazards
- Ability to remove or narrow existing motor vehicle and bike lanes through the work zone
- Ability to safely transition bicyclists into and out of motor vehicle traffic
- Grade
- Frequency of pavement grindings, potholes, and utility lids
- Lighting and sight distance

Figure 15. A parking lane is temporarily repurposed as a pedestrian pathway so that the existing bike lane can remain in place despite the adjacent work zone.

References

1. Seattle Department of Transportation, Traffic Control Manual for In-Street Work, 2018.

GUIDANCE

Work zone accommodations for bicyclists should include treatments to warn bicyclists of the beginning and end of the work zone; barriers and other treatments should be used to protect the bicyclists from work zone hazards and signs should be used to provide direction and warnings to bicyclists and other road users.

- Temporary closures and detours should be clearly marked with signs in advance of the work zone.
- Work zone signs, construction vehicles, and other construction materials should not be stored or placed within bicycle facilities that are open for use.
- Roadway surfaces where bicyclists are expected should be swept regularly to minimize hazards from debris. In locations of high construction activity, the frequency for sweeping could be up to several times per work day.
- Where possible, temporary facilities should maintain the preexisting level of separation between bicyclists and vehicle traffic. This is particularly important for temporary closures of separated bike lanes and shared use paths, as these bikeways often attract people who are not comfortable operating in mixed traffic.
- Where possible, provide a bike lane on the same roadway as the work zone by shifting or narrowing adjacent traffic lanes or removing on-street parking.
- Closure of a bike lane shall be deemed the last resort in the absence of other practicable routing or accommodation options needed to assure the safety of cyclists. When bike lanes are closed, placement of advance signs alerting cyclists to the closure and potential detour routes should be far enough ahead of the closure to allow cyclists to determine their alternate route.
- Dismount zones are strongly discouraged as a form of bicycle accommodation. Only in extreme cases where no other option is available should bicycles be forced to dismount to use a pedestrian facility.

CA-MUTCD Section 6D.101 (CA)

There are several considerations in planning for bicyclists in Temporary Traffic Control (TCC) zones on highways and streets:

A. A travel route that replicates the most desirable characteristics of a wide paved shoulder or bikeway through or around the TTC zone is desirable for bicyclists.
B. If the TTC zone interrupts the continuity of an existing bikeway system, signs directing bicyclists through or around the zone and back to the bikeway is desirable.
C. Unless a separate bike path through or around the TTC zone is provided, adequate roadway lane width to allow bicyclists and motor vehicles to travel side by side through or around the TTC zone is desirable.

Guidance:

D. *When the roadway width is inadequate for allowing bicyclists and motor vehicles to travel side by side, warning signs should be used to advise motorists of the presence of bicyclists in the travel way lanes. See Section 6G.05 for more details.*

Standard:

E. Bicyclists shall not be led into direct conflicts with mainline traffic, work site vehicles, or equipment moving through or around the TTC zone.

Transition Areas

- In transition areas, signs must be used to give bicyclists advanced warning of nearby work zones, so they have enough time and space to transition to their designated alternative route or shared lane.
- Channelizing devices should be used to direct bicyclists to an alternate route if the normal route is obstructed. In some cases, flaggers can be used to guide bicyclists to the appropriate location. Use of devices is only necessary in places where bicyclists were provided a designated travel lane separate from vehicle traffic under existing conditions.
- At the end of the work zone, bicyclists should be directed to their normal bikeway using channelizing devices, and signs.
- Transitions should be kept as short as possible. This may require construction of temporary curb ramps to transition bicyclists to and from the street.

Table 2. Materials needed for work zone transition areas

Work Zone Transition Area	Materials
Advance warning area upstream of work zone	▪ Warning signs to inform bicyclists of work zone activity and detour (if applicable)
Transition area upstream of work zone	▪ Warning signs to inform bicyclists of work zone activity ▪ Regulatory signs to denote closed areas (if applicable) ▪ Directional signage to indicate how bicyclists should travel to their temporary facility (if applicable) ▪ Tapers, channelizing devices, and flaggers (if applicable)
Termination area downstream of work zone	▪ Transition area with tapers and channelizing devices (if applicable) ▪ Signage indicating the end of the work zone ▪ Directional signage to indicate how bicyclists should travel back to the permanent facility (if applicable)

Prioritization

Bicycle accommodations should be prioritized in the following way:

1. Where feasible, the best option is to use the existing bicycle facility and protect it from worksite activities.
2. If option one is not feasible, consider adjusting adjacent facilities in the right-of-way to provide a bicycle route adjacent to the existing bicycle facility.
3. Where options one and two are not feasible, provide a bicycle detour as an alternate route.

1. MAINTAIN BICYCLE FACILITY

Where feasible, the existing bicycle facility should be maintained. The facility may be narrowed to the minimum width. Bicyclists should remain separated from worksite activity with appropriate, crashworthy channelization devices.

2. ADJUST ADJACENT FACILITIES AND PROVIDE BICYCLE FACILITY

Where it is not possible to maintain the existing bicycle facility and ensure bicyclists are protected from work site activities, adjacent facilities in the right-of-way should be altered to create space for a bicycle facility (if one previously existed). The following is a list of alterations to adjacent facilities that can completed to provide space for a bicycle facility.

- **Remove on-street parking:** If a parking lane is available, provide a bicycle facility in the parking lane.
- **Temporarily close a two-way left turn lane or other auxiliary lane:** If there is a two-way left turn lane or other auxiliary lane in the roadway that can be temporarily closed, shift vehicular traffic into the two-way left turn lane and provide bicycle facilities that are protected from both vehicular traffic and worksite activities.
- **Merge travel lanes:** If there is no auxiliary lane, but there are multiple lanes of traffic in one direction, consider merging the vehicular lanes through the work zone and using the outer vehicular lane for bicycle and pedestrian use.

Figure 16. CA-MUTCD compliant signs ((left) W11-1 for California and (right) W16-1p) to use to indicate that bicyclists and drivers must share the road. can be used in combination.

- **Widen bike lane:** If there is no parking, auxiliary, or second vehicular lane, but there is an existing bike lane, provide protection from traffic and widen the bike facility and mark it for bicycle and pedestrian use.
- **Merge bikes and vehicles:** If there is not enough space to widen the bike facility, consider merging bicycles with traffic. In this case provide speed controls (signs and channelization devices) to bring vehicular speed down to 25 mph through the work zone. [2]
- Appropriate signage should be used to provide advance warning of the shared facility. The Bicycle warning sign (W11-1), “Bicycles ON ROADWAY”, “Share the Road,” or similar CA- MUTCD compliant signs shall be used (see Figure 16).

Under all circumstances, bicyclists should remain separated from worksite activity.

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[2] This guidance is in accordance with the Federal Highway Administration’s *Bikeway Selection Guide* which presents speed and volume thresholds for separating bicyclists from vehicular traffic when designing a bike facility suitable for people of all ages and abilities.

3. CREATE BICYCLE DETOUR

When maintenance of existing bikeways or diversions onto temporary alignments are not feasible, a bicycle detour should be used to keep bicyclists safe from work zone activities and vehicular traffic.

- The CA-MUTCD includes appropriate mode-specific detour guidelines in the section on temporary traffic controls. Where guidelines do not adequately cover a situation specific to bicycle use, general vehicular guidelines and professional judgment should be applied.
- Bicyclists should remain separated from worksite activity with appropriate, crashworthy channelization devices.

Figure 17. A temporary multi-use path is constructed in a vehicle travel lane to help pedestrians and bicyclists safely cross a bridge when a detour isn't an option.

- Bicycle detours and alternate routes should parallel the existing bicycle facility and minimize detour distance to the extent possible.
- Bicycle detours and alternate routes should be maintained and cleared of debris on a regular basis.
- Warning and directional signs should be used to help bicyclists navigate the transition to and from the detour and should be placed at least five days in advance of the route closure.
- It is preferable for the alternate route to direct bicyclists to a facility that is equal to or lower in traffic stress than the existing route.

TECHNICAL STANDARDS

MINIMUM AND PREFERRED WIDTHS

Class I Bikeways (Bike Paths)

- The minimum paved width of travel way for a two-way bike path shall be 8 feet, 10-foot preferred. The minimum paved width for a one-way bike path shall be 5 feet.
- Where heavy bicycle volumes are anticipated and/or significant pedestrian traffic is expected, the paved width of a two-way bike path should be greater than 10 feet, preferably 12 feet or more.

Class II Bikeways (Bike Lanes)

- Maintain 4-feet wide temporary bike lanes

References

1. Seattle Department of Transportation, Traffic Control Manual for In-Street Work, 2018.

SAMPLE BICYCLE ACCOMODATIONS

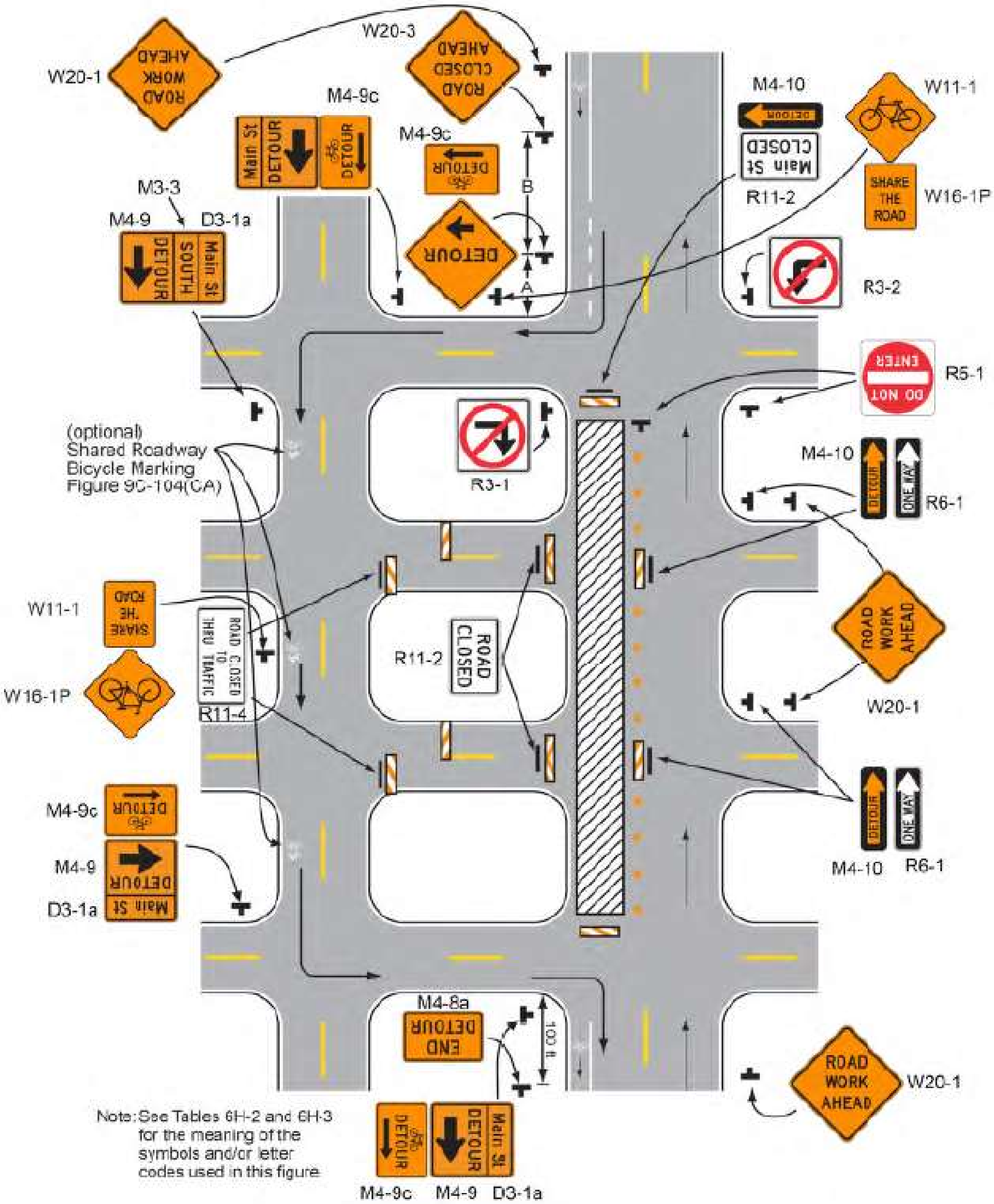


Figure 18. Example of a detour for a bike lane on roads with closure of one travel direction.
Source: CA-MUTCD, Figure 6H-103

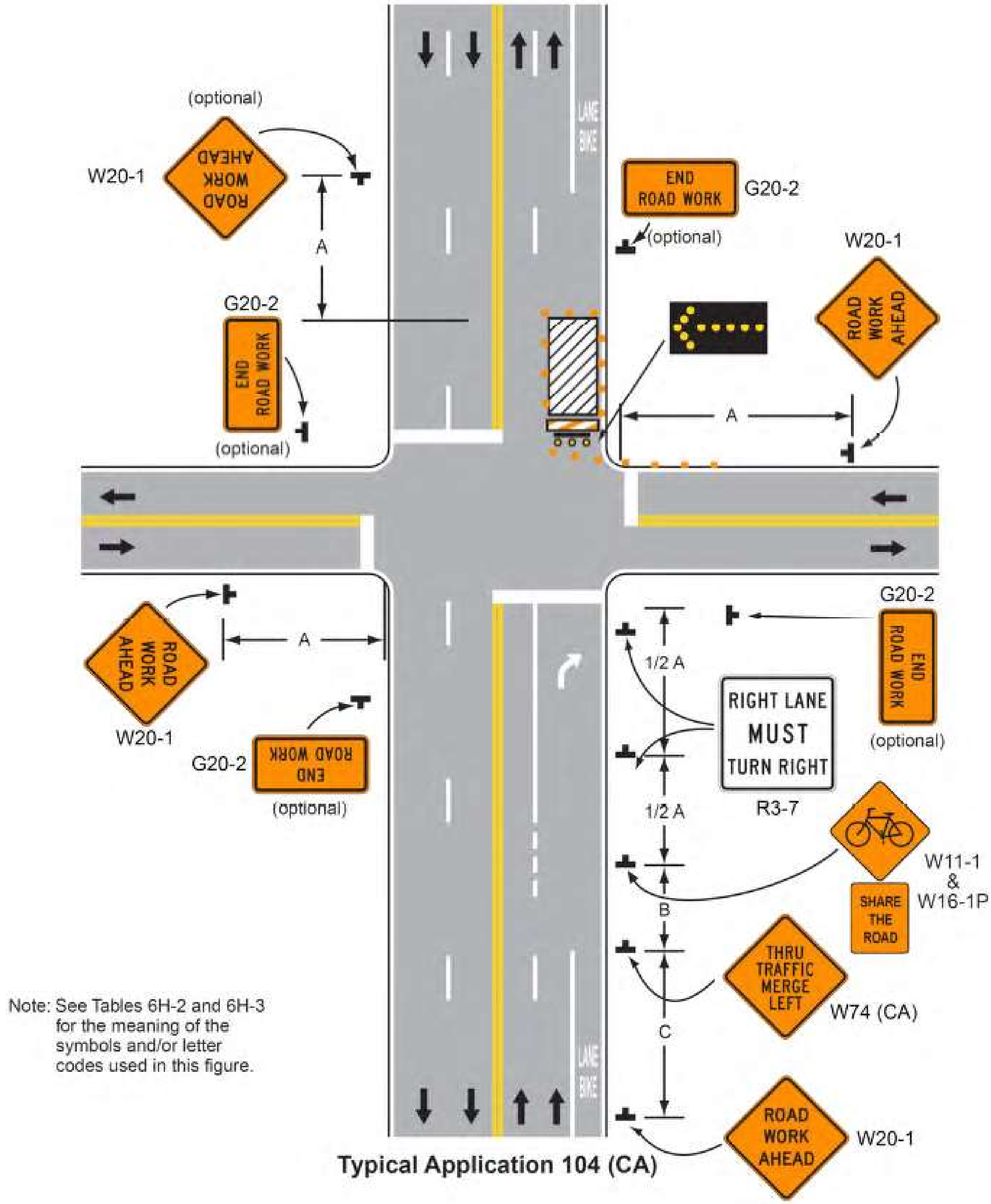


Figure 19. Example of right lane and bike lane closure on far side of intersection.
Source: CA-MUTCD, Figure 6H-104

