DISTRICTS 1 AND 2
BIKEWAYS STRATEGY

Final Report: December 2013

DISTRICTS 1 AND 2 BIKEWAYS STRATEGY
OCTA - Orange County Transportation Authority

Alta Planning + Design
IBI Group

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I Executive Summary

This report summarizes the results of a collaborative effort focused on the identification of potential regional bikeways within Orange County's Supervisorial Districts 1 and 2. This effort is funded with a federal grant received by the Orange County Council of Governments, with a 20% local match provided by the Orange County Transportation Authority (OCTA).

Regional bikeway planning supports the goals contained in existing countywide transportation plans, such as the Long Range Transportation Plan, OCTA Strategic Plan, and the Orange County Sustainable Communities Strategy. These goals include expanding travel choices, improving safety, and supporting the viability of bicycle transportation. These goals are interrelated, for example:

- In a 2012 report published by the Transportation Research Board (TRB), improving the bikeway network leads to increased use – in a 90-city study utilizing 2006-2008 journey to work data, a highly significant statistical relationship was found with 2.5% more bicycling for each 10% increase in bikeways
- The 2012 TRB report also reports that the average bicyclist will go 31% out of their way to use a bike lane and 45% for a bicycle boulevard instead of riding in mixed traffic
- Encouraging bicycling results in improved safety outcomes and reduced crash costs per person-trip through the "safety in numbers" effect

OCTA's roles in bikeways planning are outlined in the 2009 Commuter Bikeways Strategic Plan (CBSP):

- Suggesting regional priorities for optimal use by local jurisdictions;
- Assisting in coordinating plans between jurisdictions;
- Providing planning and design guidelines; and
- Participating in outreach efforts to encourage bicycle commuting.

The Regional Bikeways Planning effort led by OCTA is expanding upon the 2009 OCTA CBSP to identify potential regional bikeway improvements. While this planning process has been initiated and coordinated by OCTA, local jurisdictions will bring projects from concept to construction, through coordination with Caltrans and OCTA as needed.

Regional Bikeways Planning is a countywide process involving OCTA, local jurisdictions, and public stakeholders. This process began in 2011 with a pilot effort for Supervisorial District 4 in northern Orange County. Following the success of that effort, OCTA will continue to conduct similar efforts throughout the County and is currently focusing on Supervisorial Districts 1 & 2.

Phase 1 of the effort is this bikeways strategy (Strategy). The Strategy identifies regional bikeway corridors that connect to major activity centers including employment areas, transit stations, colleges and universities. The regional bikeway corridors have been identified based on consensus-building and facilitation efforts. In Phase 2, feasibility studies will be developed to provide planning level design recommendations to the local jurisdictions.

While OCCOG & OCTA have commissioned this report, implementation of bikeway corridors will be led by the city(s) or the County with right-of-way jurisdiction. In some cases, roadways are managed by Caltrans, such as Pacific Coast Highway (State Route 1), or at freeway interchanges. While OCCOG & OCTA promote the implementation of corridors recommended in this report, final design, construction, and maintenance of the corridor would ultimately need to be accepted by the respective jurisdictions as outlined above. Additionally, the city(s) or the County may need to coordinate with various landowners such as utility companies, rail operators, and the OCTA for right-of-way acquisition. As the current owner of the PE ROW, OCTA has ultimate discretion regarding uses within the old rail corridor.

The Strategy aims to enhance community interaction and provide increased travel choices for a variety of residents within northwestern Orange County. The integrated planning effort establishes routes for focused attention to improve bikeways for cyclists of all skill levels, coordinate cross-jurisdictional efforts, and serve major destinations and employment centers. The coordinated efforts by OCTA and member agencies can result in improved bicyclist safety, reduced automobile trips, reduced fuel consumption and air emissions, and improved community health outcomes.

Outreach Event #2: Buena Park Hall & Police Department Open House

Outreach Event #3: Newport Beach Back Bay Trail

I.I Facilitation Efforts

Preparation of this report was a collaborative effort, with facilitation by OCTA of input from public stakeholders, agency staff, and elected officials. Preparation of the Strategy included:

- A project development team (PDT) was convened with planning and engineering representatives from each member agency within Districts 1 and 2, as well as OCTA, OCCOG, and project consultant team staff. The PDT met on multiple occasions to discuss project goals and objectives, opportunities and constraints, preliminary corridor alignments, and draft ranking criteria.
- Focus group meetings were convened with smaller working groups of PDT representatives. During the focus meetings, large format boards were printed for brainstorming potential bikeways corridors. The printed materials included identification of utility corridors, water and rail corridors, the transportation network, existing and proposed bikeways, major destinations, and other key features for consideration and collaborative brainstorming.
- Two workshops provided the opportunity for public input on the project. The first workshop included a presentation on the potential corridors and their ranking and public input was requested on corridor concepts and ranking evaluation criteria. Attendees included public stakeholders from the bicycle advocacy, health, safety, and social justice sectors, as well as elected officials and community residents. Presentations and large-format boards were provided describing the planning process and project components. The second workshop was attended

Outreach Event #5: Santa Ana Health & Fitness Fair

by a similar number of people with boards showing the proposed corridors. A presentation discussed the eleven corridors and key changes since the first workshop, and focused on concepts for near-term implementation. Attendees at the workshop were provided the opportunity to comment to the group and were asked to provide comments on the boards directly and through a comment sheet. Promotion of the second workshop included direct emails to stakeholders that had provided contact information to "stay connected" to the project at outreach events, the website, or through the survey.

- A project webpage was created at www.octa.net/D1-2bike. The webpage includes a project overview and a map illustrating the existing bikeways network in the project area. The webpage was updated regularly with project materials including meeting materials, meeting dates, and contact information.
- A survey that asked respondents to identify corridors they would be most likely to utilize, their bicycling preferences, and frequency was distributed online, during outreach events, and at the first public workshop. The survey was provided in English and Spanish, and included a graphic showing the preliminary regional corridors. A total of 103 surveys were completed, including six in Spanish.
- A separate survey was distributed at the second Bikeways Workshop in September 2013 to gauge attendees' level of cycling comfort and to ask to describe their typical bicycle trip purpose(s). The survey also solicited feedback on the proposed corridors and ranking results as presented in the second draft of the Bikeways Strategy.
- Nine small-format outreach events were held throughout the project area to reach an audience diverse in geography, as well as skill-level (from the "strong & fearless" to the "interested but concerned"). These included organized events such as the Huntington Beach Bicycle Master Plan meeting, Buena Park City Hall and Police Department Open House, the Santa Ana Health & Fitness Fair, the Fountain Valley Kiwanis Club meeting, the Latino Health Access Wellness Corridor Walk/Ride, the Westminster Dia de la Familia event, and the OC Wheelmen Annual Picnic, and a standalone booth at Mile Square Park in Fountain Valley and the Newport Beach Back Bay Trail.
- The Districts 1 & 2 Bikeways Collaborative has been promoted and covered by various outlets throughout the process. The winter 2013 edition of OCTA's "Bikeways Newsletter" described the December 2012 kickoff to the effort and mentioned the 4th District's similar planning process. The local nonprofit

news source *Voice of OC* published an article about bicycle safety on May 30, 2013, and credited the current regional bikeways strategy effort for seeking to make the county's roadways safer for bicycling. OCTA's blog and newsletter – *"Orange County On the Move"* – advertised the Bikeways Workshop in its April edition, then provided a recap in the May edition. In addition, the independent *"bikeNewportBeach.org"* blog provided a positive summary of the first Bikeways Workshop on May 16, 2013. The second Bikeways Workshop in September of 2013 was promoted in *Orange County On the Move* on July 26, 2013, and in Supervisor Janet Nguyen's *First District Journal* on August 15th. The second Workshop was then recapped by *bikeNewportBeach.org*, *Orange County On the Move*, and Supervisor Shawn Nelson's *4th District Update* shortly after the September 11th event.

I.II Regional Corridors

As shown in **Figure ES-1**, a total of eleven (11) regional bikeway corridors are proposed. The corridors include key connections to existing regional bikeway routes (e.g. Santa Ana River & Coyote Creek trails), as well as to major destinations within the districts (e.g. the beach & Santa Ana Regional Transportation Center). In addition, several of the proposed corridors would link with regional bikeway corridors identified in the District 4 Bikeways Strategy.

Each of the proposed regional bikeway corridors were evaluated using a set of criteria that are consistent with OCTA's 2009 CBSP and the goals of the Districts 1 and 2 Bikeways Collaborative and build off those used for the District 4 Bikeways Collaborative. The criteria was developed through discussions with the PDT members, and public feedback received during Workshop #1. The criteria below account for a range of opportunities, constraints, and other factors that could influence usage and implementation:

- Trip Demand
- Level of Traffic Stress
- Reported Collisions
- Public Support
- Physical Constraints
- Completes the Corridor
- Completes the Network
- Economic Efficiency

Table ES-1 summarizes the ranking evaluation, with raw and weighted scores shown. The weighted scores account for normalizing between 0 and 100, and weighting of each criterion. As shown in the table, Corridor C received the highest total score at 75 out of 100 points.