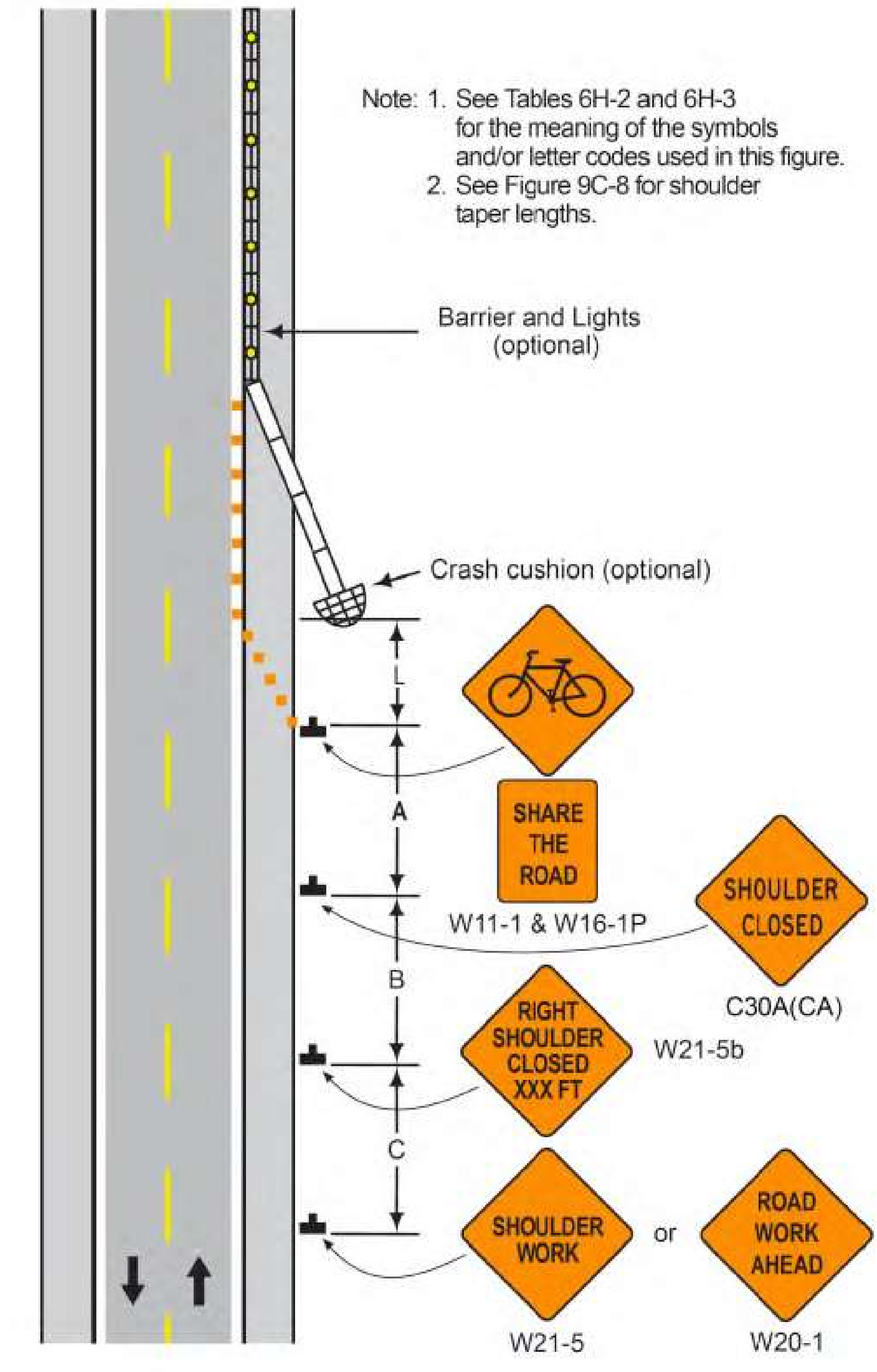


Figure 20. Example shoulder closure on urban low speed road to accommodate bicyclists using a shared lane.
Source: CA-MUTCD, Figure 6H-101

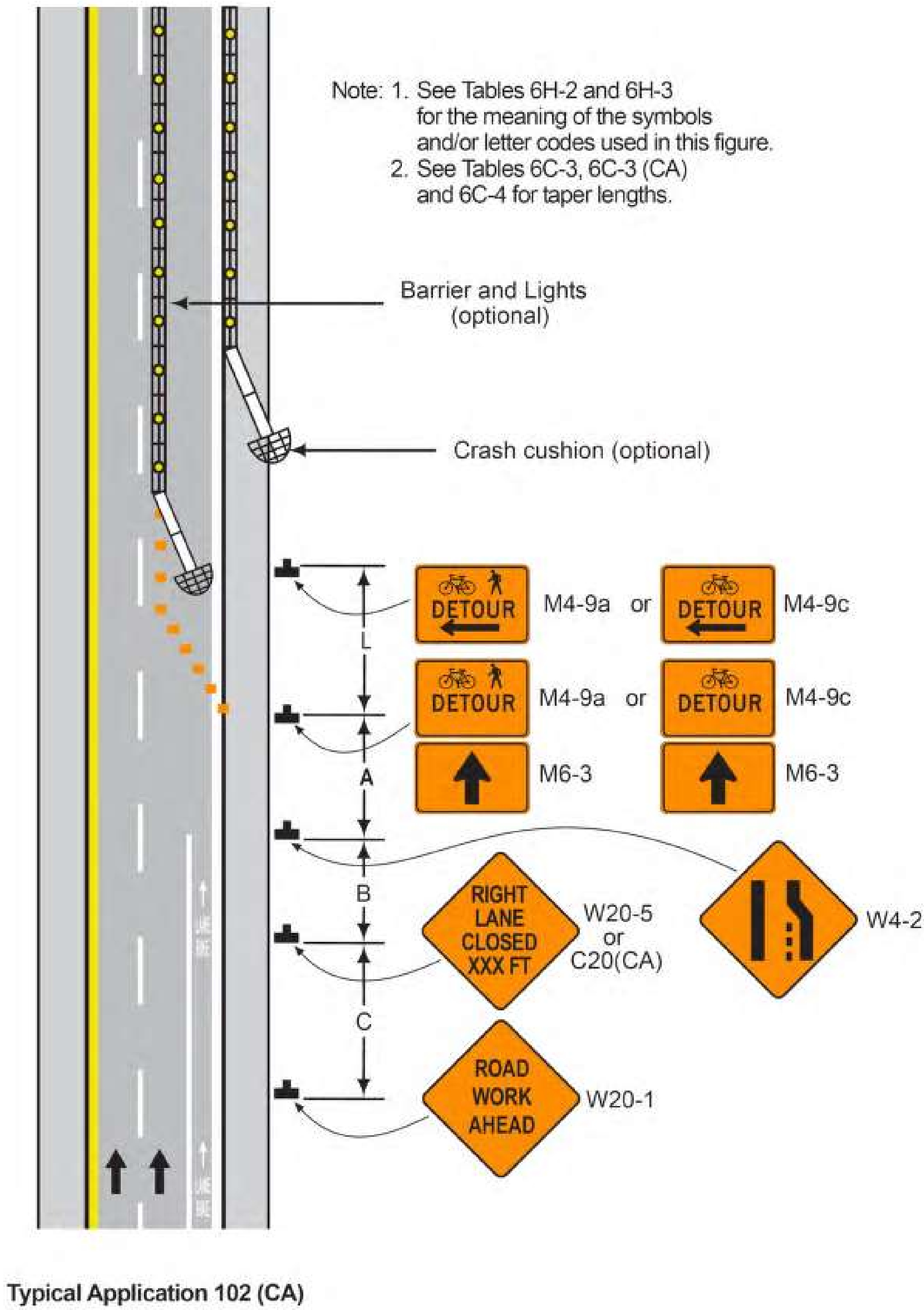


Figure 21. Example lane closure on a high-speed road to accommodate bicyclists (or bicyclists and pedestrians).
Source: CA-MUTCD, Figure 6H-102

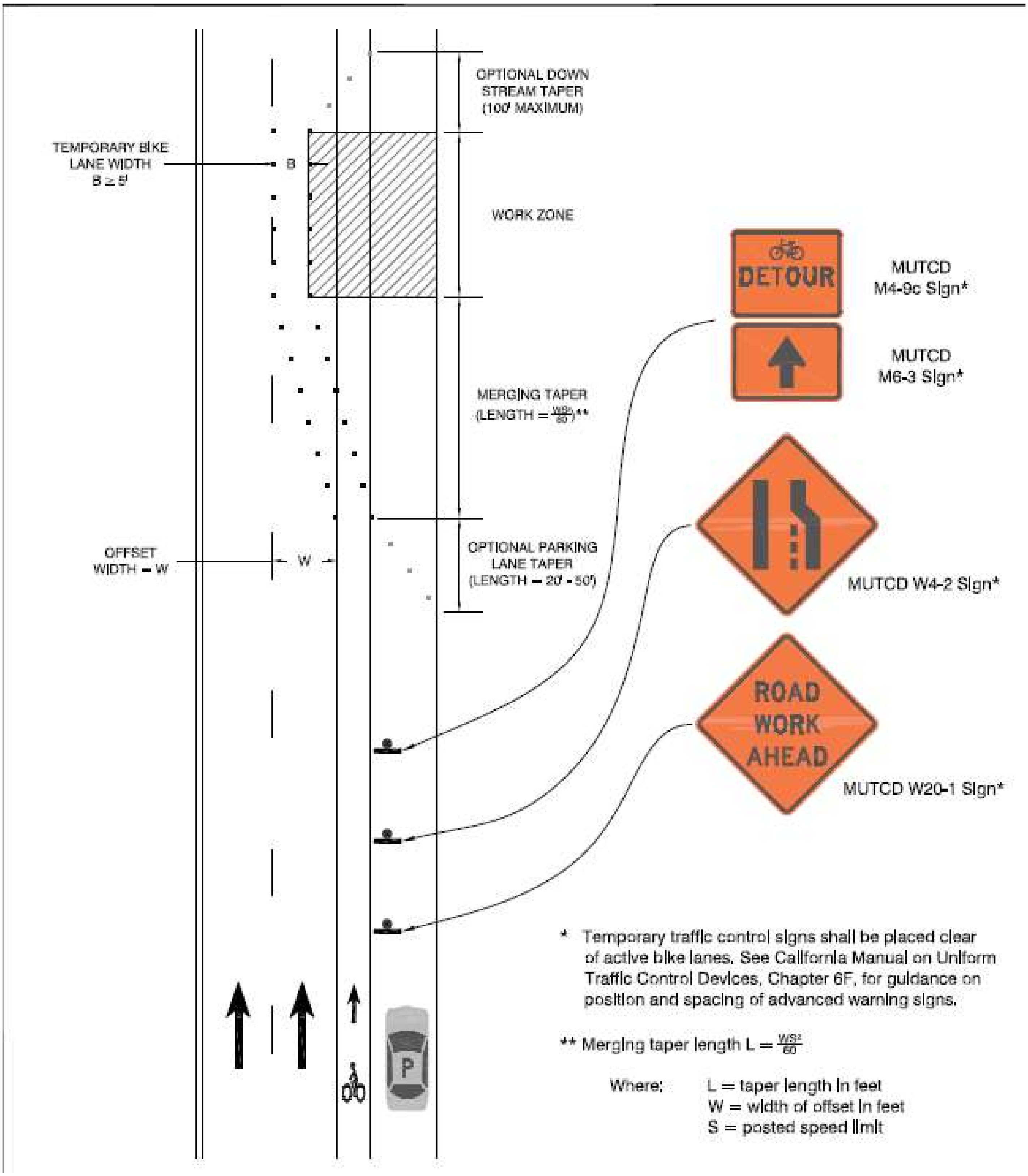


Figure 22. Example of multilane roadway with travel lane closure, temporary bike lane, and parking lane closure.
Source: City of Oakland, 2017

Traffic Control Devices

This section presence details for the traffic control devices used to safely accommodate pedestrians and bicyclists in and around work zones. Specifically, this section covers signage, pavement markings, channelization devices, tapers, and flaggers. Temporary Traffic Control Plans require a description of the specific item being used and its location in the work zone accommodation.

SIGNS

Bicycle-specific signing shall be used any time construction disrupts a designated bike lane or shared use path. Specific signing may be used when a signed bicycle route is impacted by construction.

Signing within the work zone should be clear and consistent for the entire length of the work area. The placement of temporary signs should be designed so as not to disrupt traffic flow, and to be easily visible to all users. Provide critical, accurate wayfinding information throughout the course of the construction.

Temporary signing can also be helpful in identifying the location, or beginning and ending points of a temporary bicycle facility. Temporary warning signs as well as regulatory bicycle traffic control signs may be useful in safely guiding bicycles through or around work zones. Regulatory and warning signs must follow CA-MUTCD Guidelines. **Appendix A** contains examples of some of the most commonly used regulatory and warning signs in pedestrian and bicycle accommodations.

Figure 23. Signs **should not** be placed in a manner that obstructs a pedestrian or bicyclist's travel path. Note that the sign shown is a modified C20 sign and is not CA-MUTD compliant.

Design Details

- Signs and other devices mounted lower than 7 feet above the temporary pedestrian pathway should not project more than 4 inches into accessible pedestrian facilities.
- Signs should be placed so that neither the sign nor support restrict bike lanes or sidewalks to less than 4 feet in width; for this reason, 48-inch warning signs are typically prohibited except on high-speed streets (35mph and faster).

Along roads with bike lanes adjacent to the curb with curb-tight sidewalks, or other locations where typical sign placement may restrict sidewalks, bike lanes, paths, or vehicle lanes, consider the following:

- Place sign behind the sidewalk.
- Adjust sign spacing so that the sign can be placed behind the sidewalk.
- Install the signs on an existing utility pole, street light pole, or other sign support with permission from the owner of the support.
- Install the sign on a new perforated steel tube sign support (PSST) with a flange base.
- Use more prominent devices (PCMS, Arrow Boards).
- Install the sign on a traffic barrier sign support.

When signs are placed in a parking lane, parking should be removed in advance of the sign to provide a clear and unobstructed view by an approaching vehicle.

- 25 feet of parking space should be removed in front of the sign along streets where the operating speed is 30mph or less.
- 40 feet of parking spaces should be removed in front of the sign along streets where the operating speed limit is 35mph or greater.

On one-way streets with two or more lanes, signs should be used on both the left and right sides of the street.

Table 3. Recommended Advance-Warning Sign Spacing

Road Type	Distance Between Signs*		
	A	B	C
Urban - 25 mph or less **	100 ft	100 ft	100 ft
Urban – 25 – 40 mph ***	250 ft	250 ft	250 ft
Urban – More than 40 mph **	350 ft	350 ft	350 ft
Rural	500 ft	500 ft	500 ft
Expressway/Freeway	1,000 ft	1,500 ft	2,640 ft

Source: CA-MUTCD

*The A dimension is the distance from the transition or point of restriction to the first sign. The B dimension is the distance between the first and second signs. The C dimension is the distance between the second and third signs. The “third sign” is the sign that is furthest upstream from the TTC zone.
** Posted speed limit, off-peak 85th-percentile speed prior to work starting, or other anticipated operating speed in mph.

References

1. Vermont Agency of Transportation, Vermont Bicycle and Pedestrian Work Zone Traffic Control Guide, 2018.
2. Portland Bureau of Transportation, Traffic Design Manual, Volume 2: Temporary Traffic Control, 2017.
3. California Department of Transportation, Manual on Uniform Traffic Control Devices, 2018.

FLAGGERS

In some cases, flaggers are the best way to separate roadway users or direct users to the safest travel path. All on-site flaggers should be aware of the TTCP's accommodations for pedestrians and bicyclists. Flaggers shall be trained and certified in the proper fundamentals of flagging moving traffic before being assigned as flaggers. In general, flaggers may be more appropriate to use than traffic control equipment during the following circumstances:

- When workers or equipment are intermittently blocking a travel lane
- Where equipment is backing
- Where only one travel lane is available for two directions of travel
- Where traffic control equipment is being placed or removed in the roadway
- In emergency situations until proper traffic control equipment can be obtained and properly installed
- To assist in the control of pedestrian traffic at intersection and crosswalks

Additional considerations to keep in mind when using flaggers include:

- Flaggers should not be used in cases where work zone disruptions will take place during non-working hours. Temporary traffic control signals are preferable to flaggers for long-term projects and other activities that would require flagging at night.
- If flaggers are used at a location with a live signal, flagger instructions must not conflict with the live signal.
- Flaggers shall not be used as a replacement of a pedestrian accommodation or detour.
- A flagger's sole responsibility is to flag traffic, a flagger shall not have other responsibilities while flagging.

Figure 24. A flagger is used to help bicyclists navigate a difficult intersection which crosses a popular bicycle path.

It is current best practice to clear the vehicles from an approach first, while bicycles remain halted. Once the vehicles have cleared the queue, or at the flagger's halting of the queue, bicycles will proceed to travel through the work zone. This practice separates the through movements of vehicles and bicycles so that they are not competing for the same space and shall be used when the lane width is 11 feet or less and no dedicated bicycle facility is provided through the work zone. If separate roadway space is provided for bicyclists (i.e. a shoulder or bike lane), they may proceed together with motorized traffic.

References

1. Vermont Agency of Transportation, Vermont Bicycle and Pedestrian Work Zone Traffic Control Guide, 2018.
2. California Department of Transportation, Manual on Uniform Traffic Control Devices, 2018.
3. Seattle Department of Transportation, Traffic Control Manual for In-Street Work, 2018.

CHANNELIZING DEVICES

Channelizing devices delineate a desired path, mark specific hazards, separate opposing traffic flows and are used to partially or totally close a roadway.

When channelizing devices conflict with pavement markings, space the devices at no more than ½ S feet, where S is the speed in mph. For example, if it is necessary to create a temporary center line on a 30mph street that is not consistent with the pavement markings, reduce the spacing between channelizing devices to 15 feet. Channelizing device spacing may also be reduced for night work, when shifting traffic, or when it is otherwise desirable to create a more conspicuous path for drivers to follow.

Figure 25. An example of a crashworthy channelization device which can be used to delineate a pedestrian or bicycle path.

Bicycle channelization devices

Bicycle channelization devices (BCDS) are longitudinal devices designed primarily to separate bicycles from the work area. BCDS may be used between a vehicular traffic lane and a multi-use path or where bicycles will not need to merge with vehicular traffic to execute a turn or other movement.

Between Bicyclists and Traffic

BCDs are placed between the bicyclists and vehicular traffic where posted speeds exceed 30 mph and/or volumes exceed 4,000 ADT.

Between Bicyclists and the Work Area

BCDs are placed between the work area and the bike lane/shoulder where it is necessary to separate bicyclists from active work areas.

DESIGN DETAILS

- Depending on what is used for a BCD and site-specific conditions, an end treatment may be needed to ensure that the BCD is not a hazard for vehicle traffic.
- BCDs are not required to provide detectability as with a pedestrian channelization device.
- A clear width of at least 4 feet must be provided from the edge of any BCD to the edge of pavement or other physical object such as a curb or face of guardrail.
- BCDs that separate bicyclists from vehicular traffic must be crashworthy ((concrete, steel or plastic (water-filled)).
- BCDs that separate bicyclists from pedestrians do not need to be crashworthy; cones, flexible delineator posts, or pedestrian barricades may be used as BCDs.

References

1. Portland Bureau of Transportation, Traffic Design Manual, Volume 2: Temporary Traffic Control, 2017.
2. Vermont Agency of Transportation, Vermont Bicycle and Pedestrian Work Zone Traffic Control Guide, 2018.

Pedestrian Channelizing Devices

Channelizing devices are used to define temporary walkways and to separate pedestrians from either construction activities or traffic. If the temporary walkway is created using roadway or parking space (i.e. not using existing sidewalks) and pedestrians are being directed to a new path of travel, then Pedestrian Channelizing Devices (PCD) are required.

The appropriate placement of PCDs will vary depending on the desired pedestrian pathway, the location of traffic, and the location of the work area hazards.

Between Pedestrians and Traffic

In cases where the project affects the existing pedestrian facility and pedestrians are provided access on the same roadway surface as motor vehicles (e.g. a closed lane or shoulder), an NCHRP-350 or MASH compliant crashworthy barrier system (concrete, steel or plastic (water-filled)) on the roadway surface shall be used to separate vehicles from pedestrians.

Figure 26. Traffic cones are not suitable channelization devices because they are not crashworthy and they do not provide a continuous detectable edge.

Between Pedestrians and The Work Area

Use the PCD between pedestrians and the active construction work area when the following conditions apply:

- Pedestrian traffic must pass alongside the work area. The "work area" may include active or inactive work, the storage of equipment and materials, or empty space for contractor access/staging purposes.
- If work area hazards are present on both sides of the pedestrian pathway, PCDs should be placed on both sides of the pathway.

DESIGN DETAILS

- Barricades should be continuous, stable, and non-flexible.
- Barricades should be constructed with a toe rail no higher than 2 inches above the adjacent surface and a continuous railing mounted on top. The barricade height should not exceed 42 inches and the top rail shall be situated to allow pedestrians to use the rail as a guide for their hands. The top railing of the barricade should have diagonal stripes with 70 percent contrast. This will assure the barricade is highly visible to pedestrians.
- When used in the street, PCDs should have retroreflective markings for enhanced visibility.
- PCDs should be used on both sides of the pedestrian route when work area hazards or traffic are present on both sides of the roadway.
- Devices should not prevent the drainage of water from the pathway. An opening with a 2-inch maximum height above the walkway surface is allowed for drainage.
- Pedestrian fences should be at least 8 feet high to discourage pedestrians from climbing over the fence and should be (cane) detectable by vision impaired.
- PCDs must have a continuous detectable top and bottom edge so that pedestrians with visual disabilities can detect them.
- All devices used to provide guidance for pedestrians shall interlock to prevent gaps between devices.

- All devices should be free of sharp or rough edges with all fasteners installed below the surface and capped to prevent harm to hands, arms, or clothing.
- Barriers should be made of sturdy, non-bendable material such as wood. Plastic, water filled barriers are an appropriate channelizing device for pedestrian facilities.
- The use of cones, barrels, or other intermittent devices with tape is not acceptable as a PCD.
- Barricades are used to block off active work areas and may also be used as a channelizing device.
- A barrier, detectable by a person with a visual disability traveling with the aid of a long cane, must be placed across the full width of the closed sidewalk they would normally use.
- Additional information on channelizing devices can be found in the CA-MUTCD Chapter 6F.

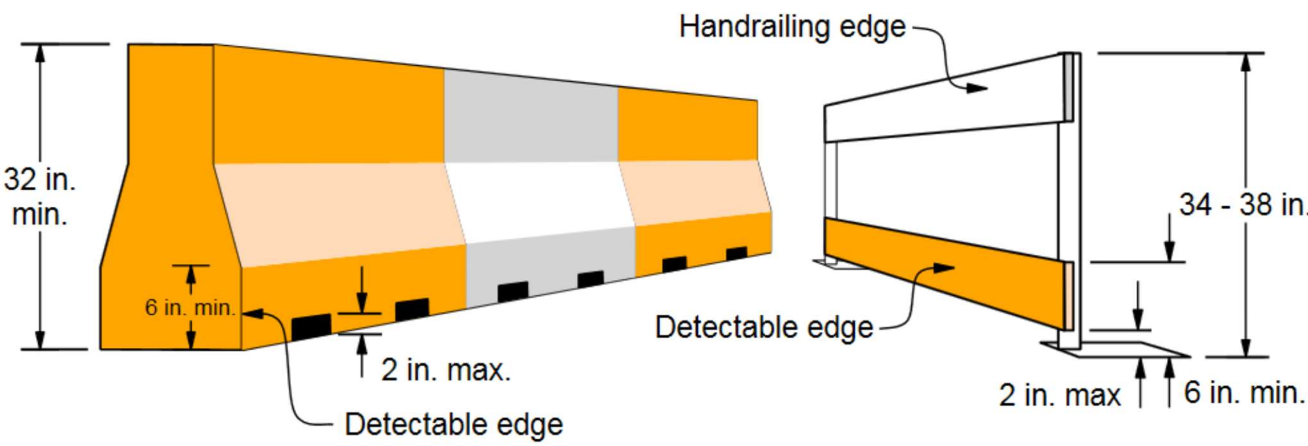


Figure 27. Design standards for acceptable pedestrian channelization devices.
Source: City of Portland, Traffic Design Manual, Volume 2: Temporary Traffic Control, 2017.

References

1. Vermont Agency of Transportation, Vermont Bicycle and Pedestrian Work Zone Traffic Control Guide, 2018.
2. Federal Highway Administration, University Course on Bicycle and Pedestrian Transportation, Lesson 21; Bicycle and Pedestrian Accommodation in Work Zones, FHWA-HRT-05-125, 2006.

TAPERS

Tapers are created by using a series of channelizing devices to move traffic out of or into the normal travel path. Tapers may be used in both the transition and termination areas. The appropriate length of the taper will vary depending on site conditions. The appropriate taper length (L) should be determined using the criteria shown in Tables 6C-3, 6C-3(CA), and 6C-4 in the CA-MUTCD, reproduced in **Appendix C**.

Figure 28. Tapers used to make it clear to drivers that they must stay left to avoid the temporary pedestrian path.

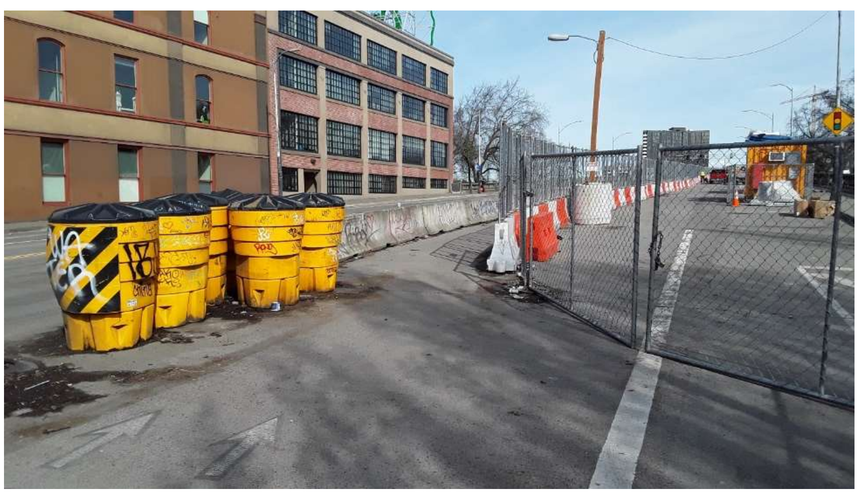


Figure 29. Taper used to direct traffic left to keep drivers out of the temporary multi-use path.

References

1. Portland Bureau of Transportation, Traffic Design Manual, Volume 2: Temporary Traffic Control, 2017.

Temporary Traffic Control Plan Requirements

All work zone project applications that require the closure or obstruction[3] of a travel lane, sidewalk, or street must include a site-specific temporary traffic control plan (TTCP). A TTCP describes TTC measures to be used for facilitating road users through a work zone or an incident area. TTC plans should be prepared by persons knowledgeable (for example, trained and/or certified) about the fundamental principles of TTC and work activities to be performed. The design, selection, and placement of TTC devices for a TTCP should be based on engineering judgment. The TTCP should show the work zone and all of the proposed traffic control devices. Use the guidance provided in this document to create the TTCP.

The TTCP must include a description of the types of traffic control devices that will be used and their location. At a minimum, the TTCP must show the following:

- Existing bicycle facilities
- Temporary bicycle routes, with specific materials, signage, and channelization devices for bicycles.
- Bike lanes and multiuse paths to be closed (if necessary)
- Scope of work / construction plans
- Existing sidewalk or pedestrian pathway
- Temporary pedestrian routes, with specific materials, signage, and channelization devices for pedestrians
- Temporary ADA ramps and/or walkways
- Dimensions and layout of existing facilities, including sidewalks, travel lanes, bicycle facilities…etc.
- Description or graphic of existing and proposed temporary traffic controls, including covered or relocated pedestrian signal heads (if necessary)
- Descriptions or graphics of traffic control devices, walkways, and ramps must clearly show how materials meet ADA requirements of detectability and accessibility
- Scope of Work / Construction Plans
- Sidewalks, pedestrian pathways, or crosswalks to be closed (if necessary)

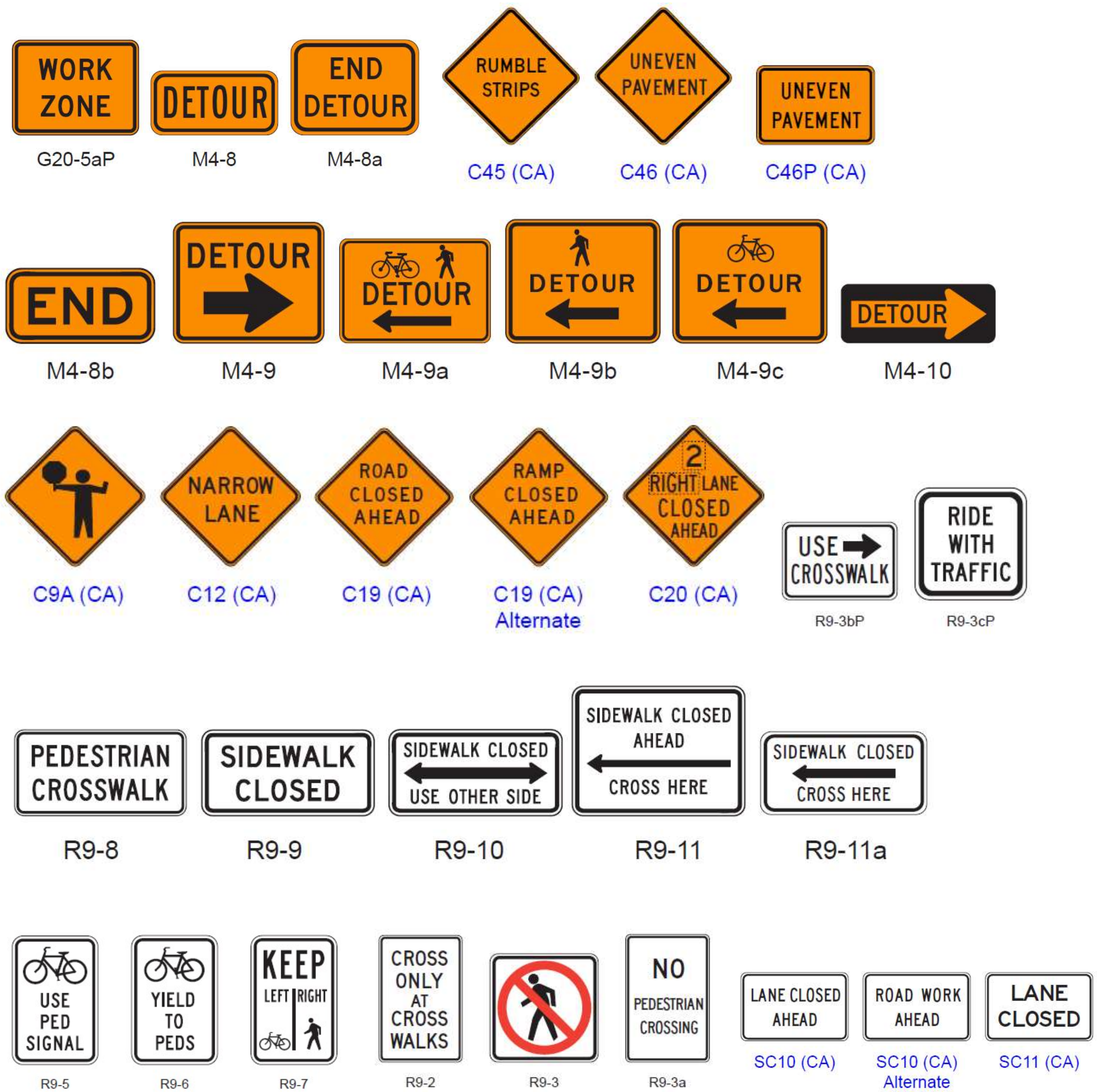
The TCCP shall have the approval of the City Engineer or the Engineer's designee prior to implementation. Refer to Section 6C.01 in the CA-MUTCD for more information about TTCPs.

References

1. Portland Bureau of Transportation, Traffic Design Manual, Volume 2: Temporary Traffic Control, 2017.
2. California Department of Transportation, Manual on Uniform Traffic Control Devices, 2018.