The regional corridors were ranked to help guide implementing agencies in prioritizing bikeway improvements. The evaluation process determined that the corridors below would provide the greatest relative potential benefit to cyclists in terms of regional connectivity, access to key destinations, and improved safety, while also possessing significant public support and limited physical constraints that could hinder implementation. The following top ranked corridors will be further studied for feasibility in the second phase of the Districts 1 & 2 Bikeways Collaborative:

- **Corridor C:** Pacific Coast Highway;
- **Corridor A:** Pacific Electric Right-of-Way;
- **Corridor D:** Magnolia-Hoover; and
- **Corridor E:** Slater-Segerstrom.

These four corridors traverse the majority of the project cities. While feasibility review is not immediately being provided for all the corridors, cities may advance study of any corridor where there is interest in continuing the efforts of the strategy.

Table ES-2 summarizes the results of the criteria ranking for the eleven proposed corridors within Districts 1 and 2 with length and a range of costs shown.

Table ES-1: Corridor Scoring

Criteria		Rank	Score	Economic Efficiency		Trip Demand		Level of Traffic Stress		Public Input		Physical Constraints		Completes the Corridor		Completes the Network		Reported Collisions	
Best Possible Score			Total	RS	WS	RS	WS	RS	WS	RS	WS	RS	WS	RS	WS	RS	WS	RS	WS
			100	4.3	18	6.0	18	3.8	18	69	9	1	9	17%	9	2.1	9	12.1	9
C	PCH	1	75	1.8	8	3.4	10	3.8	18	69	9	1	9	17%	9	1.1	5	9.2	7
A	PE ROW	2	73	4.3	18	6.0	18	3.7	18	46	6	4	2	100%	2	1.8	8	1.7	1
D	Magnolia-Hoover	3	61	2.2	9	4.0	12	3.2	15	32	4	2	5	44%	4	2.1	9	3.5	3
E	Slater-Segerstrom	4	60	2.2	9	3.7	11	3.4	17	30	4	3	3	34%	5	1.6	7	5.3	4
B	Bristol-Bear	5	58	1.7	7	4.4	13	3.4	16	62	8	3	3	79%	2	1.4	6	4.0	3
G	Knott-Springdale	6	56	1.0	4	3.2	10	3.6	17	12	2	1	9	67%	2	2.0	9	4.0	3
H	Seal Beach - Orange Ave	7	53	1.1	5	3.5	11	2.6	13	31	4	1	9	47%	3	1.5	7	1.9	1
I	Brookhurst - Ward	7	53	1.3	5	3.4	10	2.9	14	12	2	1	9	43%	4	1.3	6	3.6	3
K	Indianapolis - Fairview	7	53	2.5	11	3.4	10	2.1	10	32	4	2	5	47%	3	1.6	7	4.1	3
F	Westminster-Hazard	10	49	1.3	5	3.3	10	3.4	16	30	4	2	5	90%	2	0.9	4	3.8	3
J	Edison Transmission	11	48	0.4	2	2.4	7	3.0	14	8	1	2	5	100%	2	1.8	8	12.1	9

*Note: RS = Raw Score; WS = Weighted Score

Table ES-2: Corridor Ranking

Corridor ID	Corridor Name	Rank	Weighted Score	Length (miles)	Cost Range (millions)
C	PCH	1	75	21.3	$1.4 - $1.7
A	PE ROW	2	73	15.6	$26.3 - $32.1
D	Magnolia-Hoover	3	61	15.0	$4.7 - $5.7
E	Slater-Segerstrom	4	60	13.5	$16.2 - $19.9
B	Bristol-Bear	5	58	12.3	$17.0 - $20.8
G	Knott-Springdale	6	56	8.1	$1.0 - $1.2
H	Seal Beach - Orange Ave	7	53	10.0	$2.7 - $3.3
I	Brookhurst - Ward	7	53	11.8	$2.8 - $3.4
K	Indianapolis - Fairview	7	53	11.1	$1.5 - $1.8
F	Westminster-Hazard	10	49	11.4	$6.0 - $7.4
J	Edison Transmission	11	48	2.8	$2.2 - $2.7
TOTAL				132.9	**$81.8 - $100.0**

Note: The costs shown above are high-level estimates based on national averages for similar facilities. Costs include right-of-way, anticipated bridges and construction costs, but do not include environmental clearance, design, utility impacts or maintenance costs.

I.III Action Plan

This section identifies potential near-term projects that can be implemented by each of the cities within Districts 1 and 2 to begin implementation of the proposed corridors. Potential near-term projects are those with low construction costs that can be implemented in relatively short order as funds become available. Each jurisdiction would be responsible for the implementation of their respective projects and strategies for funding these projects. OCTA would assist local jurisdictions through such things as letters of support, grant notifications and guidance, and design solutions. Coordination between jurisdictions is encouraged to implement linkages simultaneously.

Each of the corridors has been reviewed at a conceptual level to identify "potential near-term" projects expected to require minimum capital investment, little or no right-of-way acquisition, and may require minimal environmental review. These may include restriping a street to implement a Class II bikeway, signing a street to designate it as a Class III bikeway, or signing and striping an existing paved off-street path or maintenance road of sufficient width to serve as a Class I off-street bikeway. Pursuit of funding is a near-term effort that can be led by project study area cities with support from OCTA. OCTA can help with grant applications and letters of support.

I.IV Programs

Of the "Five E's" of bicycle planning, four are related to programs: encouragement, education, enforcement and evaluation. Programs should complement engineering improvements such as bike paths, lanes and routes by giving Orange County residents the tools they need to safely and confidently use the bikeway network. All of the Five E's work together to enhance the bicycling experience. Based on community input and coordination with agency staff, programmatic recommendations have been provided to complement the infrastructure recommendations associated with the defined corridors.

I.V Funding Sources

Federal, state and local government agencies invest billions of dollars every year in the nation's transportation system. Only a fraction of that funding is used in planning and implementation of bicycle infrastructure and policy development to improve conditions for cyclists. Even though appropriate funds are limited, they are available, but desirable projects sometimes go unfunded because communities may be unaware of a fund's existence, or may apply for the wrong type of grants. Also, there typically is strong competition between municipalities for the available bikeway funding.

Whenever federal funds are used for bicycle projects, a certain level of state and/or local matching funding is generally required. State funds are often available to local governments on similar terms. Almost every implemented bicycle program and facility in the United States has had more than one funding source, and it often takes a good deal of coordination to pull the various sources together.

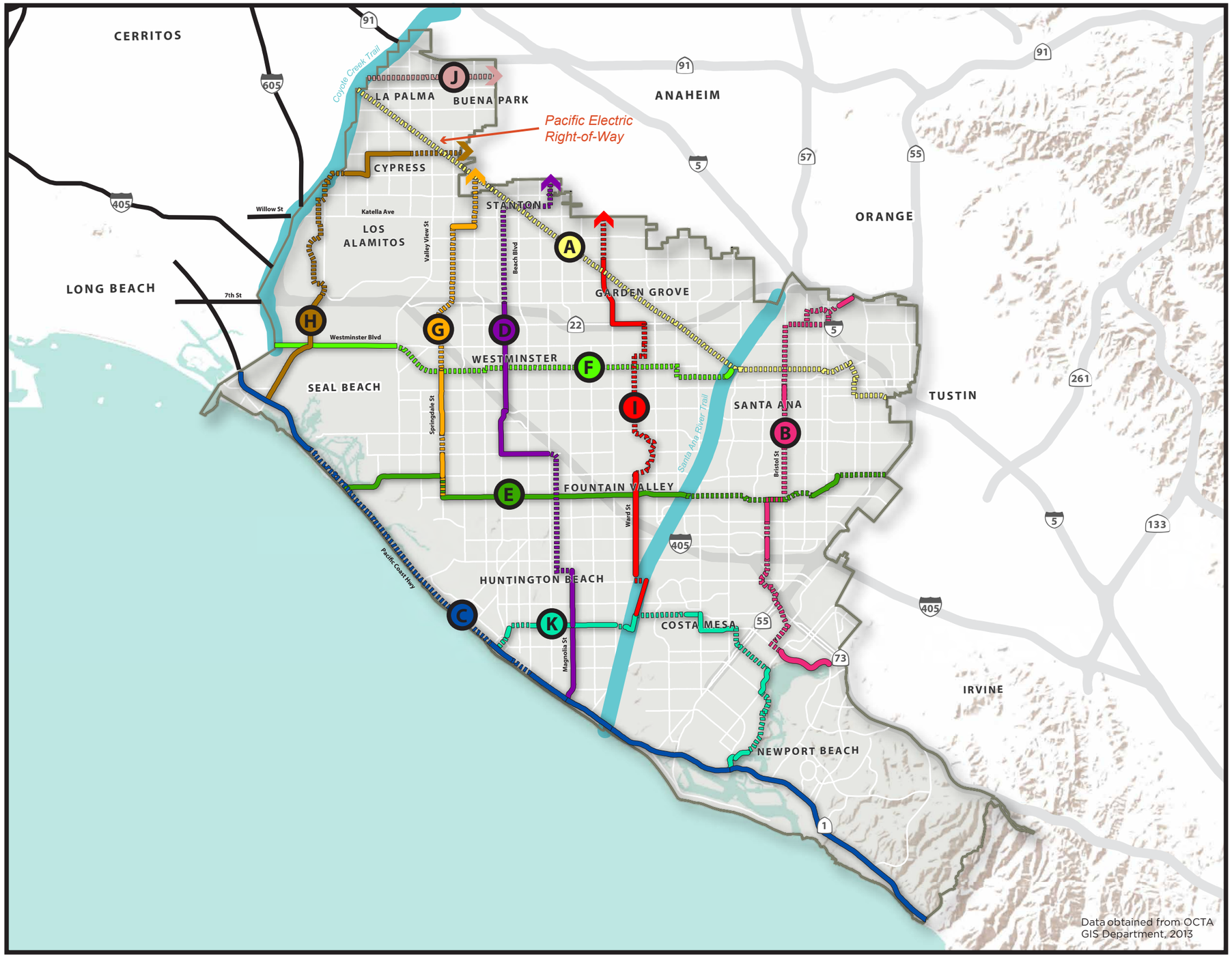
According to the Federal Highway Administration's (FHWA) publication, An Analysis of Current Funding Mechanisms for Bicycle and Pedestrian Programs at the federal, state and local Levels, where successful local bike facility programs exist, there is usually a full time bicycle coordinator with extensive understanding of funding sources. Cities such as Seattle, Washington, Portland, Oregon and Tucson, Arizona, are prime examples. Bicycle coordinators are often in a position to develop a competitive project and detailed proposal that can be used to improve conditions for cyclists within their jurisdictions.