[3] Obstruction in this case refers to any obstruction or encroachment that reduces the pedestrian path or bikeway to less than 4 feet in width.

Appendix A: Common Pedestrian and Bicycle Regulatory and Warning Signs



Refer to the CA-MUTCD Sign Charts for more approved signs which can be used at or near work zones. It can be downloaded for free from http://www.dot.ca.gov/trafficops/tcd/docs/CA_SignChart_2014Rev2_Tabloid.pdf.

Appendix B: CalTrans ADA Checklist

ADA checklist

☐ The path must be stable, firm, and slip resistant. Pedestrian facilities must be surfaced with asphalt concrete, cement concrete, or timber. Dirt is not an acceptable surface.

☐ The surface should be smooth and continuously hard throughout the entire length of the temporary pedestrian facility. No abrupt changes should exist in grade or terrain that could cause tripping or be a barrier to wheelchair use.

☐ Surface discontinuities must not exceed ½ inch maximum. Vertical discontinuities between ¼ inch and ½ inch should be beveled at a maximum of 2:1 or flatter, and bevels should be constant across the entire level change. New surfaces must not have vertical surface discontinuities. Curb ramps, landings, and gutter areas must not have surface discontinuities.

☐ On pedestrian access route joints and gratings, surface openings must not permit passage of a sphere larger than 1/2 inch. Place horizontal surface openings so that the long dimension is perpendicular to the dominant direction of travel.

☐ The cross slope must be no greater than 1:50 (2 percent).

☐ The running slope must be no greater than 1:20 (5 percent). Otherwise, meet the ramp requirements discussed below. For street facilities, the running slope may follow the adjoining street.

☐ When feasible, a width of 60 inches should be maintained throughout the pedestrian pathway.

☐ When it is not possible to maintain a width of 60 inches, a 60 x60-inch passing space must be provided at least every 200 feet to allow individuals in wheelchairs to pass.

☐ The path must have a clear width of no less than 48 inches. Verify that no fixed objects (cabinets, poles, and so forth) will reduce the path width at any point.

☐ Signs and other devices mounted lower than 7 feet above the temporary pedestrian pathway should not project more than 4 inches into accessible pedestrian facilities. Refer to Part 6, Section 6D.02 of the California MUTCD.

☐ Objects must not protrude into the path. Check with the project engineer for exceptions.

☐ Vertical clearance must be 80 inches minimum.

☐ If the path requires a 180-degree turn, the turning pad must be at least 60 inches deep.

☐ Access to nearby temporary transit stops must be provided.

Ramps

☐ The cross slope must be no greater than 1:50 (2 percent).

☐ The running slope must be no greater than 1:12 (8.3 percent).

☐ Each ramp must have level landings at the bottom and top. A landing must be as wide as the run leading to it and have a minimum length of 60 inches.

☐ Ramps must have hand railings and edge protection.

Push buttons

☐ If the pedestrian push button requires a side reach, obstructions at the bottom cannot extend more than 24 inches from base.

☐ A pedestrian push button used to provide equivalent TTC information to pedestrians with visual disabilities should be equipped with a locator tone to notify them that a special accommodation is available and help them locate the button.

References

1. California Department of Transportation, Temporary Pedestrian Facilities Handbook, 2014.

Appendix C: CA-MUTCD Taper Length Criteria

Table 6C-3. Taper Length Criteria for Temporary Traffic Control Zones

Type of Taper	Taper Length
Merging Taper	at least L
Shifting Taper	at least 0.5 L
Shoulder Taper	at least 0.33 L
One-Lane, Two-Way Traffic Taper	50 feet minimum, 100 feet maximum
Downstream Taper	50 feet minimum, 100 feet maximum

Note: Use Table 6C-4 to calculate L

Figure 1. Taper length criteria for temporary traffic control zones.
Source: CA-MUTCD

Table 6C-4. Formulas for Determining Taper Length

Speed (S)	Taper Length (L) in feet
40 mph or less	$L = \frac{WS^2}{60}$
45 mph or more	$L = WS$

Where: L = taper length in feet
W = width of offset in feet
S = posted speed limit, or off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed in mph

Figure 2a. Taper length criteria by speed for temporary traffic control zones.
Source: CA-MUTCD

Table 6C-3(CA). Taper Length Criteria for Temporary Traffic Control Zones
(for 12 feet Offset Width)

Speed* S (mph)	Minimum Taper Length** for Width of Offset 12 feet (W)			
	Merging L (feet)	Shifting L/2 (feet)	Shoulder L/3 (feet)	Down Stream (feet)***
20	80	40	27	50
25	125	63	42	50
30	180	90	60	50
35	245	123	82	50
40	320	160	107	50
45	540	270	180	50
50	600	300	200	50
55	660	330	220	50
60	720	360	240	50
65	780	390	260	50
70	840	420	280	50
75	900	450	300	50

* - Posted speed limit, off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed in mph.

** - For other offsets use the following merging taper length formula for L:

For speeds of 40 mph or less, $L=WS^2/60$

For speeds of 45 mph or more, $L=WS$

Where: L = taper length in feet
W = width of offset in feet
S = posted speed limit, off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed in mph

*** - Maximum downstream taper length is 100 feet. See Section 6C.08.

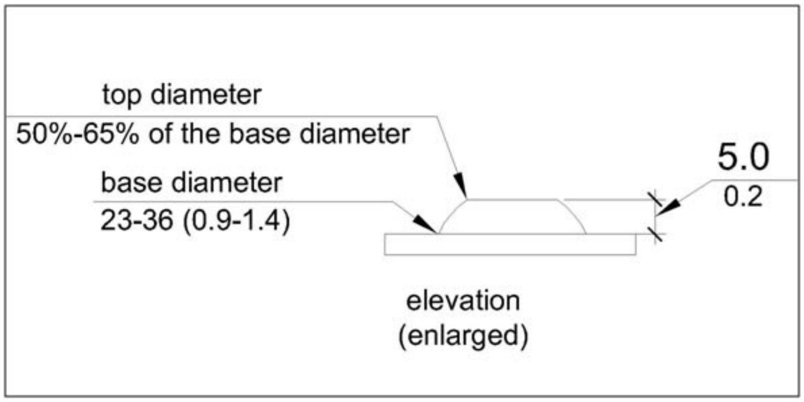
Figure 2b. Taper length criteria by speed for temporary traffic control zones.
Source: CA-MUTCD

Appendix D: PROWAG Section 305

R305 Detectable Warning Surfaces

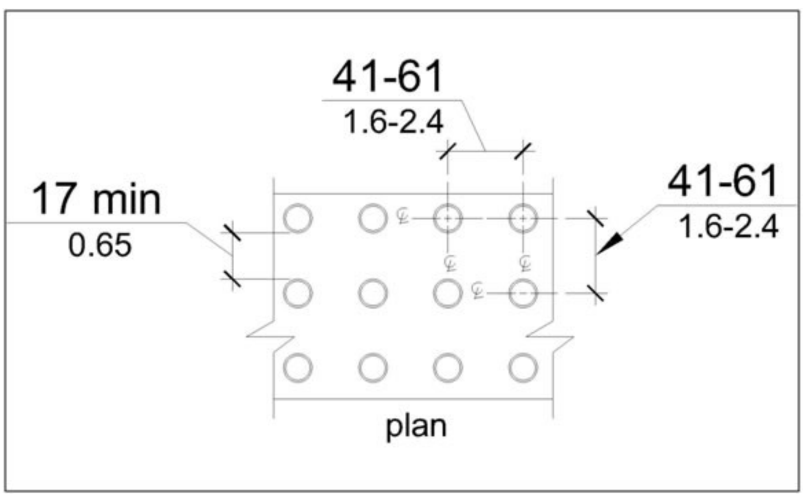
R305.1 General. Detectable warning surfaces shall consist of truncated domes aligned in a square or radial grid pattern and shall comply with R305.
Advisory R305.1 Dome Size. Where the truncated domes are arrayed radially, they may differ in diameter and center-to-center spacing within the ranges specified in R305.1.1 and R305.1.2.
R305.1.1 Dome Size. The truncated domes shall have a base diameter of 23 mm (0.9 in) minimum and 36 mm (1.4 in) maximum, a top diameter of 50 percent of the base diameter minimum and 65 percent of the base diameter maximum, and a height of 5 mm (0.2 in).

Figure R305.1.1 Dome Size



R305.1.2 Dome Spacing. The truncated domes shall have a center-to-center spacing of 41 mm (1.6 in) minimum and 61 mm (2.4 in) maximum, and a base-to-base spacing of 17 mm (0.65 in) minimum, measured between the most adjacent domes.

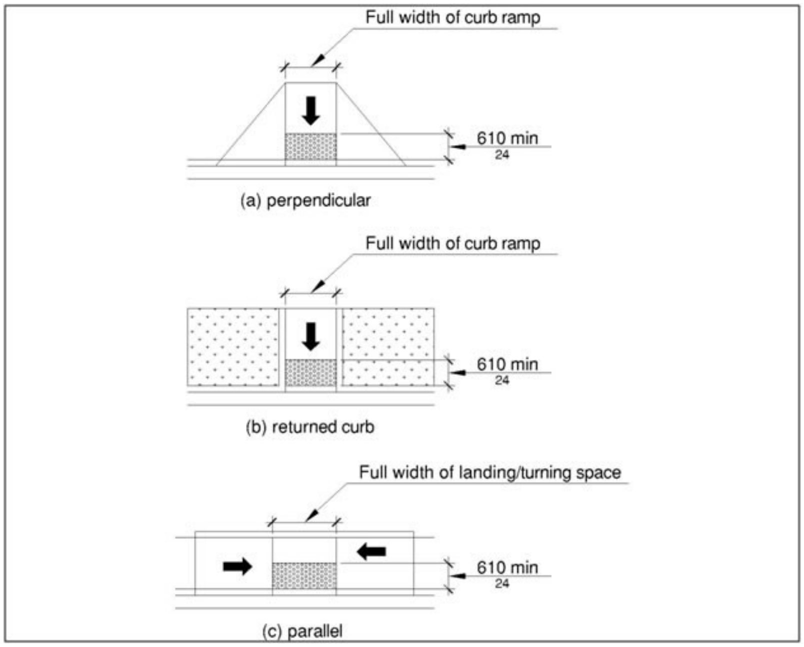
Figure R305.1.2 Dome Spacing



R305.1.3 Contrast. Detectable warning surfaces shall contrast visually with adjacent gutter, street or highway, or pedestrian access route surface, either light-on-dark or dark-on-light.
Advisory R305.1.3 Contrast. Visual contrast may be provided on the full surface of the curb ramp but should not extend to flared sides. Visual contrast also helps pedestrians who use wheelchairs to locate the curb ramp from the other side of the street.
R305.1.4 Size. Detectable warning surfaces shall extend 610 mm (2.0 feet) minimum in the direction of pedestrian travel. At curb ramps and blended transitions, detectable warning surfaces shall extend the full width of the ramp run (excluding any flared sides), blended transition, or turning space. At pedestrian at-grade rail crossings not located within a street or highway, detectable warnings shall extend the full width of the crossing. At boarding platforms for buses and rail vehicles, detectable warning surfaces shall extend the full length of the public use areas of the

platform. At boarding and alighting areas at sidewalk or street level transit stops for rail vehicles, detectable warning surfaces shall extend the full length of the transit stop.

Figure R305.1.4 Size



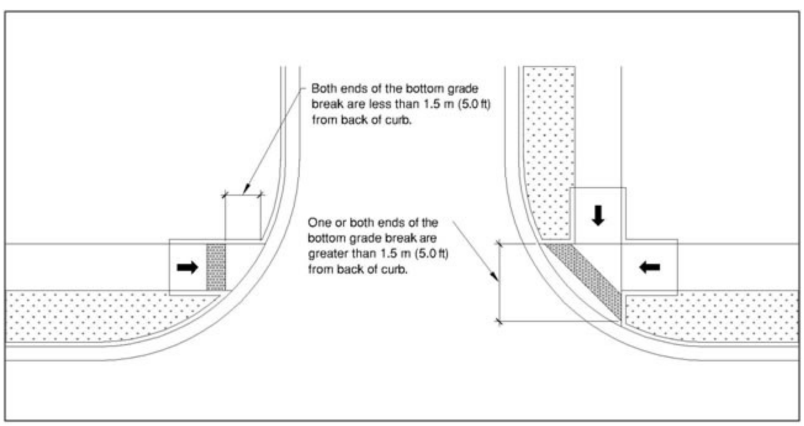
R305.2 Placement. The placement of detectable warning surfaces shall comply with R305.2.

Advisory R305.2 Placement. Some detectable warning products require a concrete border for proper installation. The concrete border should not exceed 51 mm (2 in). Where the back of curb edge is tooled to provide a radius, the border dimension should be measured from the end of the radius.

R305.2.1 Perpendicular Curb Ramps. On perpendicular curb ramps, detectable warning surfaces shall be placed as follows:

1. Where the ends of the bottom grade break are in front of the back of curb, detectable warning surfaces shall be placed at the back of curb.
2. Where the ends of the bottom grade break are behind the back of curb and the distance from either end of the bottom grade brake to the back of curb is 1.5 m (5.0 ft) or less, detectable warning surfaces shall be placed on the ramp run within one dome spacing of the bottom grade break.
3. Where the ends of the bottom grade break are behind the back of curb and the distance from either end of the bottom grade brake to the back of curb is more than 1.5 m (5.0 ft), detectable warning surfaces shall be placed on the lower landing at the back of curb.

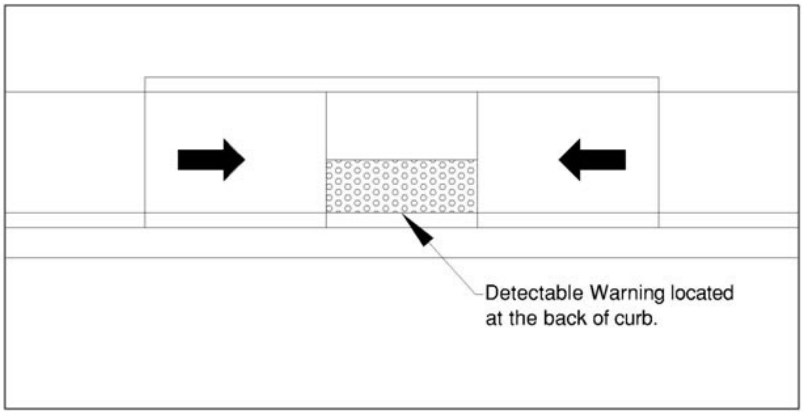
Figure R305.2.1 Perpendicular Curb Ramps



Advisory R305.2.1 Perpendicular Curb Ramps. Detectable warning surfaces are intended to provide a tactile equivalent underfoot of the visible curb line. If detectable warning surfaces are placed too far from the curb line because of a large curb radius, the location may compromise effective crossing. Detectable warning surfaces should not be placed on paving or expansion joints. The rows of truncated domes in detectable warning surfaces should be aligned perpendicular to the grade break between the ramp run and the street so pedestrians who use wheelchairs can “track” between the domes. Where detectable warning surfaces are provided on a surface with a slope that is less than 5 percent, dome orientation is less critical.

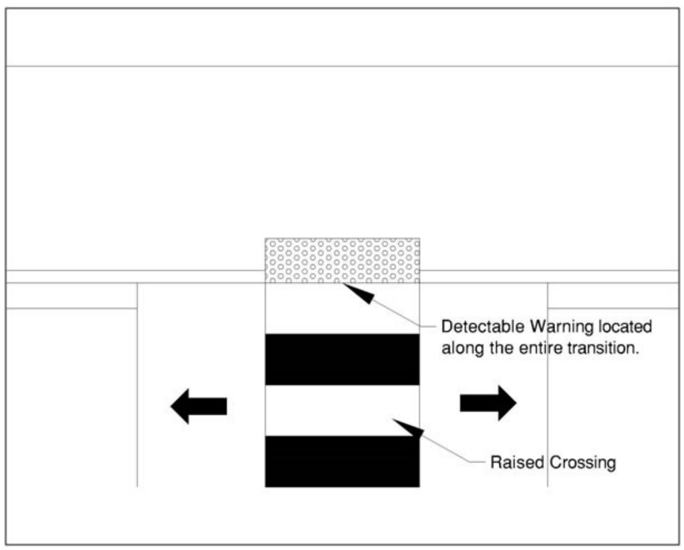
R305.2.2 Parallel Curb Ramps. On parallel curb ramps, detectable warning surfaces shall be placed on the turning space at the flush transition between the street and sidewalk.

Figure R305.2.2 Parallel Curb Ramps



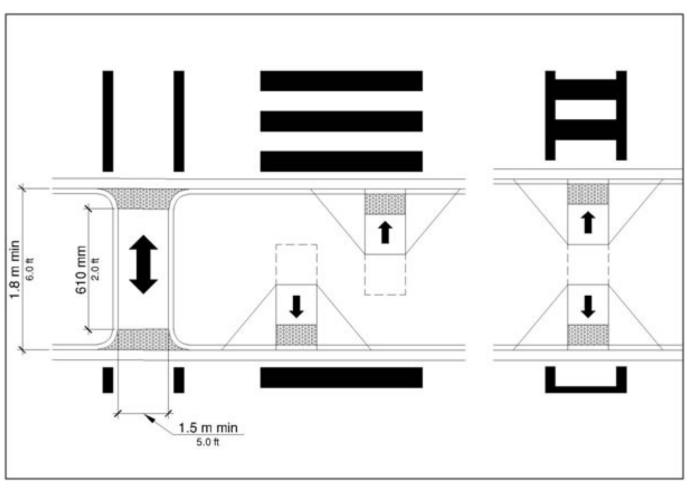
R305.2.3 Blended Transitions. On blended transitions, detectable warning surfaces shall be placed at the back of curb. Where raised pedestrian street crossings, depressed corners, or other level pedestrian street crossings are provided, detectable warning surfaces shall be placed at the flush transition between the street and the sidewalk.

Figure R305.2.3 Blended Transitions



R305.2.4 Pedestrian Refuge Islands. At cut-through pedestrian refuge islands, detectable warning surfaces shall be placed at the edges of the pedestrian island and shall be separated by a 610 mm (2.0 ft) minimum length of surface without detectable warnings.

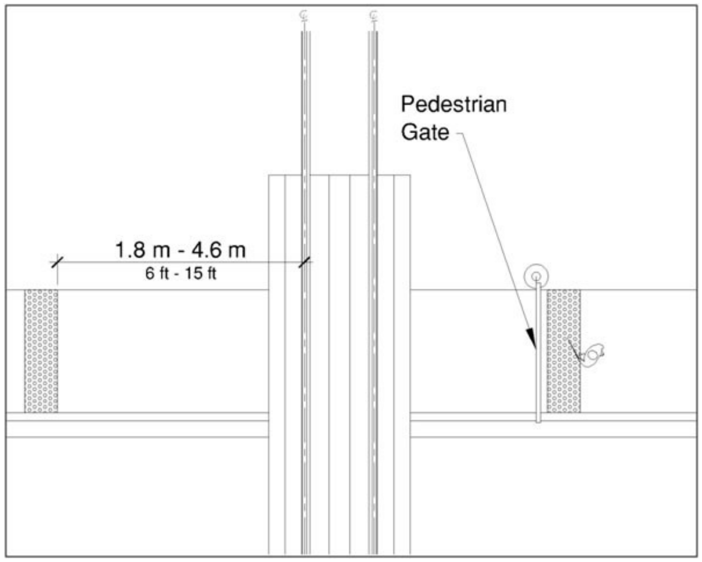
Figure R 305.2.4 Pedestrian Refuge Island



Advisory R305.2.4 Pedestrian Refuge Islands. The edges of cut-through pedestrian refuge islands can provide useful cues to the direction of the crossing.

R305.2.5 Pedestrian At-Grade Rail Crossings. At pedestrian at-grade rail crossings not located within a street or highway, detectable warning surfaces shall be placed on each side of the rail crossing. The edge of the detectable warning surface nearest the rail crossing shall be 1.8 m (6.0 ft) minimum and 4.6 m (15.0 ft) maximum from the centerline of the nearest rail. Where pedestrian gates are provided, detectable warning surfaces shall be placed on the side of the gates opposite the rail.

Figure R305.2.5 Pedestrian At-Grade Rail Crossings



R305.2.6 Boarding Platforms. At boarding platforms for buses and rail vehicles, detectable warning surfaces shall be placed at the boarding edge of the platform.

R305.2.7 Boarding and Alighting Areas. At boarding and alighting areas at sidewalk or street level transit stops for rail vehicles, detectable warning surfaces shall be placed at the side of the boarding and alighting area facing the rail vehicles.

Appendix E: Temporary Traffic Control Checklist

Before creating a Temporary Traffic Control Plan, take note of the following items at the construction site so you can determine how to safely accommodate bicyclists and pedestrians.

- ☐ Is there a bike facility present? What class?
- ☐ Is there sidewalk present?
- ☐ Is a crosswalk present?
- ☐ Is the site on a transit route?
- ☐ Is there a transit stop present?
- ☐ Truck route?
- ☐ Speed limit?
- ☐ How many travel lanes are there?
- ☐ What are the dimensions (e.g., width) of all existing facilities, including travel lanes, sidewalks or other pedestrian pathways, and bike facilities?

Consider whether access to any of the following items will be obstructed in anyway by the proposed construction:

- ☐ Crosswalks
- ☐ Pedestrian signals
- ☐ Transit stops
- ☐ Vehicle travel lanes
- ☐ Bicycle facilities
- ☐ Sidewalks or other pedestrian pathways
- ☐ Curb ramps or other types of ramps

APPENDIX F
COST ESTIMATE METHODOLOGY

TOOLE DESIGN

1635 BROADWAY
SUITE 200
OAKLAND, CA 94612

510.298.0740
TOOLEDESIGN.COM

MEMORANDUM

January 10, 2020

To: Charmine Solla, P.E., T.E.
Organization: City of Hayward Public Works
From: Patrick Gilster, AICP and Sara Rauwolf, EIT, Toole Design
Project: Hayward Bicycle and Pedestrian Master Plan

Re: Cost Estimate Methodology

This memorandum summarizes the methodology used in the City of Hayward Bicycle and Pedestrian Master Plan cost estimates. The goal of the cost estimates is to produce bicycle, pedestrian, and transit cost estimates on a per-mile basis to package and present projects as complete corridors, versus as separate projects for each mode. Pedestrian improvements are therefore assumed on a per-mile basis, based on roadway classification, versus identifying spot-specific pedestrian improvements. More detailed cost estimates should be completed during the preliminary planning and design stages of each project to better refine individual project cost estimates. Additionally, sidewalk gaps will need to be identified and calculated separated for implementation.

The steps below identify how the overall process results in per-mile costs for bicycle, pedestrian, and transit costs.

Step 1: Establish Unit Costs → **Step 2:** Calculate costs for intersections and crossings → **Step 3:** Create per-mile pedestrian improvement assumptions → **Step 4:** Create per-mile bicycle improvement assumptions → **Step 5:** Create per-mile transit improvement assumptions → **Step 6:** Create complete corridor cost estimates

Step One: Establish Unit Costs

Unit costs were established for individual project components using a variety of similar local project cost estimates, recent City of Hayward bids, Alameda CTC Cost Estimating Guide, and Caltrans Contract Cost Database. The table below summarizes the unit costs applied in this project.

Unit Costs

Treatment	Unit	Unit Cost	Source
12" White Crosswalk/Limit Line (Thermo)	LF	$6	Recent bids
6" Bicycle Broken Lane Line (Thermo)	LF	$1	Cupertino
6" Bicycle Lane Line (Thermo)	LF	$3	Recent bids

Unit Costs

Treatment	Unit	Unit Cost	Source
8" Channelization Line (Thermo)	LF	$4	Cupertino
24" White (Thermo)	LF	$12	Recent bids
24" Yellow (Thermo)	LF	$12	Recent bids
ADA Curb Ramp	EA	$4,700	Recent bids
Color Epoxy	SF	$6	Alameda
Concrete Curb and Gutter*~	LF	$76	Recent bids
Concrete Curb*~	LF	$30	Alameda
Concrete Sidewalk*~	SF	$17	Recent bids
Curb Extension (Single bulb-out)*	EA	$40,000	Cupertino
Green Thermoplastic	SF	$8	Alameda
Roadway Excavation	CY	$15	San Ramon
Class 2 Aggregate Subbase	CY	$39	San Ramon
Asphalt Path	SF	$6	San Ramon
Hot Mix Asphalt, 1/2" Maximum Type A	TN	$90	Cupertino
Median Refuge (Improve Existing)~	EA	$6,000	Cupertino
Median Refuge (New)~	EA	$10,000	Cupertino
Narrow Curb Radii (10' radii)*~	EA	$23,000	Cupertino
Narrow Curb Radii (25' radii)*~	EA	$20,000	Cupertino
Neighborhood Traffic Circle (30' diam. With 8' apron)*	EA	$12,000	Alameda
Painted Curb	LF	$3	Alameda
Raised Intersection*~	EA	$100,000	Cupertino
RRFB (One pair)	EA	$15,000	Cupertino
Sign Install	EA	$500	Recent bids
Soft Hit Posts	LF	$8	Cupertino
Thermoplastic Bicycle Boulevard Legend (@ 51 Sq Ft Each)	EA	$70	Recent bids
Thermoplastic Bicycle Lane Legend @ 14 Sq Ft each	EA	$45	Recent bids
Loop Bicycle Detection	EA	$600	Recent bids
Video Bicycle Detection	Intersection	$25,000	Alameda
Bicycle Signal Head	EA	$1,200	Alameda
Bike/Ped Push Button	EA	$400	Alameda
New Traffic Signal	Intersection	$ 400,000	Alameda
Protected Turn Phasing	Approach	$60,000	Alameda
Pedestrian Signal Head	EA	$500	Alameda
Signal foundation for type 1 standard	EA	$450	Alameda
Signal type 1 standard (complete w/ flange & bolts)	EA	$300	Alameda
Pedestrian Scale Pole, foundation and luminaire w/ Pullbox	EA	$8,000	Alameda
Roadway Lighting Pole, Foundation and Luminaire w/ Pullbox	EA	$6,500	Alameda
Trenching/Conduit/ Conductors for Lighting	LF	$15	Alameda
Pedestrian Hybrid Beacon	EA	$80,000	Alameda

** = Drainage Contingency Needed; ~ = Utility Contingency Needed*

Step Two: Calculate Composite Costs for Intersections and Crossings

Composite costs were developed for signalized intersections and midblock unsignalized pedestrian crossings based on the assumptions below. Assumptions regarding the number of signalized and unsignalized crossings per mile are explained in Step 3.

Signalized Crossing Cost Assumptions

Total estimated cost per signal improvement: $215,040 (existing signal upgrade)

Item	Unit	Quantity	Unit Cost	Total Cost	Assumptions
Intersection Curb Extensions (All four corners extended)	EA	1	$50,080	$50,080	*Bulb-outs on all four corners*
Median Refuge (New)~	EA	2	$10,000	$20,000	*Median refuge islands on major roadway, not on minor roadway*
High-Visibility Crosswalk	EA	4	$1,440	$5,760	*High-visibility crosswalks on all four approaches (assuming 40'-wide approaches)*
Video Bicycle Detection	Intersection	4	$25,000	$100,000	*Bicycle video detection at intersection*
Bike/Ped Push Button	EA	8	$400	$3,200	*Ped push buttons at each curb ramp*
Pedestrian Signal Head	EA	8	$500	$4,000	*Ped signal head at each curb ramp*
Pedestrian Scale Pole, foundation and luminaire w/ Pullbox	EA	4	$8,000	$32,000	*One pedestrian signal pole per corner (with two ped signal heads)*

Mid-block Rapid Rectangular Flashing Beacon (RRFB) Cost Assumptions

Total estimated cost per mid-block RRFB: $35,360

Item	Unit	Quantity	Unit Cost	Total Cost	Assumptions
Mid-block Curb Extensions (One per side - Two total curb ext)	EA	1	$18,920	$18,920	*One bulb-out per direction (assuming a parking lane)*
High-Visibility Crosswalk	EA	1	$1,440	$1,440	*One high-visibility crosswalk (assuming 40'-wide roadway)*
RRFB (One pair)	EA	1	$15,000	$15,000	

Mid-block Pedestrian Hybrid Beacon (PHB) Cost Assumptions

Total estimated cost per mid-block PHB: $129,280

Item	Unit	Quantity	Unit Cost	Total Cost	Assumptions
Mid-block Curb Extensions (One per side - Two total curb ext)	EA	2	$18,920	$37,840	*One bulb-out per direction (assuming a parking lane)*
Median Refuge (New)~	EA	1	$10,000	$10,000	*Median refuge island*
High-Visibility Crosswalk	EA	1	$1,440	$1,440	*One high-visibility crosswalk (assuming 40'-wide roadway)*
Pedestrian Hybrid Beacon	EA	1	$80,000	$80,000	

Singular Curb Extension Cost Assumptions

Total estimated cost per single curb extension: $9,460

Item	Unit	Quantity	Unit Cost	Total Cost	Assumptions
Roadway Excavation	CY	30	$15	$450	
Curb and Gutter	LF	50	$76	$3,800	
Concrete Sidewalk	SF	30	$17	$510	
ADA Curb Ramp	EA	1	$4,700	$4,700	

Mid-block Curb Extensions (One per side) Cost Assumptions

Total estimated cost per mid-block curb extensions: $18,920

Item	Unit	Quantity	Unit Cost	Total Cost	Assumptions
Roadway Excavation	CY	60	$15	$900	
Curb and Gutter	LF	100	$76	$7,600	
Concrete Sidewalk	SF	60	$17	$1,020	
ADA Curb Ramp	EA	2	$4,700	$9,400	

Intersection Curb Extensions (All four corners extended) Cost Assumptions

Total estimated cost per mid-block curb extensions: $50,080

Item	Unit	Quantity	Unit Cost	Total Cost	Assumptions
Roadway Excavation	CY	200	$15	$3,000	
Curb and Gutter	LF	80	$76	$6,080	
Concrete Sidewalk	SF	200	$17	$3,400	
ADA Curb Ramp	EA	8	$4,700	37,600	

Step Three: Create Per-Mile Pedestrian Improvement Assumptions

Using the crossing costs from Step 2, pedestrian corridor assumptions were made based on street typology for local/neighborhood, collector, and arterial roads. These assumptions also include smaller intersection improvements like additional ADA curb ramp improvements and high-visibility crosswalk treatments. A high-cost and low-cost improvement assumption was generated for each street typology. This helps to account for varying levels of possible investments where the same order of magnitude of improvements may not be required or where pedestrian improvements were not requested during the public engagement phase of the project.