To support agency efforts to find outside funding sources to implement improvements along the proposed corridors, a summary by source type has been provided with details regarding eligibility, use, and requirements associated with funding sources.

PROJECT CORRIDOR OVERVIEW

OCTA Districts 1 and 2 Bikeways Collaborative

Figure **ES-1**



LEGEND

Existing Facility	Proposed Facility	
		A: Pacific Electric ROW*
		B: Bristol-Bear
		C: Pacific Coast Highway*
		D: Magnolia-Hoover*
		E: Slater-Segerstrom*
		F: Westminster-Hazard
		G: Knott-Springdale
		H: Seal Beach-Orange Avenue
		I: Brookhurst-Ward
		J: Edison Transmission Line
		K: Indianapolis-Fairview

- Existing Regional Corridor
- District 1 & 2 Boundary
- District 4 Corridor Connections

Miles: 0 — 2.5 — 5

*Feasibility studies planned at top ranked corridors

1 Introduction

1.1 Background and Purpose

This report summarizes the results of a collaborative effort focused on the identification of potential regional bikeways within Orange County's Supervisorial Districts 1 and 2. This effort is funded with a federal grant received by the Orange County Council of Governments, with a 20% local match provided by the Orange County Transportation Authority (OCTA).

The OCTA develops the countywide Commuter Bikeways Strategic Plan (CBSP) which outlines OCTA's roles in bikeways planning. These include:

- Suggesting regional priorities for optimal use by local jurisdictions;
- Assisting in coordinating plans between jurisdictions;
- Providing planning and design guidelines; and
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The Regional Bikeways Planning effort led by OCTA is expanding upon the 2009 OCTA CBSP to identify potential regional bikeway improvements. While this planning process has been initiated and coordinated by OCTA, local jurisdictions will bring projects from concept to construction, through coordination with Caltrans and OCTA as needed.

Regional Bikeways Planning is a countywide process involving OCTA, local jurisdictions, and public stakeholders. This process began in 2011 with a pilot effort for Supervisorial District 4 in northern Orange County. Following the success of that effort, OCTA will continue to conduct similar efforts throughout the County and is currently focusing on Supervisorial Districts 1 & 2.

Phase 1 of the effort is this bikeways strategy (Strategy). The Strategy identifies regional bikeway corridors that connect to major activity centers including employment areas, transit stations, colleges and universities. The regional bikeway corridors have been identified based on consensus-building and facilitation efforts. In Phase 2, feasibility studies will be developed to provide planning level design recommendations to the local jurisdictions.

1.2 Overview

This document summarizes the recommendations and action plan for the implementation of regional bikeways within the Supervisorial Districts 1 and 2 in Northwestern Orange County. These recommendations are the result of a collaborative effort conducted over a nine month period, including local agencies within Orange County Supervisorial Districts 1 and 2, regional agencies, and stakeholders. This effort was focused on identifying candidate regional bikeways that could best serve cyclists of all skill levels throughout study area, and developing an action plan for the implementation of bikeway improvements. The objective of this strategy is to coordinate planning and funding efforts between the agencies to focus on the implementation of regionally-beneficial bikeways.

1.3 Bikeway Classifications

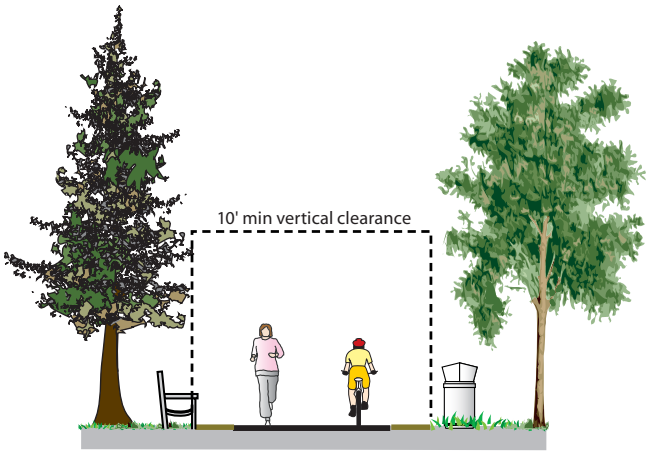
Throughout this report, reference is made to different classes or categories of bikeways. The California Department of Transportation (Caltrans) refers to the California Streets and Highways Code Section 890.4 for definition of the three bikeway classifications commonly found throughout California. Graphic 1 shows the three bikeway classifications utilized in this report. Refer to more detailed discussion of bikeway types in Section 5.

- Class I – Bikeways or Bike Paths, which provide a completely separated right-of-way designated for the exclusive use of bicycles and pedestrians with crossflows by motorists minimized.
- Class II – Bike Lane, which provides a restricted right-of-way designated for the exclusive or semi-exclusive use of bicycles with through travel by motor vehicles or pedestrians prohibited, but with vehicle parking and crossflows by pedestrians and motorists permitted.
- Class III – On-street or off-street Bike Route, which provides a right-of-way designated by signs or permanent markings and shared with pedestrians or motorists.

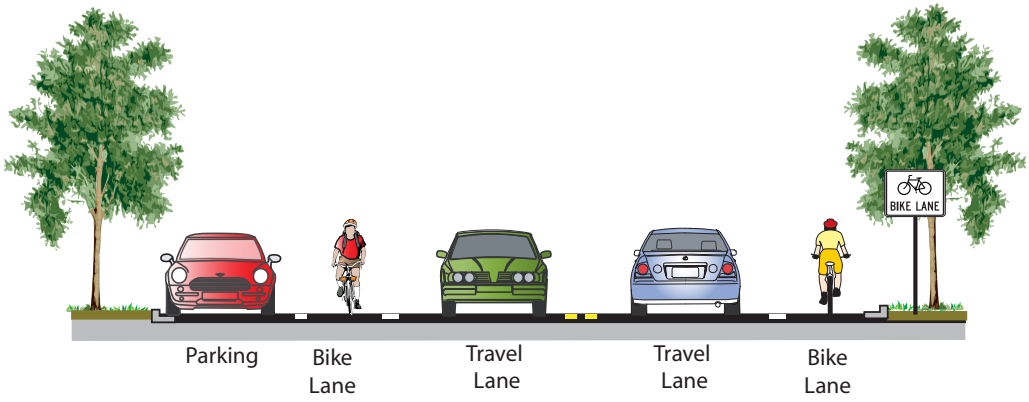
1.4 Jurisdictional Governance

While OCCOG & OCTA have commissioned this report, implementation of bikeway corridors will be led by the city(s) or the County with right-of-way jurisdiction. In some cases, roadways are managed by Caltrans, such as Pacific Coast Highway (State Route 1), or at freeway interchanges. While OCCOG & OCTA promote the implementation of corridors recommended in this report, final design, construction, and maintenance of the

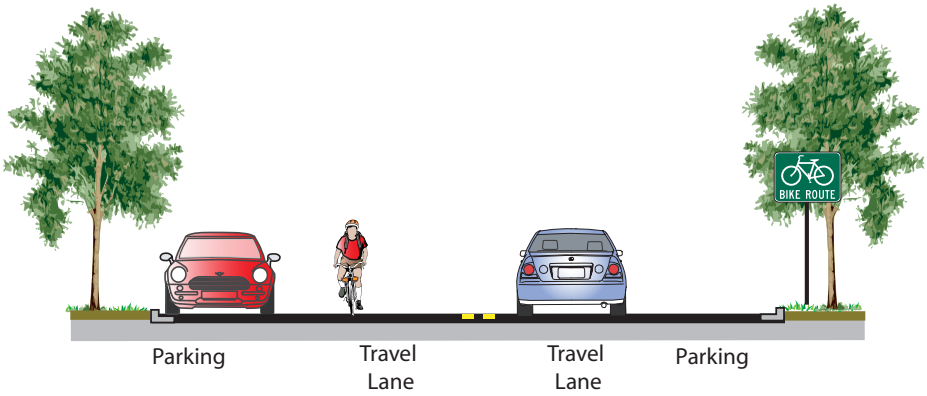
corridor would ultimately need to be accepted by the respective jurisdictions as outlined above. Additionally, the city(s) or the County may need to coordinate with various landowners such as utility companies, rail operators, and the OCTA for right-of-way acquisition. As the current owner of the PE ROW, OCTA has ultimate discretion regarding uses within the old rail corridor.



Class I: Shared-Use Path/Trail



Class II: Bike Lane



Class III: Bike Route

Graphic 1: Caltrans Bikeway Classifications

2 Existing Conditions

2.1 Context

As noted in the CBSP, much of the early suburban development took place in Northern Orange County, and infrastructure facilities were geared towards commutes into Los Angeles. The Pacific Electric rail cars served much of this area, until their service was stopped in the early 1960s. By this time Orange County residents began to be more dependent on automobiles for their commutes. North Orange County was designed with grid-pattern road networks, much like Los Angeles. The grid-pattern, along with the relatively level topography, is beneficial to bicycle commuters, as it allows them to maneuver through short blocks, for more direct routes. Unfortunately, many of these streets were not designed to support the traffic demand that we see today. They are often narrow, and not designed to safely accommodate automobiles together with bicycles. However, these roadways, along with some of the watersheds and abandoned rail rights-of-way, retain opportunities to make bicycling more viable.

Orange County Parks (OC Parks) is planning to conduct a feasibility study and implementation plan for a regional bikeway system known as the Orange County Bicycle Loop that would utilize Coyote Creek, Pacific Coast Highway, the Santa Ana River Trail and links through cities in north Orange County. The loop would travel through Supervisorial Districts 1, 2, 3, and 4.

2.2 Rationale

The Strategy aims to enhance community interaction and provide increased travel choices for a variety of residents within northwestern Orange County. The integrated planning effort establishes routes for focused attention to improve bikeways for cyclists of all skill levels, coordinate cross-jurisdictional efforts, and serve major destinations and employment centers. The coordinated efforts by OCTA and member agencies can result in improved bicyclist safety, reduced automobile trips, reduced fuel consumption and air emissions, and improved community health outcomes.

Several of these goals are interrelated, such as the desire to increase the bicycling mode share in Orange County and improve user safety. Aside from the clear health benefits of more physical activity, studies have shown that more bicycling is correlated with improved safety (the “safety in numbers” effect):

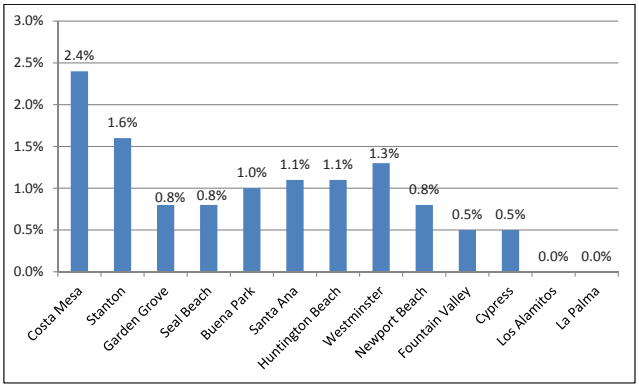
- Cycling fatalities fell by 21% in the U.S. from 1998 to 2008 (Pucher, J., et al., 2011) even while bicycling activity is rising: the American Community Survey shows that bicycling to work has increased in all but four states between 2005 and 2009. (Alliance for Biking and Walking, 2012)
- Cities with high bicycling rates tend to have lower crash rates for all road users. (Marshall, W., and Garrick, N., 2011)
- A study of walking and bicycling in California cities found that the risk of injury to pedestrians and cyclists decreases as walking or bicycling rates increase. (Jacobsen, P.L., 2013)

Therefore, providing for more bicycling activity is likely to be an effective means to improve cyclist safety.

2.3 Activity Levels and Collision Analysis

2.3.1 Bicycle Commute Mode Share by City

Bicycle commute mode share by city is determined using available data in the American Community Survey (ACS)[1]. **Graphic 2** shows that the bicycle mode share for all work trips ranges between 0% and 2.4% within the cities of Districts 1 & 2. The state and county average is 1.0%, while the national average is 0.5%.



Graphic 2: Bicycle Commute Mode Share by City
Source: 2007-2011 American Community Survey, B0801 5-Year Estimates

1 US Census Bureau: 2007-2011 American Community Survey, 5-Year Estimates

2.3.2 Estimated Commuter and Utilitarian Bicyclists

A key goal of this strategy is to maximize the number of bicyclists in order to realize multiple benefits, such as improved health, less traffic congestion, and maintenance of ambient air quality levels. In order to achieve this, a better understanding of the number of existing bicycle trips is needed. The U.S. Census and ACS provide useful data for understanding bicycling rates across different populations and geographies (as shown in **Graphic 2**), but they only report the modes which residents use for commuting to and from work. The following estimates include additional utilitarian trips – those made for daily activity – made by populations other than adults commuting to work. **Table 2-1** is a model that uses specific data from the U.S. Census American Community Survey; National Safe Routes to School survey information; and Federal Highway Administration College Commute Survey information.

As shown in **Table 2-1**, there are an estimated 50,762 daily bicycle commuters and utilitarian riders in Districts 1 and 2. It is important to note that this is simply an order-of-magnitude estimate, based on available data and does not include recreational trips.

2.3.3 Collision Analysis

Safety is a major concern for both existing and potential bicyclists, as they often will not ride if they perceive the roadways to be unsafe. Identifying bicycle collision sites can assist in developing improvements or determining appropriate bicycle routes. Orange County is currently ranked 9th highest out of the 58 California counties in the number of reported bicyclist injuries and fatalities relative to daily vehicle miles traveled. The County is ranked 6th highest when looking only at bicyclists under the age of 15.[2]

This report analyzes reported bicyclist-involved crash data in Districts 1 and 2 from 2007-2011 obtained from the California Statewide Integrated Traffic Records

2 California Office of Traffic Safety, 2010.

Table 2-1: Bicycle Trends in Districts 1 and 2

Variable	Figure	Calculated Value	Source
Existing study area population	1,241,371	–	2007-2011 American Community Survey, B00001 5-Year Estimates
Existing employed population	577,018	–	2007-2011 American Community Survey, B0801 5-Year Estimates
Existing bike-to-work mode share	1.0%	–	2007-2011 American Community Survey, B0801 5-Year Estimates
Existing number of bike-to-work commuters	–	5,770	Employed persons multiplied by bike-to-work mode share
Existing work-at-home mode share	3.7%		2007-2011 American Community Survey, S0801 5-Year Estimates
Existing number of work-at-home bike trips	–	1,067	Assumes 5% of population working at home makes at least one daily bicycle trip
Existing transit-to-work mode share	3.6%		2007-2011 American Community Survey, S0801 3-Year Estimates
Existing transit bicycle commuters	–	5,193	Employed persons multiplied by transit mode share. Assumes 25% of transit riders access transit by bicycle
Existing school children, ages 5-14 (grades K-8)	167,128		2007-2011 American Community Survey, S0801 5-Year Estimates
Existing school children bicycling mode share	2.0%		National Safe Routes to School surveys, 2010.
Existing school children bike commuters	–	3,343	School children population multiplied by school children bike mode share
Existing number of college students in study area	100,082		2007-2011 American Community Survey, B14001 5-Year Estimates
Existing estimated college bicycling mode share	10.0%		Review of bicycle commute share in seven university communities (source: National Bicycling & Walking Study, FHWA, Case Study No. 1, 1995).
Existing college bike commuters		10,008	College student population multiplied by college student bicycling mode share
Existing total number of bike commuters	–	25,381	Total bike-to-work, school, college and utilitarian bike trips. Does not include recreation.
Total daily bicycling trips	--	**50,762**	**Total bicycle commuters x 2 (for round trips)**

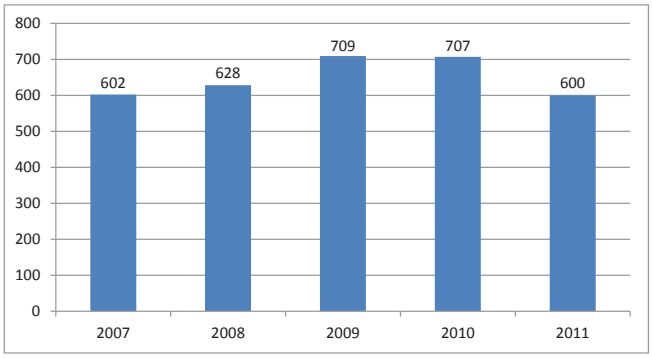
System (SWITRS).[3] In the five year period, there were 3,246 total crashes in the study area. **Table 2-2** on the following page presents the total crashes in Districts 1 and 2 by violation category and party at fault. As shown, the violation category with the most bicyclists at fault was riding on the wrong side of the road, while the violation category with the most drivers at fault was automobile right-of-way. This suggests a lack of education by both drivers and bicyclists on how to interact with other modes safely. Overall, bicyclists were cited at fault more often than drivers.