Soft costs applied to all project applications include:

- Soft Costs – 65%
  - Traffic Control – 10%
  - Construction Management – 20%
  - Mobilization – 10%
  - Design and Inspection – 25%
- Contingency – 20%

Local/Neighborhood Road – Low Cost

Total estimated cost per mile for low-cost local/neighborhood improvements: $860,000

Item	Unit	Quantity	Unit Cost	Total Cost	Assumptions
ADA Curb Ramp	EA	80	$4,700	$376,000	*10 blocks per mile, directional curb ramps on all intersection legs*
High-Visibility Crosswalk	EA	40	$1,440	$57,600	*10 blocks per mile, crosswalks across all legs at every intersection*
Material Cost				$433,600	
Soft Costs				$281,840	
Subtotal				$715,440	
Contingency				$143,088	
Total				**$860,000**	

Local/Neighborhood Road – High Cost

Total estimated cost per mile for low-cost local/neighborhood improvements: $1,050,000

Item	Unit	Quantity	Unit Cost	Total Cost	Assumption
Mid-Block RRFB	EA	2	$35,360	$70,720	*Two RRFBs per mile*
Curb Extension (Single bulb-out)*	EA	2	$50,080	$100,160	*10 blocks per mile, curb extensions at 2 intersections*
ADA Curb Ramp	EA	64	$4,700	$300,800	*10 blocks per mile, directional curb ramps on all intersection legs*
High-Visibility Crosswalk	EA	40	$1,440	$57,600	*10 blocks per mile, crosswalks across all legs at every intersection*
Material Cost				$529,280	
Soft Costs				$344,032	
Subtotal				$873,312	
Contingency				$174,662	
Total				**$1,050,000**	

Collector Road – Low Cost

Total estimated cost per mile for low-cost collector improvements: $1,050,000

Item	Unit	Quantity	Unit Cost	Total Cost	Assumption
Mid-Block RRFB	EA	2	$35,360	$70,720	*Two RRFBs per mile*
Curb Extension (Single bulb-out)*	EA	2	$50,080	$100,160	*10 blocks per mile, curb extensions at 2 intersections*
ADA Curb Ramp	EA	64	$4,700	$300,800	*10 blocks per mile, directional curb ramps on all intersection legs*
High-Visibility Crosswalk	EA	40	$1,440	$57,600	*10 blocks per mile, crosswalks across all legs at every intersection*
Material Cost				$529,280	
Soft Costs				$344,032	
Subtotal				$873,312	
Contingency				$174,662	
Total				**$1,050,000**	

Collector Road – High Cost

Total estimated cost per mile for high-cost collector improvements: $1,780,000

Item	Unit	Quantity	Unit Cost	Total Cost	Assumption
Mid-Block RRFB	EA	2	$35,360	$70,720	*Two RRFBs per mile*
Curb Extension (Single bulb-out)*	EA	4	$50,080	$200,320	*10 blocks per mile, curb extensions at 4 intersections*
ADA Curb Ramp	EA	32	$4,700	$150,400	*10 blocks per mile, curb ramps at intersections on major street*
High-Visibility Crosswalk	EA	32	$1,440	$46,080	*10 blocks per mile, crosswalks across major and minor streets at every intersection*
Signal Improvements	EA	2	$215,040	$430,080	*Signal improvements at 3 intersections per mile*
Material Cost				$897,600	
Soft Costs				$583,440	
Subtotal				$1,481,040	
Contingency				$296,208	
Total				**$1,780,000**	

Arterial Road – Low Cost

Total estimated cost per mile for low-cost arterial improvements: $2,030,000

Item	Unit	Quantity	Unit Cost	Total Cost	Assumption
Mid-Block RRFB	EA	2	$35,360	$70,720	*Two RRFBs per mile*
Mid-Block Pedestrian Hybrid Beacon	EA	1	129,280	$129,280	*One PHB per mile*
Curb Extension (Single bulb-out)*	EA	4	$50,080	$200,320	*10 blocks per mile, curb extensions at 4 intersections*
ADA Curb Ramp	EA	32	$4,700	$150,400	*10 blocks per mile, curb ramps at intersections on major street*
High-Visibility Crosswalk	EA	32	$1,440	$46,080	*10 blocks per mile, crosswalks across major and minor streets at every intersection*
Signal Improvements	EA	2	$215,040	$430,080	*Signal improvements at 3 intersections per mile*
Material Cost				$1,026,880	
Soft Costs				$667,472	
Subtotal				$1,694,352	
Contingency				$338,870	
Total				**$2,030,000**	

Arterial Road – High Cost

Total estimated cost per mile for high-cost arterial improvements: $2,410,000

Item	Unit	Quantity	Unit Cost	Total Cost	Assumption
Mid-Block RRFB	EA	2	$129,280	$258,560	*Two RRFBs per mile*
Mid-Block Pedestrian Hybrid Beacon	EA	4	$50,080	$200,320	*Two RRFBs per mile*
Curb Extension (Single bulb-out)*	EA	16	$4,700	$75,200	*10 blocks per mile, curb extensions at 6 intersections*
ADA Curb Ramp	EA	28	$1,440	$40,320	*10 blocks per mile, curb ramps at intersections on major street*
High-Visibility Crosswalk	EA	3	$215,040	$645,120	*10 blocks per mile, crosswalks across major and minor streets at every intersection*
Signal Improvements	EA	2	$129,280	$258,560	*Signal improvements at 3 intersections per mile*
Material Cost				$1,219,520	
Soft Costs				$792,688	
Subtotal				$2,012,208	
Contingency				$402,442	
Total				**$2,410,000**	

Step Four: Create Per-Mile Bicycle Improvement Assumptions

Bicycle project cost assumptions were generated to account for changes within the proposed recommended bikeway facility space only. Additional costs for roadway resurfacing would need to be factored into the cost estimates below other than Class I Multi-use Path cost assumptions, which assume brand-new paths and not rehabilitation.

Class I Multi-Use Path Cost Assumptions

Total estimated cost per mile for Class I Multi-Use Paths: $1,164,000

Item	Unit	Quantity	Unit Cost	Total Cost	Assumptions
Roadway Excavation	CY	2738	$15	$41,152	*14' width, 2' depth*
Class 2 Aggregate Subbase	CY	4106.667	$39	$158,394	*10 'width, 1.5' depth*
Asphalt Path	SF	52800	$6	$316,800	*10' width*
6" Bicycle Lane Line (Thermo)	LF	10560	$3	$31,680	*10 blocks per mile, curb extensions at intersections on major street*
Sign Install	EA	22	$500	$11,000	*500' spacing, both sides of street*
High-Visibility Crosswalk	EA	20	$1,440	$28,800	*10 blocks per mile, crosswalks across major street at every intersection*
Material Cost				$587,826	
Soft Costs				$382,087	
Subtotal				$969,913	
Contingency				$193,983	
Total				**$1,164,000**	

Class II Bicycle Lane Cost Assumptions

Total estimated cost per mile for Class II Bicycle Lanes (not buffered): $151,000

Item	Unit	Quantity	Unit Cost	Total Cost	Assumption
6" Bicycle Lane Line (Thermo)	LF	21120	$3	$63,360	*Continuous, bi-directional bicycle lanes*
Sign Install	EA	22	$500	$11,000	*500' spacing, both sides of street*
Thermoplastic Bicycle Lane Legend @ 14 Sq Ft each	EA	43	$45	$1,935	*250' spacing*
Material Cost				$76,295	
Soft Costs				$49,592	
Subtotal				$125,887	
Contingency				$25,177	
Total				**$151,000**	

Class II Buffered Bicycle Lane Cost Assumptions

Total estimated cost per mile for Class II Buffered Bicycle Lanes: $232,000

Item	Unit	Quantity	Unit Cost	Total Cost	Assumption
6" Bicycle Lane Line (Thermo)	LF	31680	$3	$95,040	*Both sides of buffer*
Sign Install	EA	22	$500	$11,000	*500' spacing, both sides of street*
8" Channelization Line (Thermo)	LF	2244	$4	$8,976	*20' spacing, diagonal channelization lines (4.25' length assumes 3' wide buffer)*
Thermoplastic Bicycle Lane Legend @ 14 Sq Ft each	EA	43	$45	$1,935	*250' spacing*
Material Cost				$116,951	
Soft Costs				$76,018	
Subtotal				$192,969	
Contingency				$38,594	
Total				**$232,000**	

Class III Bicycle Route Cost Assumptions

Total estimated cost per mile for Class III Bicycle Route: $28,000

Item	**Unit**	**Quantity**	**Unit Cost**	**Total Cost**	**Assumption**
Thermoplastic Bicycle Boulevard Legend (@ 51 Sq Ft Each)	EA	43	$70	$3,010	*250' spacing*
Sign Install	EA	22	$500	$11,000	*500' spacing, both sides of street*
Material Cost				$14,010	
Soft Costs				$9,107	
Subtotal				$23,117	
Contingency				$4,623	
Total				**$28,000**	

Class III Bicycle Boulevard Cost Assumptions

Total estimated cost per mile for Class III Bicycle Boulevards (traffic calming): $131,000

Item	Unit	Quantity	Unit Cost	Total Cost	Assumption
Thermoplastic Bicycle Boulevard Legend (@ 51 Sq Ft Each)	EA	43	$70	$3,010	*250' spacing*
Neighborhood Traffic Circle (30' diam. With 8' apron)*	EA	1	$12,000	$12,000	*Assumes one per mile*
Curb Extension (Single bulb-out)*	EA	1	$40,000	$40,000	*Assumes one complete intersection to calm traffic*
Sign Install	EA	22	$500	$11,000	*500' spacing, both sides of street*
Material Cost				$66,010	
Soft Costs				$42,907	
Subtotal				$108,917	
Contingency				$21,783	
Total				**$131,000**	

Class IV Separated Bikeway – Low Cost Assumptions

Total estimated cost per mile for low-cost Class IV Separated Bikeway: $336,000

Item	Unit	Quantity	Unit Cost	Total Cost	Assumption
Sign Install	EA	22	$500	$11,000	*500' spacing, both sides of street*
6" Bicycle Lane Line (Thermo)	LF	21120	$3	$63,360	*Both sides of buffer*
8" Channelization Line (Thermo)	LF	2244	$4	$8,976	*20' spacing, diagonal channelization lines (4.25' legnth assumes 3' wide buffer)*
Thermoplastic Bicycle Lane Legend @ 14 Sq Ft each	EA	43	$45	$1,935	*250' spacing*
Soft Hit Posts	LF	10560	$8	$84,480	
Material Cost				$169,751	
Soft Costs				$110,338	
Subtotal				$280,089	
Contingency				$56,018	
Total				**$336,000**	

Class IV Separated Bikeway – High Cost Assumptions

Total estimated cost per mile for high-cost Class IV Separated Bikeway: $1,219,000

Item	Unit	Quantity	Unit Cost	Total Cost	Assumption
Sign Install	EA	22	$500	$11,000	*500' spacing, both sides of street*
Thermoplastic Bicycle Lane Legend @ 14 Sq Ft each	EA	43	$45	$1,935	*250' spacing*
Concrete Sidewalk*~	SF	28680	$17	$476,088	*3'-wide concrete buffer, both sides of street, less 50' at each intersection, 10 blocks per mile*
Concrete Curb*~	LF	21120	$6	$126,720	*Continuous*
Material Cost				$615,743	
Soft Costs				$400,233	
Subtotal				$1,015,976	
Contingency				$203,195	
Total				**$1,219,000**	

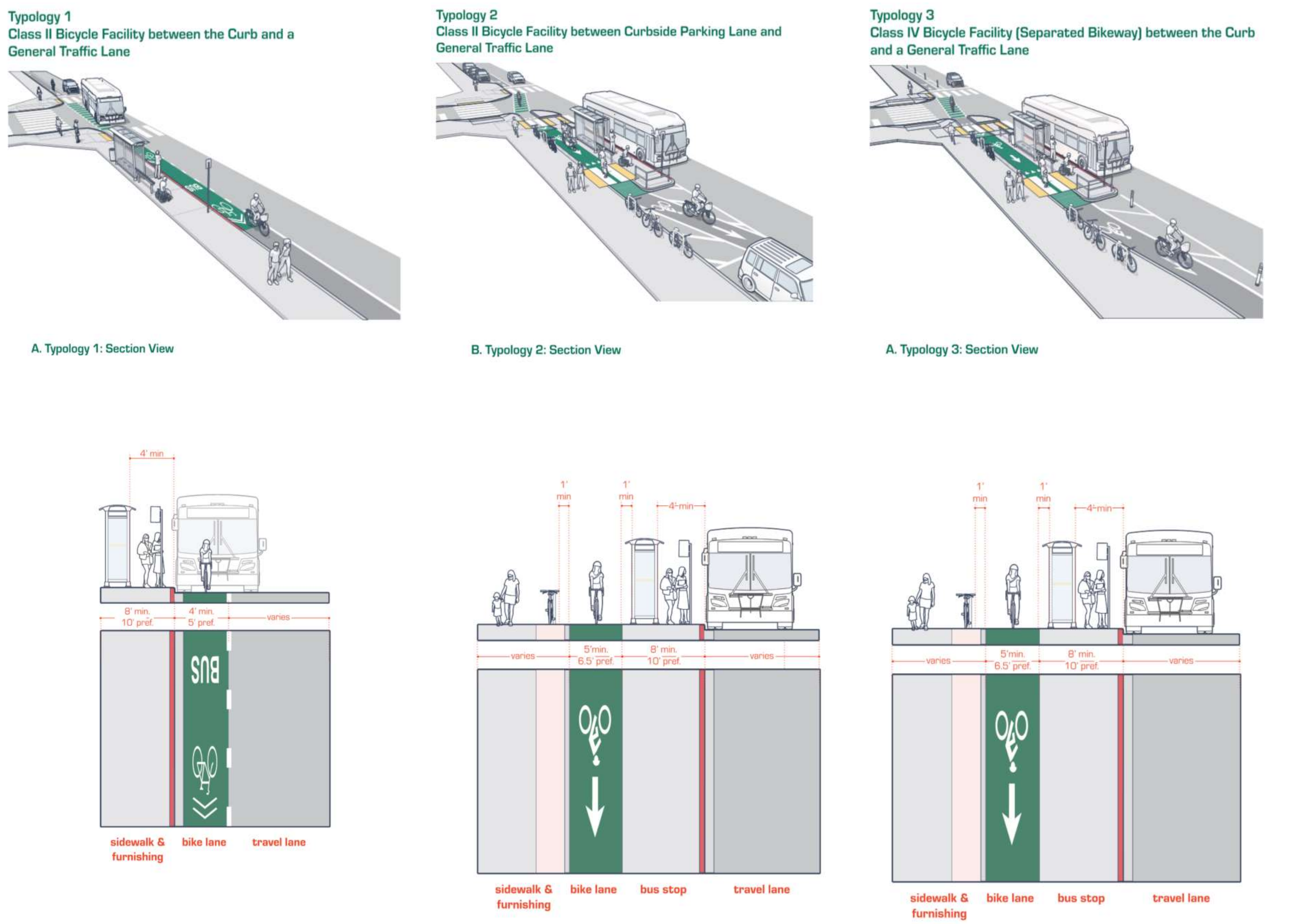
Step Five: Create Per-Mile Transit Improvements Assumptions

Transit improvement assumptions for this project were developed in conjunction with the AC Transit Multimodal Corridor Design Guide. Per-mile high-, medium-, and low-cost improvement assumptions were generated for project segments running along AC Transit bus routes. Each transit cost assumption was generated to account for pedestrian-supportive amenities only and does not include direct costs for transit-only improvements such as signal improvements like Transit Signal Prioritization or Bus Rapid Transit. Additionally, sidewalk improvements will need to be considered in addition to the unit for bus stops provided below during each corridor project scoping.

Composite Costs for Bus Stop Typologies

The AC Transit Multimodal Corridor Design Guide provides multiple bus stop configuration typologies that could be applied through its service area. For the purposes of this Plan, bus stop typology 1 is generally preferred for Class II Bike Lane applications and low-cost Class IV Separated Bikeway applications where transit may mix with the bikeway at bus stops. Bus stop typology 2 and typology 3 are very similar from a cost perspective and shown as a combined typology 2/3, below. Typology 2/3 is generally preferred where separate of transit and bicycle facilities is needed on higher frequency transit routes and where curb-separated Class IV facilities are desired. Figure 1 on the following shows the different typologies.

Figure 1. AC Transit Multimodal Corridor Guide Bus Stop Typologies



Floating Transit Island Unit Cost

To assist with cost estimating, the floating transit island cost for Typology 2/3 is calculated separately. Each individual transit island assumes a raised one-way separated bikeway area, lean rail, and detectable warning surfaces are included. The total unit cost for the floating transit island is: $41,725 (does not include contingencies).