Table 2-2: Bicycle Collisions in Districts 1 and 2 by Violation Category and Party at Fault, 2007-201

Violation Category	Bicycle	Vehicle	Pedestrian	Not Stated
Unknown	0	0	0	180
Under the Influence	44	20	0	10
Impeding Traffic	0	0	1	0
Unsafe Speed	115	31	0	70
Following Too Closely	7	4	0	6
Wrong Side of Road	1,075	11	0	106
Improper Passing	14	8	0	5
Unsafe Lane Change	23	6	0	9
Improper Turning	140	119	0	138
Automobile ROW	201	223	0	93
Pedestrian ROW	13	0	0	3
Pedestrian Violation	12	0	6	6
Traffic Signals and Signs	122	53	0	50
Lights	2	0	0	1
Brakes	3	0	0	1
Other Equipment	2	1	0	0
Other Hazardous Violation	25	67	0	26
Other Than Driver	0	0	0	51
Unsafe Starting or Backing	1	12	0	3
Other Improper Driving	28	2	2	12
Not Stated	47	2	0	35

As noted, the SWITRS database showed a total of 3,246 reported bicyclist-involved crashes in the Districts 1 and 2 study area from 2007-2011. **Graphic 3** shows the bicyclist-involved crashes by year.

3 The number of collisions measured (one year of data along the corridor and adjacent corridors) was used in the OCTA District 4 Bikeways Strategy.



Graphic 3: Bicyclist-Involved Crashes by Year
Source: SWITRS 2007-2011

As shown above, bicyclist-involved crashes per year range from 600 to 709, which averages approximately 650 crashes per year.

2.3.4 Recent Agency Efforts to Improve Bicycle Planning & Infrastructure

Cities within the project study area have recently led planning and engineering efforts to improve cyclist safety, enhance infrastructure and support increased bicycling within Orange County. Planning of bicycle infrastructure through General Plan updates or bicycle master planning has occurred in Costa Mesa, Huntington Beach, Los Alamitos, Newport Beach and Santa Ana. Physical improvements to infrastructure have been developed by cities such as Seal Beach, Santa Ana, Costa Mesa, and Newport Beach. For example the City of Newport Beach recently implemented a roadway reconfiguration to provide on-street bike lanes on 32nd Street on Newport Peninsula.

Roadway reconfiguration to provide bicycle lanes.
(Source: City of Newport Beach)

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3 Regional Bikeway Corridors

As shown in **Figure 3-1**, a total of eleven (11) regional bikeway corridors are proposed. The corridors include key connections to existing regional bikeway routes (e.g. Santa Ana River & Coyote Creek trails), as well as to major destinations within the districts (e.g. the beach & Santa Ana Regional Transportation Center). In addition, several of the proposed corridors would link with regional bikeway corridors identified in the District 4 Bikeways Strategy. The corridors are presented with highlights on destinations served, constraints, and opportunities. Additionally, the corridors were ranked according to an established set of criteria as described below.

3.1 Regional Corridors

The following provides a detailed discussion of each corridor. Labeling and order of the corridors does not imply importance. Please refer to the ranking analysis presented in Section 3.3 for prioritization.

Efforts have been made to identify conceptual alignments of each corridor; however, refinements are expected as feasibility studies provide enhanced analysis and review of constraints and opportunities. Therefore, flexibility in the alignment of each corridor should be expected to help achieve regional connectivity and continuous linkage.

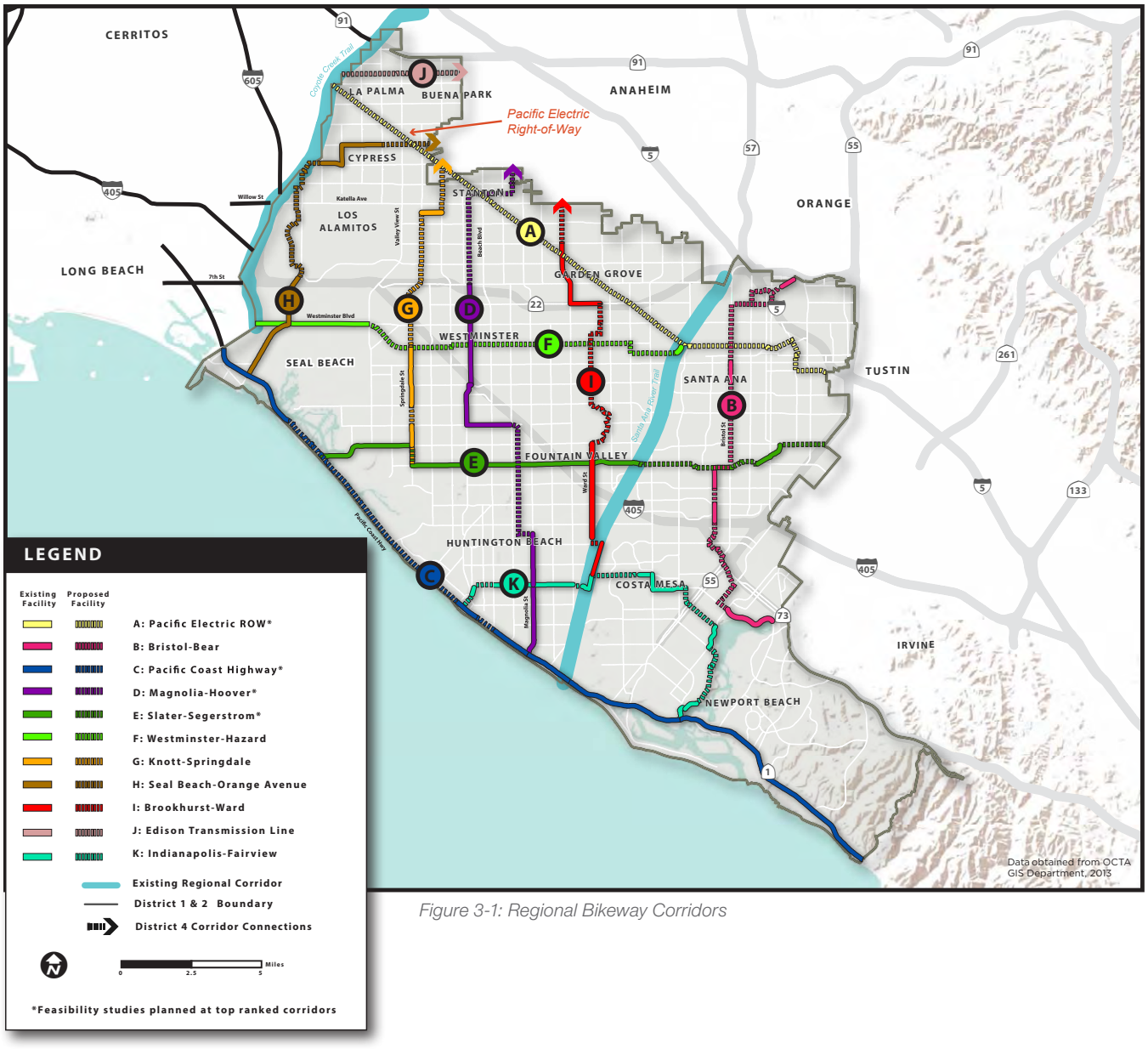

Figure 3-1: Regional Bikeway Corridors

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3.1.1 Corridor A: Pacific Electric Right-of-Way (PE ROW)

Jurisdictions:	Distance:
• Buena Park • Cypress • Garden Grove • La Palma • Santa Ana • Stanton	• 15.6 miles
	Cost:
	• $ 26.3–32.1 million