Item	Unit	Quantity	Unit Cost	Total Cost	Assumption
Roadway Excavation	CY	300	$15	$4,500	*15' x 60' area*
Curb and Gutter	LF	90	$76	$6,840	*Includes small corner island*
Concrete Sidewalk	SF	925	$17	$15,725	*Transit island, raised bikeway, and corner island*
ADA Curb Ramp at Rear of Platform	EA	1	$4,700	$4,700	*Ramp at rear of platform*
Detectable Warning Surface	SF	30	$42	$1,260	*Four 5' x 1.5' surfaces*
Tubular Handrailing (Lean Rail)	LF	50	$174	$8,700	*60' total island minus crossings*

Typology 1 Composite Cost

Total estimated cost per single typology 1 bus stop: $38,000

Item	Unit	Quantity	Unit Cost	Total Cost	Assumption
Green Thermoplastic	SF	75	$8	$600	*Green paint, dashed bike lane - 5' x 30' (divided by two to account for dash)*
Green Thermoplastic	SF	420	$8	$3,360	*Green paint, solid bike lane - 5' x 84'*
Painted Curb	LF	84	$3	$252	*Red curb paint - 84'*
Transit Shelter	EA	1	$10,000	$10,000	*Transit shelter*
Bike Rack	EA	2	$812	$1,623	*Class II bike parking - 2 racks for 4 bikes*
Sign Install	EA	1	$500	$500	*Bus Stop Pole*
High-Visibility Crosswalk	EA	2	$1,440	$2,880	*Re-paint crosswalks on two approaches*
Thermoplastic Bicycle Boulevard Legend (@ 51 Sq Ft Each)	EA	2	$ 70	$ 140	*Sharrow pavement markings*
Material Cost				$19,355	
Soft Costs				$12,581	
Subtotal				$31,936	
Contingency				$6,387	
Total				**$38,000**	

Typology 2/3 Composite Cost

Total estimated cost per single typology 2/3 bus stop: $131,000

Item	Unit	Quantity	Unit Cost	Total Cost	Assumption
Green Thermoplastic	SF	145	$8	$1,160	*Green paint, dashed bike lane through intersection - 5' x 58'*
Green Thermoplastic	SF	300	$8	$2,400	*Green paint, solid bike lane behind transit island - 5' x 60'*
Painted Curb	LF	60	$3	$180	*Red curb paint - 60'*
Transit Shelter	EA	1	$10,000	$10,000	*Transit shelter*
Bike Rack	EA	2	$812	$1,623	*Class II bike parking - 2 racks for 4 bikes*
Sign Install	EA	1	$500	$500	*Bus Stop Pole*
Floating Transit Island	EA	1	$41,725	$41,725	*Floating transit island with raised bikeway, lean rails, and detectable warning surfaces - 10' x 60' island and 5' x 60' ramped up bike lane*
ADA Curb Ramp	EA	1	$4,700	$4,700	*1 curb ramp at intersection corner (not for transit island)*
High-Visibility Crosswalk	EA	2	$1,440	$2,880	*Re-paint crosswalks on two approaches*
Thermoplastic Bicycle Lane Legend @ 14 Sq Ft each	EA	22	$45	$990	*Bike lane pavement markings*
12" White Crosswalk/Limit Line (Thermo)	LF	10	$6	$60	*Yield lines + sign*
Material Cost				$66,218	
Soft Costs				$43,042	
Subtotal				$109,260	
Contingency				$21,852	
Total				**$131,000**	

Transit Corridor Identification

In collaboration with AC Transit, transit corridors were sorted in to high-/medium-/low-cost corridors in order to apply per-mile cost assumptions. Full transit corridor cost ranges for all transit-related improvements are indicated in this section for informational purposes only, but only the pedestrian and bicycle access to transit costs are included in this plan.

High-Cost Transit Corridor Cost Assumptions

High-cost transit corridors are corridors identified for future bus rapid transit (BRT), with more required signal updates and civil construction than any of the lower cost transit corridors. AC Transit indicated that the full cost of all pedestrian, bicycle, and transit improvements for high-costs corridors are estimated to range in cost from $8 million per mile to $12 million per mile. The following have been identified as high-cost transit corridors:

- Hesperian Boulevard
- Mission Boulevard
- A Street
- B Street
- Tennyson Boulevard

Medium-Cost Transit Corridor Cost Assumptions

Improvements along medium-cost transit corridors may include boarding islands, transit signal priority, and queue jumps (including new signal heads, striping changes, transit detection and corresponding infrastructure), among other improvements. AC Transit indicated that the full cost of all pedestrian, bicycle, and transit improvements for medium-costs corridors are estimated to range in cost from $4 million per mile to $6 million per mile. The following have been identified as medium-cost transit corridors:

- C Street
- Winton Avenue/D Street
- Clawiter Road/Industrial Boulevard
- Grand Street

Low-Cost Transit Corridor Cost Assumptions

These high- and medium-cost transit corridors are supported with several low-cost transit corridors, identified in the BPMP project list. Improvements along low-cost transit corridors may include bus stop relocations and updates, implementation of transit signal priority, striping changes, and sidewalk improvements, among other more minor improvements. AC Transit indicated that the full cost of all pedestrian, bicycle, and transit improvements for low-costs corridors are estimated to range in cost from $1 million per mile to $3 million per mile.

Transit Corridor Per-Mile Cost Calculations

The table below calculates the total per-mile cost assumptions based on the proposal bicycle facility, the transit corridor cost level, the assumed bus stop typology, and the bus stop spacing.

Bikeway Facility Type	Transit Corridor Cost	AC Transit Bus Stops Type	AC Transit Bus Stop Unit Cost	Stop Spacing (FT)	Stops Per Mile	Cost Per Mile
Class II Bicycle Lane	High	Typology 2/3	$131,000	1700	6	**$786,000**
Class II Bicycle Lane	Medium	Typology 1	$38,000	1000	10	**$380,000**
Class II Bicycle Lane	Low	Typology 1	$38,000	1000	10	**$380,000**
Class IV Separate Bikeway	High	Typology 2/3	$131,000	1700	6	**$786,000**
Class IV Separate Bikeway	Medium	Typology 2/3	$131,000	1000	10	**$1,310,000**
Class IV Separate Bikeway	Low	Typology 1	$38,000	1000	10	**$380,000**

Step Six: Create Complete Corridor Costs Estimates

Once all the individual per-mile cost assumptions for pedestrian, bicycle, and transit facilities were established, the length of each implementation segment was used in conjunction with the street typology to generate “complete corridor” cost estimates. The complete corridor project cost estimates can be found in the BPMP project list. As stated earlier, pedestrian and transit improvements should be reassessed prior to implementation or release of potential bids to confirm the exact number of treatments. The costs presented in the BPMP are designed to help give a conservative estimate of potential pedestrian and transit improvements costs on a large scale.

APPENDIX G

FUNDING SOURCE DESCRIPTIONS AND DETAILS

This technical appendix provides details on eligible funding sources for the Hayward Bicycle and Pedestrian Master Plan. This includes the following.

Contents

FEDERAL SOURCES

Better Utilizing Investments to Leverage Development (BUILD) Grant

Managing Agency: United States Department of Transportation

The Better Utilizing Investments to Leverage Development, or BUILD Transportation Discretionary Grant program, provides a unique opportunity for the United States Department of Transportation to invest in road, rail, transit and port projects that promise to achieve national objectives. Previously known as Transportation Investment Generating Economic Recovery, or TIGER Discretionary Grants, Congress has dedicated nearly $5.6 billion for nine rounds of National Infrastructure Investments to fund projects that have a significant local or regional impact. The eligibility requirements of BUILD allow project sponsors at the State and local levels to obtain funding for multimodal, multi-jurisdictional projects that are more difficult to support through traditional transportation department (DOT) programs. BUILD can fund port and freight rail projects, for example, which play a critical role in our ability to move freight, but have limited sources of Federal funds.

Congestion Management & Air Quality (CMAQ)

Managing Agency: Federal Highway Administration

The Congestion Mitigation and Air Quality Improvement (CMAQ) program provides a flexible funding source for State and local governments to fund transportation projects and programs to help meet the requirements of the Clean Air Act (CAA) and its amendments. CMAQ money supports transportation projects that reduce mobile source emissions in areas designated by the U.S. Environmental Protection Agency (EPA) to be in nonattainment or maintenance of the national ambient air quality standards. Since its beginning in 1992, the CMAQ program has provided more than $30 billion for over 29,000 transportation-related emission reduction projects for State DOTs, metropolitan planning organizations (MPOs), and other sponsors across the country. All CMAQ projects must come from a transportation plan and Transportation Improvement Program. The Federal share for most CMAQ-eligible projects is 80 percent, but certain safety projects that include an air quality or congestion relief component (e.g., carpool/vanpool projects), may have a Federal share of 100 percent.

Surface Transportation Block Grant (STBG) Program

Managing Agency: Federal Highway Administration

The Fixing America's Surface Transportation (FAST) Act converts the long-standing Surface Transportation Program (STP) into the Surface Transportation Block Grant Program (STBG) acknowledging that this program has the most flexible eligibilities among all Federal-aid highway programs and aligning the program's name with how the FHWA has historically administered it. The STBG promotes flexibility in State and local transportation decisions and provides flexible funding to best address State and local transportation needs. STBG funding may be used for projects to preserve and improve the conditions and performance on any Federal-aid highway, bridge and tunnel projects on any public road, pedestrian and bicycle infrastructure, and transit capital projects, including intercity bus terminals.

Land and Water Conservation Fund (LWCF)

Managing Agency: National Park Service

The LWCF provides matching grants to States and local governments for the acquisition and development of public outdoor recreation areas and facilities. Over its first 49 years (1965 - 2014), LWCF has provided more than $16.7 billion to acquire new Federal recreation lands as grants to State and local governments. Projects can include acquisition of open space, development of small city and neighborhood parks, and construction of trails or greenways.

Rivers, Trails, and Conservation Assistance Program

Managing Agency: National Park Service

The National Park Service Rivers, Trails, and Conservation Assistance program supports community-led natural resource conservation and outdoor recreation projects across the nation. The National Park Service helps community groups, nonprofits, tribes, and state and local governments to design trails and parks, conserve and improve access to rivers, protect special places, and create recreation opportunities.

Community Development Block Grant Program

Managing Agency: US Derpatment of Housing and Urban Development (HUD)

The Community Development Block Grant (CDBG) entitlement program provides annual grants on a formula basis larger cities and urban counties to develop "viable communities by providing decent housing, a suitable living environment, and opportunities to expand economic opportunities, principally for low- and moderate- income persons." Bicycle and pedestrian facilities are eligible uses of these funds, including for example sidewalk reconstruction. More information is available at https://www.hudexchange.info/programs/cdbg-entitlement/.

STATE PROGRAMS

Active Transportation Program (ATP) Grants

Managing Agency: California Department of Transportation (Caltrans)

The Active Transportation Program consolidates existing federal and state transportation programs, including the Transportation Alternatives Program (TAP), Bicycle Transportation Account (BTA), and State Safe Routes to School (SR2S), into a single program with a focus to make California a national leader in active transportation. The ATP administered by the Division of Local Assistance, Office of State Programs. The purpose of the ATP is to encourage increased use of active modes of transportation by increasing the proportion of trips accomplished by biking and walking, increasing safety of non-motorized users, reduce greenhouse gases, enhance public health, and ensure that disadvantaged communities full share in the benefits of the program.

Sustainable Communities Grants

Managing Agency: California Department of Transportation (Caltrans)

The Sustainable Transportation Planning Grant Program was created to support the California Department of Transportation's (Caltrans) Mission: Provide a safe, sustainable, integrated and efficient transportation system to enhance California's economy and livability. The California Legislature passed, and Governor Edmund G. Brown Jr. signed into law, Senate Bill (SB) 1, the Road Repair and Accountability Act of 2017, a transportation funding bill that will provide a reliable source of funds to maintain and integrate the State's multi-modal transportation system. Eligible planning projects must have a transportation nexus ideally demonstrating that planning projects directly benefit the multi-modal transportation system. Sustainable Communities Grants will also improve public health, social equity, environmental justice, the environment, and provide other important community benefits.

Strategic Partnerships Grants

Managing Agency: California Department of Transportation (Caltrans)

Strategic Partnerships are intended to fund planning projects that address needs on the State highway system, while the transit component will address multimodal planning projects that focus on transit. A smaller amount of funds is dedicated to Strategic Partnership – Transit allocations to better integrate transit into the overall transportation system. Strategic Partnerships are funded through California Senate Bill (SB) 1 and are allocated in conjunction with Sustainable Communities grants.

Adaptation Planning Grants

Managing Agency: California Department of Transportation (Caltrans)

Climate change adaptation aims to anticipate and prepare for climate change impacts to reduce the damage from climate change and extreme weather events. Adaptation is distinct from, but complements, climate change mitigation, which aims to reduce GHG emissions. This funding is intended to advance adaptation planning on California's transportation infrastructure, including but not limited to roads, railways, bikeways, trails, bridges, ports, and airports. Adaptation efforts will enhance the resiliency of the transportation system to help protect against climate impacts. The overarching goal of this grant program is to support planning actions at local and regional levels that advance climate change adaptation efforts on the transportation system, especially efforts that serve the communities most vulnerable to climate change impacts. Strategic Partnerships are funded through California Senate Bill (SB) 1 under the Public Transportation Account (PTA).

State Highway Operation and Protection Program (SHOPP)

Managing Agency: California Department of Transportation (Caltrans)

The 2018 State Highway Operation and Protection Program (SHOPP) is the State Highway System's "fix-it-first" program that funds the repair and preservation, emergency repairs, safety improvements, and some highway operational improvements on the State Highway System (SHS). By continuously repairing and rehabilitating the SHS, the SHOPP protects the enormous investment that has been made over many decades to create and manage the approximately 50,000 lane-mile SHS. The SHS includes statutorily designated state-owned roads, highways (including the Interstate system) and bridges (including associated bicycle and pedestrian facilities) and their supporting infrastructure such as culverts, transportation management systems (TMS), safety roadside rest areas, and maintenance stations. Revenues for the SHOPP are generated by federal and state gas taxes and are fiscally constrained by the State Transportation Improvement Program Fund Estimate that is produced by Caltrans and adopted by the California Transportation Commission.

Highway Safety Improvement Program (HSIP) Grant

Managing Agency: California Department of Transportation (Caltrans)

The Highway Safety Improvement Program (HSIP) is one of the core federal-aid programs in the federal surface transportation act, Fixing America's Surface Transportation Act (FAST), and is administered by Caltrans. The purpose of the HSIP program is to achieve a significant reduction in traffic fatalities and serious injuries on all public roads, including non-State-owned public roads and roads on tribal land. Example safety projects include, but are not limited to: crosswalk markings, rapid flashing beacons, curb extensions, speed feedback signs, guard rails, pedestrian refuge islands, slurry seal, and other pavement markings.

Systemic Safety Analysis Report Program (SSARP)

Managing Agency: California Department of Transportation (Caltrans)

The state-funded Systemic Safety Analysis Report Program (SSARP) was established in 2016. The state funding for the SSARP program is made available by exchanging the local Highway Safety Improvement Program (HSIP) federal funds for State Highway Account (SHA) funds. The intent of this program is to assist local agencies in performing a collision analysis, identifying safety issues on their roadway networks, and developing a list of systemic low-cost countermeasures that can be used to prepare future HSIP and other safety program applications.

Transit and Intercity Rail Capital Program (TIRCP)

Managing Agency: California Transportation Commission

The Transit and Intercity Rail Capital Program (TIRCP) was created by Senate Bill (SB) 862 and modified by Senate Bill 9 to provide grants from the Greenhouse Gas Reduction Fund to fund transformative capital improvements that will modernize California's intercity, commuter, and urban rail systems, and bus and ferry transit systems to reduce emissions of greenhouse gases by reducing congestion and vehicle miles traveled throughout California. The primary program objectives include reducing greenhouse gas emissions, expanding and improving rail service to increase ridership, integrate the rail service of the state's various rail operations (including integration with the high-speed rail system), and improving safety. Caltrans, in collaboration with CalSTA, are responsible for administering this program.

State Transportation Improvement Program (STIP)

Managing Agency: California Transportation Commission

The State Transportation Improvement Program (STIP) is the biennial five-year plan adopted by the California Transportation Commission for future allocations of certain state transportation funds for state highway improvements, intercity rail, and regional highway and transit improvements. State law requires the Commission to update the STIP biennially, in even-numbered years, with each new STIP adding two new years to prior programming commitments. CTC staff recommendations are based on the combined programming capacity for the Public Transportation Account (PTA) and State Highway Account (SHA) as identified in the Fund Estimate adopted by the CTC. The Commission's adopted STIP may include only projects that have been nominated by a regional agency in its regional transportation improvement program (RTIP) or by Caltrans in its interregional transportation improvement program (ITIP).

Trade Corridor Enhancement Program (TCEP)

Managing Agency: California Transportation Commission

The objective of the Trade Corridor Enhancement Program is to fund infrastructure improvements on federally designated Trade Corridors of National and Regional Significance, on the Primary Freight Network, as identified in the California Freight Mobility Plan, and along other corridors that have a high volume of freight movement as determined by the Commission. The Trade Corridor Enhancement Program will also support the goals of the National Highway

Freight Program, the California Freight Mobility Plan, and the guiding principles in the California Sustainable Freight Action Plan.