Overview

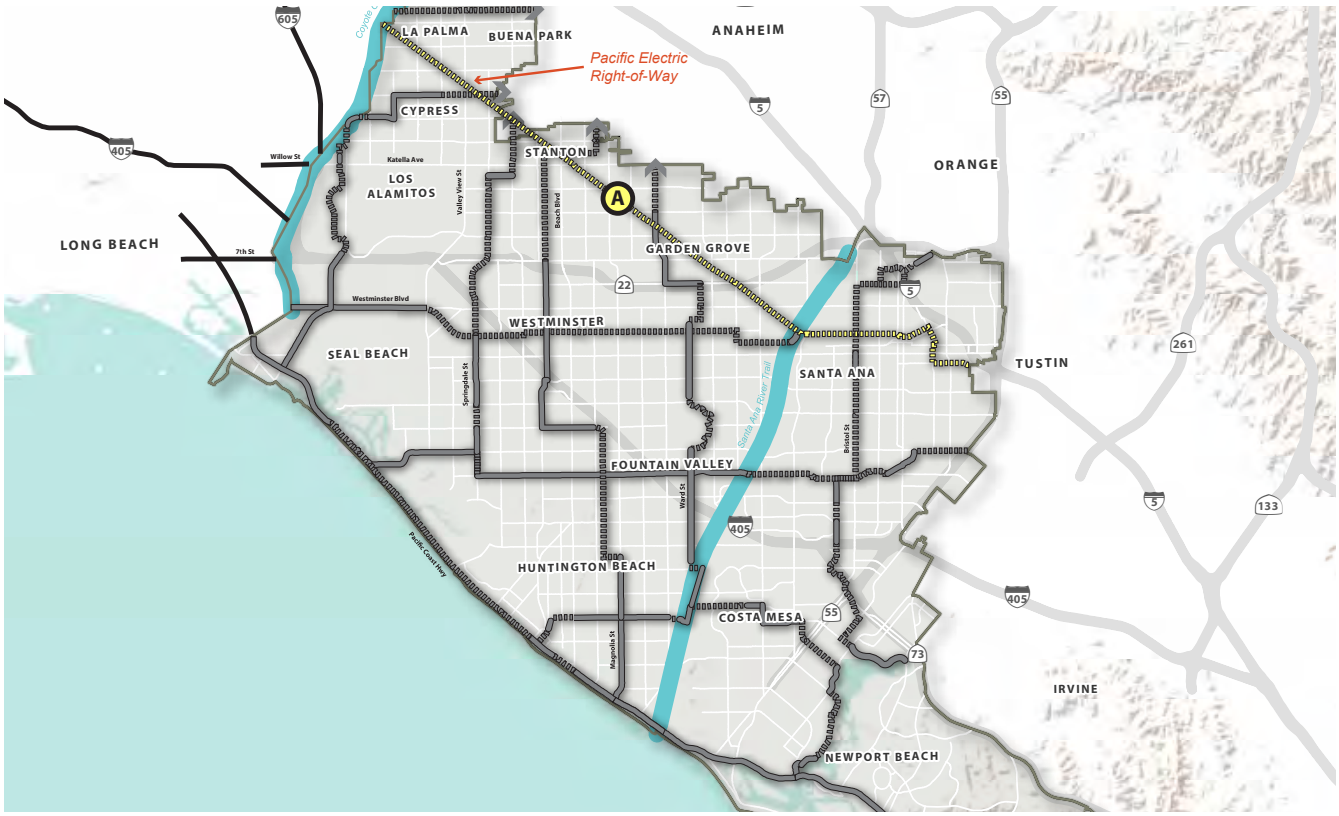
The Pacific Electric Right-of-Way (PE ROW) corridor is a combination of off-street paths and on-street bikeway segments that links Coyote Creek Trail with the Santa Ana River Trail. The corridor mostly runs diagonally southeast from La Palma to Santa Ana within the OCTA-owned PE ROW, then transitions easterly to link with the Santa Ana Regional Transportation Center (SARTC) and the City of Tustin. The corridor alignment utilizes Civic Center Drive since the City of Santa Ana is considering narrowing travel lanes west of Bristol Street. Due to its diagonal alignment, the PE ROW corridor links to several other regional corridors, including the Seal Beach-Orange Avenue, Knott-Springdale, Magnolia-Hoover, Brookhurst-Ward, Westminster-Hazard, and Bristol-Bear corridors. **Figure 3-2** shows Corridor A.

Opportunities, Constraints, and Estimated Costs

The PE ROW corridor spans a total of 15.6 miles, nearly all of which would be new bikeways under the proposal. The estimated construction cost includes four bridges with an estimated cost of $15.5 million. In addition to connecting several other potential corridors and linking the Coyote Creek and the Santa Ana River Trails, the PE ROW corridor connects several cities and the key destinations in each. Most of the corridor would be physically separated from automobile traffic, which has potential to attract new people to bicycling, with crossing under the SR-22 freeway. Major challenges for this project include maintaining the opportunity for future transit per OCTA policies, linking segments of the former right-of-way that have been appropriated for other land uses over time, intersection treatments at diagonal crossings of arterial roadways, and determining whether the existing bridge over the Santa Ana River Trail can serve the corridor. Coordination with the Santa Ana and Garden Grove Fixed Guideway Corridor may provide an opportunity to share infrastructure costs if the guideway project shares alignment with the regional bikeway.

Major Regional Destinations

Aside from the regional river trails (Coyote Creek and Santa Ana River Trails), the PE ROW corridor would also link to Cypress College, Rancho Alamitos High School, Downtown Garden Grove, Downtown Santa Ana, and SARTC.



Corridor A Inset Map

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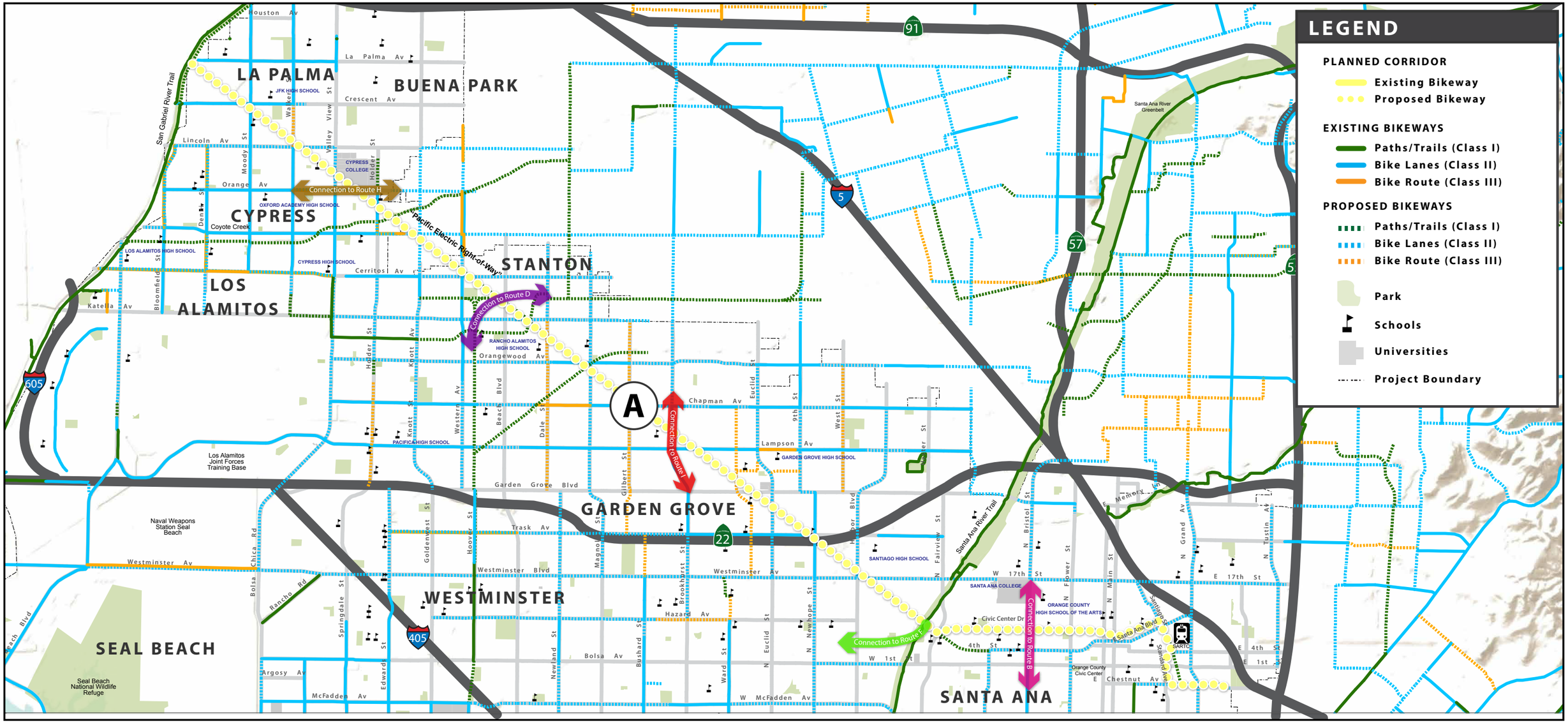
CORRIDOR A: PACIFIC ELECTRIC ROW

OCTA Districts 1 and 2 Bikeways Collaborative

Figure 3-2



Corridor A
Bikeway Improvement Details

4.5 miles of new bike lanes

11.1 miles of new trails

= 15.6 miles of bikeway

23
Schools + Universities within 1/4-mile Served

18
Parks within 1/4-mile Served

104k
People within 1/4-mile Served (approx.)

15.6 miles
Of Bikeway Improvements

$26-32 million
Project Cost

3.1.2 Corridor B: Bristol-Bear

Jurisdictions:	Distance:
• County of Orange • Costa Mesa • Newport Beach • Santa Ana	• 12.3 miles
	Cost:
	• $17–20.8 million

Overview

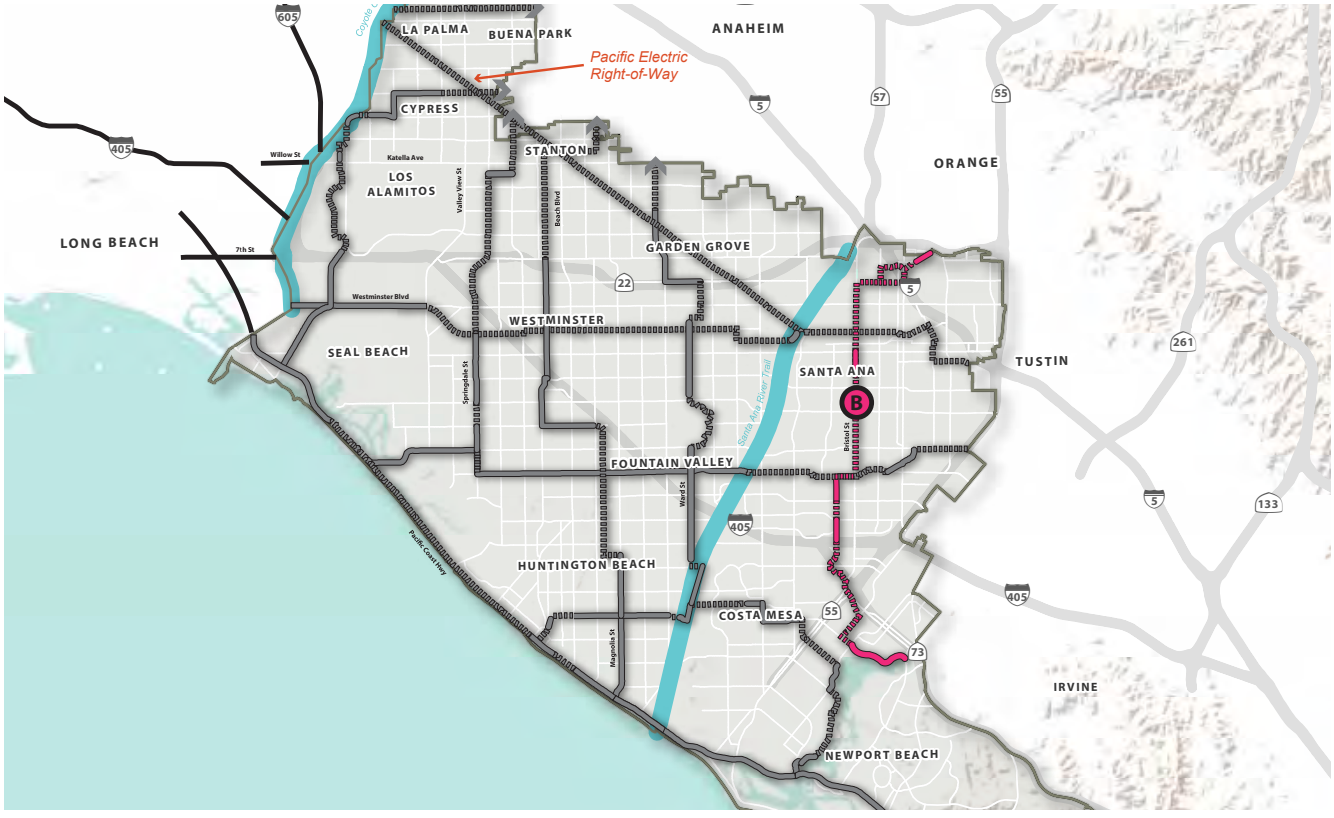
This primarily north-south corridor runs from the Santiago Creek Trail in the north to the Upper Newport Bay trail system in Newport Beach. The corridor would utilize Bear Street to cross over the I-405 freeway and under the SR-73 freeway and Bristol Street to cross under the SR-55 freeway. The Bristol-Bear corridor would link with the PE ROW and Slater-Segerstrom corridors. **Figure 3-3** shows Corridor B.

Opportunities, Constraints, and Estimated Costs

The Bristol-Bear corridor is 12.3 miles long, with 2.8 miles of the route already featuring bikeway facilities of some type. The estimated construction cost ranges between $17.0 and $20.8 million and includes approximately 2.5 miles of roadway widening. This corridor provides crossings of I-405 without high-traffic volumes from freeway ramps, however, ramps from SR-73 and SR-55 intersect with roadways proposed for the corridor. The corridor will provide access to the Santiago Creek Trail and the Newport Back Bay trails. The bikeway connection from Bristol Street to the Santiago Creek trail will be further evaluated by the City of Santa Ana during the forthcoming adoption of the Circulation Element and related Bicycle Master Plan. This portion of the Santiago Creek channel already serves as a hiking and equestrian trail. A portion of Bristol Street is planned, programmed and funded for widening by the City of Santa Ana, so the costs for the improvements are not included in this report's cost estimates. In addition, the City of Santa Ana received an OCTA Bicycle Corridor Improvement grant to install a Class II bike lane on Chestnut Avenue between Standard Avenue and Grand Avenue by the end of 2014. The City of Costa Mesa plans to study the use of the Delhi Channel at the southern end of the corridor. Use of Santa Ana Avenue on the southern end may require evaluation of on-street parking and narrowing of lanes relative to the OCTA Master Plan of Arterial Highways.

Major Regional Destinations

In addition to linking the Santiago Creek and Newport Back Bay recreational trails, this corridor would connect to Westfield MainPlace shopping center, Santa Ana College, Mater Dei High School, Segerstrom High School, and South Coast Plaza.



Corridor B Inset Map

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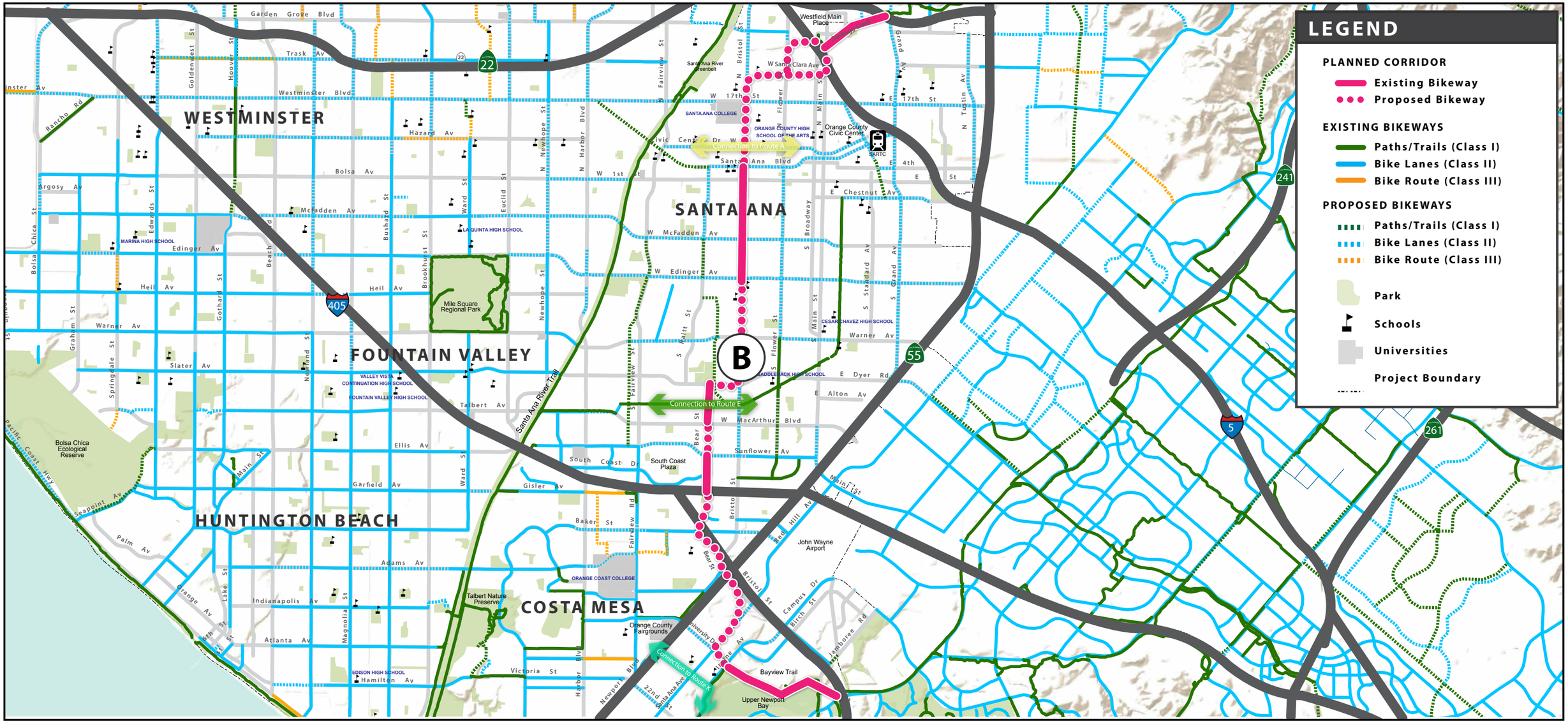
CORRIDOR B: BRISTOL-BEAR

OCTA Districts 1 and 2 Bikeways Collaborative

Figure 3-3



Corridor B Bikeway Improvement Details

- 7.8 miles of new bike lanes
- 1.9 miles of new trails
- 2.6 miles of existing bikeway

= 12.3 miles of bikeway

13
Schools + Universities within 1/4-mile Served

11
Parks within 1/4-mile Served

73k
People within 1/4-mile Served (approx.)