State-Local Partnership Program (LPP)

Managing Agency: California Transportation Commission

The Road Repair and Accountability Act of 2017 (Senate Bill 1) created the Local Partnership Program, which is modeled closely after the Proposition 1B State Local Partnership Program. The purpose of this program is to provide local and regional transportation agencies that have passed sales tax measures, developer fees, or other imposed transportation fees with a continuous appropriation of $200 million annually from the Road Maintenance and Rehabilitation Account to fund road maintenance and rehabilitation, sound walls, and other transportation improvement projects. Consistent with the intent behind Senate Bill 1, the Commission intends this program to balance the need to direct increased revenue to the state's highest transportation needs while fairly distributing the economic impact of increased funding. The Local Partnership Program provides funding to local and regional agencies to improve aging Infrastructure, road conditions, active transportation, and health and safety benefits.

Office of Traffic Safety (OTS) Grants

Managing Agency: Office of Traffic Safety

The California Office of Traffic Safety (OTS) strives to eliminate traffic deaths and injuries. It does this by making available grants to local and state public agencies for programs that help them enforce traffic laws, educate the public in traffic safety, and provide varied and effective means of reducing fatalities, injuries and economic losses from collisions.

Recreational Trails Program (RTP) Program

Managing Agency: California Department of Park and Recreation

The Recreational Trails Program (RTP) provides funds annually for recreational trails and trails-related projects. The RTP is administered at the federal level by the Federal Highway Administration (FHWA). It is administered at the state level by the California Department of Parks and Recreation (DPR) and the Department of Transportation (Caltrans) Active Transportation Program (ATP). Eligible non-motorized projects include acquisition of easements and fee simple title to property for recreational trails and recreational trail corridors; and, development, or rehabilitation of trails, trailside, and trailhead facilities. The program requires a 12% match. FHWA must approve project recommendations before California State Parks can execute grant contracts. Prior to forwarding these projects to FHWA, each must comply with the National Historical Preservation Act of 1966 (Section 106), National Environmental Policy Act (NEPA), and be listed on the State Transportation Improvement Plan (STIP).

Affordable Housing and Sustainable Communities (AHSC) Program

Managing Agency: California Strategic Growth Council

The purpose of the AHSC Program is to reduce greenhouse gas (GHG) emissions through projects that implement land-use, housing, transportation, and agricultural land preservation practices to support infill and compact development, and that support related and coordinated public policy objectives. The AHSC program includes transportation focuses related to reducing air pollution, improving conditions in disadvantaged communities, supporting or improving public health, improving connectivity and accessibility to jobs, increasing options for mobility, and increasing transit ridership. Funding for the AHSC Program is provided from the Greenhouse Gas Reduction Fund (GGRF), an account established to receive Cap-and-Trade auction proceeds.

Transformative Climate Communities (TCC) Program

Managing Agency: California Strategic Growth Council

The Transformative Climate Communities Program was established by Assembly Bill (AB) 2722 to fund the development and implementation of neighborhood-level transformative climate community plans that include multiple, coordinated greenhouse gas emissions reduction projects that provide local economic, environmental, and health benefits to disadvantaged communities. The TCC Program is also an opportunity to realize the State's vision of Vibrant Communities and Landscapes3, demonstrating how meaningful community engagement coupled with strategic investments in transportation, housing, food, energy, natural resources, and waste can reduce GHG emissions and other pollution, while also advancing social and health equity and enhancing economic opportunity and community resilience. The TCC Program funds both implementation and planning grants. While the program can fund a variety of projects, transportation-related projects can include, but are not limited to: developing active transportation and public transit projects; support transit ridership programs and transit passes for low-income riders; expand first/last mile connections, build safe and accessible biking and walking routes, and encourage education and planning activities to promote increased use of active modes of transportation.

Environmental Enhancement and Mitigation (EEM) Grant Program

Managing Agency: California Natural Resources Agency

This program authorizes the California state legislature to allocate up to $7 million each fiscal year from the Highway Users Tax Account. EEM projects must contribute to mitigation of the environmental effects of transportation facilities. The EEM Program does not generally fund commute-related trails or similar bicycle/pedestrian infrastructure. However, it does fund recreational and nature trails as part of stormwater management or green infrastructure projects.

Urban Greening Grant Program

Managing Agency: California Natural Resources Agency

As part of the California State Senate Bill (SB) 859, the California Natural Resources Agency's Urban Greening Program was created and is funded by the Greenhouse Gas Reduction Fund (GGRF) to support the development of green infrastructure projects that reduce GHG emissions and provide multiple benefits. In 2017, approximately $26 million was allocated from the GGRF to the Urban Greening Program. Projects should be focused in disadvantaged communities to maximize economic, environmental, and public benefits. The Urban Greening Program will fund projects that reduce greenhouse gases by sequestering carbon, decreasing energy consumption and reducing vehicle miles traveled, while also transforming the built environment into places that are more sustainable, enjoyable, and effective in creating healthy and vibrant communities. These projects will establish and enhance parks and open space, using natural solutions to improving air and water quality and reducing energy consumption, and creating more walkable and bike-able trails.

Environmental Justice (EJ) Small Grants Program

Managing Agency: California Environmental Protection Agency

The Environmental Justice (EJ) Small Grants Program offers funding opportunities to assist eligible non-profit community organizations and federally-recognized Tribal governments to address environmental justice issues in areas disproportionately affected by environmental pollution and hazards. The EJ Small Grants are awarded on a competitive basis with a maximum amount $50,000 per grant. EJ Small Grants can be used for a variety of environmental purposes but can also be used to augment community engagement, health, trainings, and programmatic opportunities in underserved communities.

Stormwater Management Program

Managing Agency: State Water Resources Control Board

The Storm Water Grant Program (SWGP) is intended to promote the beneficial use of storm water and dry weather runoff in California by providing financial assistance to eligible applicants for projects that provide multiple benefits while improving water quality. Under California Prop 1, the state authorized $7.545 billion in general obligation bonds for water projects including surface and groundwater storage, ecosystem and watershed protection and restoration, and drinking water protection. Funds can be made available for multi-benefit storm water management projects which may include, but shall not be limited to: green infrastructure, rainwater and storm water capture projects and storm water treatment facilities. The program can also fund Stormwater Resource Plans and project-specific planning projects. Transportation-related projects funded by the program include green streets, urban runoff enhancements, greenbelts, stormwater capture systems, and permeable pavement projects.

Clean Mobility Options for Disadvantaged Communities

The Clean Mobility Options Voucher Pilot Program (CMO)

AB 2766 Subvention Program

Managing Agency: Bay Area Air Quality Management District (BAAQMD)

Assembly Bill 2766 was adopted in 1990 to provide a revenue source that would reduce air pollution from motor vehicles. The law authorizes the California DMV to collect vehicle registration surchage; 40% of funds are retruend to cities and counties to fund pollution-reducing transportation projects Projects must meet the California Air Resources Board's (CARB) funding criteria.

Coastal Conservancy Grants

Managing Agency: Coastal Conservancy

The Coastal Conservancy of California administers grant money that is issued annually for projects that restore and protect the coast, increase public access to the coast; and increase communities' climate change resilience. The Coastal Conservancy issues tens of millions of dollars in grant money annually. Grant applications are accepted on an ongoing basis from agencies, federally-recognized tribes, and 501(c)(3) nonprofit organizations. Most Conservancy programs have no established minimum or maximum grant amounts. More information, including project eligibility, can be found at https://scc.ca.gov/grants/.

REGIONAL PROGRAMS

One Bay Area Grants (OBAG)

Managing Agency: Metropolitan Transportation Commission

MTC's One Bay Area Grant program (OBAG) is a funding approach that aligns the Commission's investments with support for focused growth. Established in 2012, OBAG taps federal funds to maintain MTC's commitments to regional transportation priorities while also advancing the Bay Area's land-use and housing goals. OBAG includes both a regional program and a county program that both targets project investments in Priority Development Areas (PDAs) and rewards cities and counties that approve new housing construction and accept allocations through the Regional Housing Need Allocation (RHNA) process. Cities and counties can use these OBAG funds to invest in local street and road maintenance, streetscape enhancements, bicycle and pedestrian improvements, transportation planning, and Safe Routes to School projects. The most recent OBAG funding cycle (OBAG 2) is project to fund approximately $800 million in projects from 2017/2018 through 2021/2022.

Transportation Development Act (TDA) Article 3

Managing Agency: Metropolitan Transportation Commission

The Transportation Development Act Article 3, or TDA 3, provides funding annually for bicycle and pedestrian projects. Two percent of TDA funds collected in the county is used for TDA 3. MTC allows each county to determine how to use funds in their county. Some counties competitively select projects while other counties distribute the funds to jurisdictions based on population. Each county coordinates a consolidated annual request for projects to be funded in the county.

Regional Measure 1, 2, 3, and Future Regional Measures

Managing Agency: Metropolitan Transportation Commission

To help solve the Bay Area's growing congestion problems, MTC worked with the state Legislature to authorize a series of ballot measure that would finance a comprehensive suite of highway and transit improvements through an increase tolls on the region's seven state-owned toll bridges. In the most recent Regional Measure (RM 3), toll revenues will be used to finance a $4.45 billion slate of highway and transit improvements in the toll bridge corridors and their approach routes. Active transportation projects may be included as accessory parts to larger infrastructure projects.

Regional Active Transportation Program

Managing Agency: Metropolitan Transportation Commission

While the California Department of Transportation (Caltrans) administers statewide Active Transportation Program grants, MTC is allocated a portion of the funds to administer a regional component. MTC provides a regional supplemental application in addition to the statewide application to apply for the competitive program funds.

Transportation Fund for Clean Air (TFCA)

Managing Agency: Bay Area Air Quality Management District

In 1991, the California State Legislature authorized the Air District to impose a $4 surcharge on cars and trucks registered within its jurisdiction to be used to provide grant funding to eligible projects that reduce on-road motor vehicle emissions. The Air District allocates these funds to its Transportation Fund for Clean Air Program, which in turn provides funding to qualifying trip-reduction and alternative-fuel vehicle-based projects, including plug-in electric vehicles. Sixty percent of TFCA funds are awarded by the Air District to eligible programs and projects through a grant program known as the Regional Fund, through various Air District sponsored programs and projects including Spare the Air, and through certain alternative-fuel vehicle-based and bicycle facility programs. The remaining 40 percent of TFCA funds are passed through to the County Program Manager Fund and are awarded by the Congestion Management Agencies of the nine counties to TFCA-eligible projects located within those counties. Qualifying active transportation projects generally include the construction of new bicycle ways and the installation of new bike parking facilities, e.g., lockers and racks.

Bicycle Rack Voucher Program (BRVP)

Managing Agency: Bay Area Air Quality Management District

This program aims to reduce air pollution in the Bay Area by supporting clean, alternative modes of transportation. As of 2016, Bicycle Rack Vouchers may be awarded in the amount of up to $60 per bicycle parking space created. Funding is normally limited to a maximum of $15,000 per applicant per year in Voucher awards. Only new bicycle rack(s) that are deployed in locations that have not previously been funded by and are not currently under consideration for funding by the Air District are eligible for funding through the BRVP.

Measure WW Urban Creek Grant

Managing Agency: East Bay Regional Park District

Measure WW was approved by voters in Alameda and Contra Costa counties in November 2008. The measure extended Measure AA, approved in 1988, to help the Park District meet the increasing demand to preserve open space for recreation and wildlife habitat. The program seeks to fund projects that provide multiple benefits including improving environmental quality, addressing climate change through a reduction of greenhouse gas emissions and adaptation, conserving natural resources, and improving public health and public access. Ideally, capital projects will provide lands and projects that benefit urban streams within the East Bay Regional Park District jurisdiction (Alameda and Contra Costa counties). Types of capital projects that are eligible include both acquisition of land (fee title or permanent easements) and development of specific projects (including habitat restoration, erosion repair and public access).

Measure FF

Managing Agency: East Bay Regional Park District

On June 5, 2018, the East Bay Regional Park District Board of Directors voted unanimously to place Measure FF on the November 2018 ballot. Measure FF will continue existing, voter-approved funding for Regional Parks in western Alameda and Contra Costa counties – without increasing taxes. Measure FF will continue funding for regional park services including wildfire prevention, public safety, maintaining or improving visitor use facilities, public access, and trails (including closing gaps in the Bay Trail), and restoring and enhancing natural areas/habitat, including sensitive redwoods, urban creeks, marshlands, grasslands, and hillsides.

Local BART Sales Tax

Managing Agency: Bay Area Rapid Transit District

One of BART’s primary funding mechanisms is a local sales tax collected across its service area. Bonds are secured through BART's sales tax revenue, consisting of 75% of revenue from a 0.5-cent sales tax collected in the three-county service area, with the remaining 25% distributed to the Metropolitan Transportation Commission (MTC). BART implements projects on agency-owned properties to improve safety and access for all modes to its stations.

Measure RR

Managing Agency: Bay Area Rapid Transit District

The elected BART Board of Directors voted unanimously to put forward a $3.5 billion general obligation measure on the November 2016 ballot that was approved by voters. The funds will help replace and maintain much of BART’s assets that are reaching their useful life. Additionally, approximately $135 million will be spent to expand opportunities to safely access stations. This includes improving active transportation access for all users including seniors and people with disabilities, primarily located on BART-owned properties. Local agencies can work with BART to identify opportunities for access improvements to local stations.

Measure B

Managing Agency: Alameda County Transportation Commission

In 2000, nearly 82 percent of Alameda County voters approved Measure B, the half-cent transportation sales tax. Alameda CTC administers Measure B funds to deliver essential transportation improvements and services. The Alameda County 20-year Transportation Expenditure Plan guides the expenditures of more than $1.4 billion in county transportation funds generated through the continuation of the sales tax over the next 20 years. The expenditure plan was developed to serve major regional transportation needs in Alameda County and to address congestion in every major commute corridor in the county. Regional priorities are to expand mass transit, improve highway infrastructure, improve local streets and roads, improve bicycle and pedestrian safety, and expand special transportation for seniors and people with disabilities. Funds are allocated through direct local distributions, discretionary programs, and to individual capital projects.

Measure BB

Managing Agency: Alameda County Transportation Commission

Alameda County voters approved the 2014 Transportation Expenditure Plan (2014 TEP) as part of Measure BB in November 2014. Measure BB authorized the augmentation and continuation of the voter-approved 2000 Measure B sales tax with a second half-cent sales tax through the end of the 2000 Measure B collection period, i.e. March 31, 2022, followed by a one-cent sales tax authorizes from April 1, 2022 through March 31, 2045.

Lifeline Transportation Program (LTP)

Managing Agency: Alameda County Transportation Commission

Alameda CTC, as the CMA, is responsible for soliciting and prioritizing projects in Alameda County for the Lifeline Transportation Program (LTP). The LTP provides funds for transportation projects that serve low-income communities using a mixture of state and federal fund sources (included under State and Regional Funding Programs since the LTP is approved at the State and Regional levels). The current program is made up of multiple fund sources including the State Transit Account, federal Job Access Reverse Commute and State Proposition 1B funds.

LOCAL PROGRAMS

Vehicle Registration Fees

Managing Agency: Hayward and Alameda County

The Measure F Alameda County Vehicle Registration Fee (VRF) Program was approved by the voters in November 2010, with 63 percent of the vote. The fee will generate about $11 million per year by a $10 per year vehicle registration fee. The collection of the $10 per year vehicle registration fee started in May 2011. The goal of the VRF program is to sustain the County's transportation network and reduce traffic congestion and vehicle-related pollution. The program includes four categories of projects including local road improvement and repairs, transit congestion relief projects, local transportation technology, and pedestrian and bicyclist access and safety program. Alameda CTC distributes an equitable share of the funds among the four planning areas of the county to fund additional projects identified by local jurisdictions.

Developer Fees and/or Transportation Impact Fees

Managing Agency: Hayward

Transportation impact fees are one-time fees typically paid prior to the issuance of a building permit and imposed on development projects by local agencies responsible for regulating land use (cities and counties). Generally the fees are charged per square foot of development or per number of trips generated. Local agencies can create a TIF Program as allowed by the State Legislature Mitigation Fee Act with Assembly Bill 1600 adopted in 1987 and with subsequent amendment to guide the imposition of public facilities fees. The Mitigation Fee Act establishes requirements on local agencies for the imposition and administration of fee programs.

The City of Hayward is working on the Transportation Impact Fee (TIF) Program, and it will be submitted to the City Council for consideration in 2020. The objective TIF is to provide local funding to ensure that adequate transportation facilities including pedestrian and bicycle improvements will be available to meet the projected needs of the City of Hayward as it grows and that the facilities planned are consistent with the Regional Transportation Plan, the City of Hayward General Plan, and the Bicycle and Pedestrian Master Plan.