9.7 miles
Of Bikeway Improvements

$17-21 million
Project Cost

3.1.3 Corridor C: Pacific Coast Highway (PCH)

Jurisdictions:	Distance:
• County of Orange • Huntington Beach • Newport Beach • Seal Beach	• 21.3 miles
	Cost:
	• $1.4–1.7 million

Overview

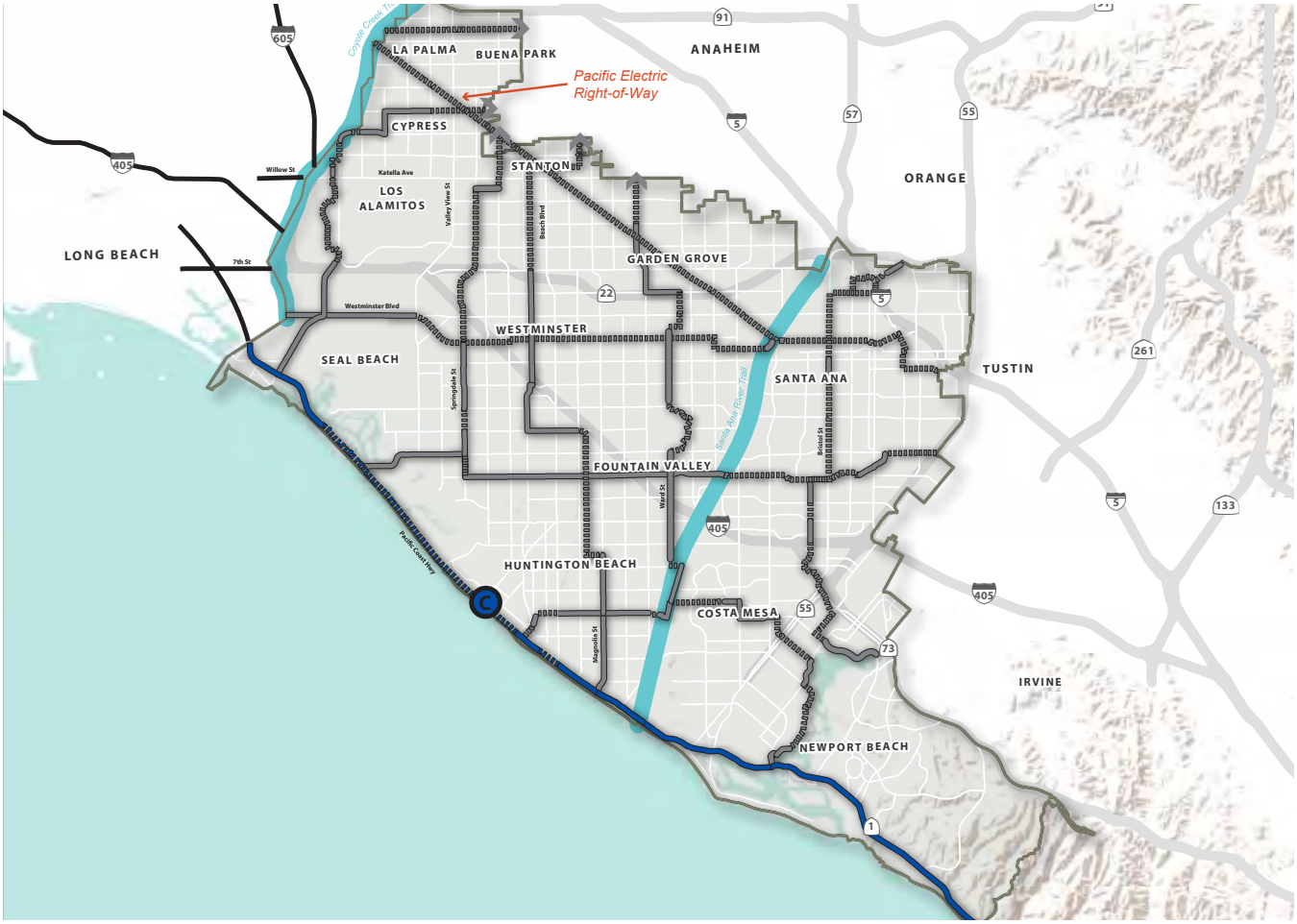
The PCH corridor runs primarily along Route 1 from Seal Beach to Newport Beach. PCH within the study area is primarily within the State of California's jurisdiction and is operated/maintained by Caltrans, except for the section between Jamboree Road and Newport Coast Drive in the City of Newport Beach. The proposed corridor would both create many miles of new bikeways and enhance existing Class II on-street facilities. At the request of the member cities, the cost estimate for PCH also includes enhancement of some existing Class III facilities. **Figure 3-4** shows Corridor C.

Opportunities, Constraints, and Estimated Costs

The proposed PCH Corridor is approximately 21.3 miles, and includes improvements to existing Class III bicycle routes, with a total estimated cost ranging between $1.4 and $1.7 million. The PCH corridor would provide access to approximately 45 parks located within ¼-mile of the corridor. Key challenges include a constrained right-of-way and heavily utilized on-street parking along some stretches of Pacific Coast Highway. PCH is the longest proposed corridor, and is a significant route for travel within the County for both commute trips as well as recreational cycling. Implementation of improvements on PCH requires extensive coordination with Caltrans, since Caltrans operates and maintains the majority of PCH within the study area.

Major Regional Destinations

Major destinations along the PCH corridor include the Coyote Creek Trail, Downtown Seal Beach, the Sunset Beach area, Bolsa Chica Ecological Reserve, Downtown Huntington Beach, the Santa Ana River Trail, Newport Beach Peninsula, Upper Newport Bay, Corona Del Mar, Crystal Cove State Beach, and other beaches and coastal parks.



Corridor C Inset Map

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CORRIDOR C: PACIFIC COAST HIGHWAY

OCTA Districts 1 and 2 Bikeways Collaborative

Figure 3-4

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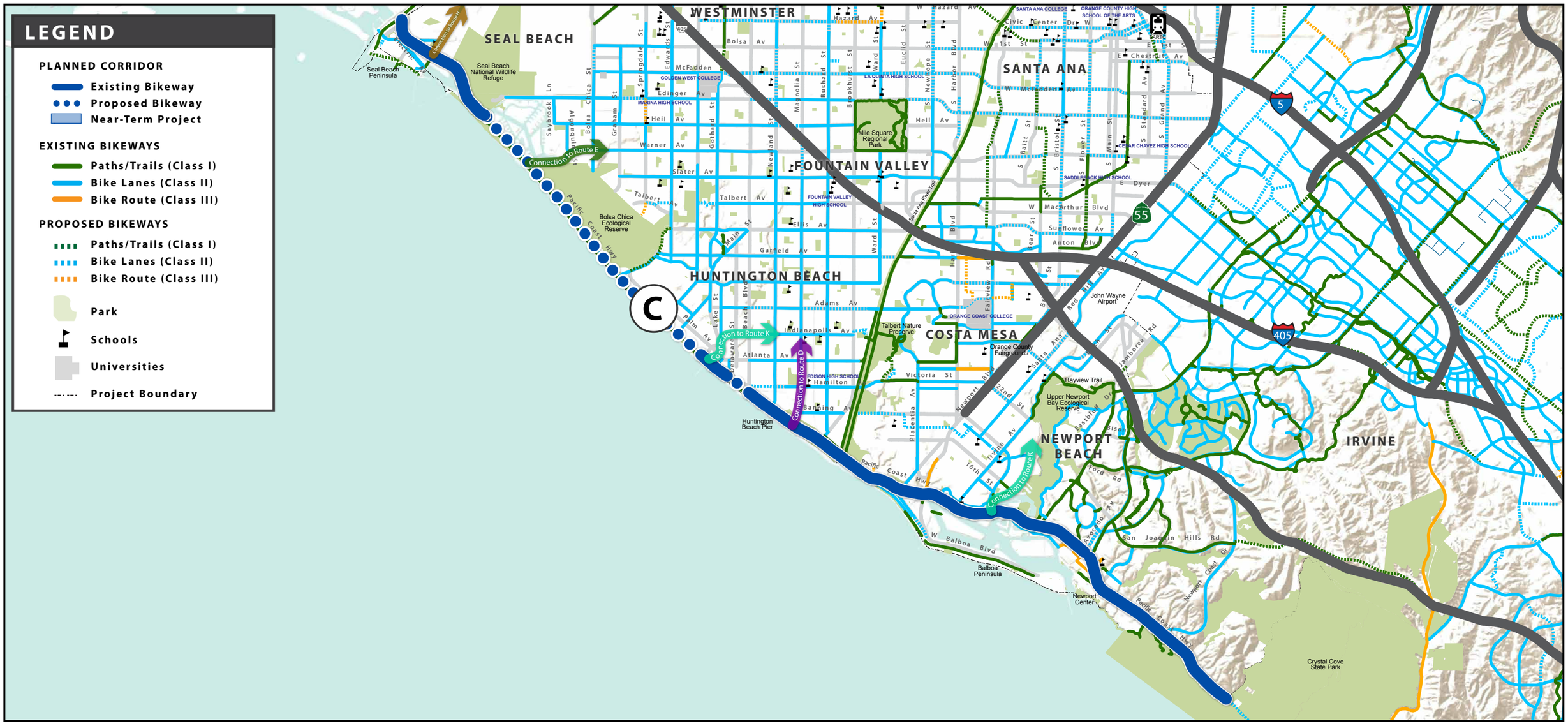


Corridor C
Bikeway Improvement Details

- 3.6 miles of new Class II bike lanes
- 10.4 miles of upgraded Class II bike lanes
- 7.3 miles of upgraded Class III bike routes

= 21.3 miles of bikeway

7
Schools + Universities within 1/4-mile Served

45
Parks within 1/4-mile Served

66k
People within 1/4-mile Served (approx.)

21.3 miles
Of Bikeway Improvements

$1.4-1.7 million
Project Cost

3.1.4 Corridor D: Magnolia-Hoover

Jurisdictions:	Distance:
• Fountain Valley • Garden Grove • Huntington Beach • Stanton • Westminster	• 15.0 miles
	Cost:
	• $4.7–5.7 million

Overview

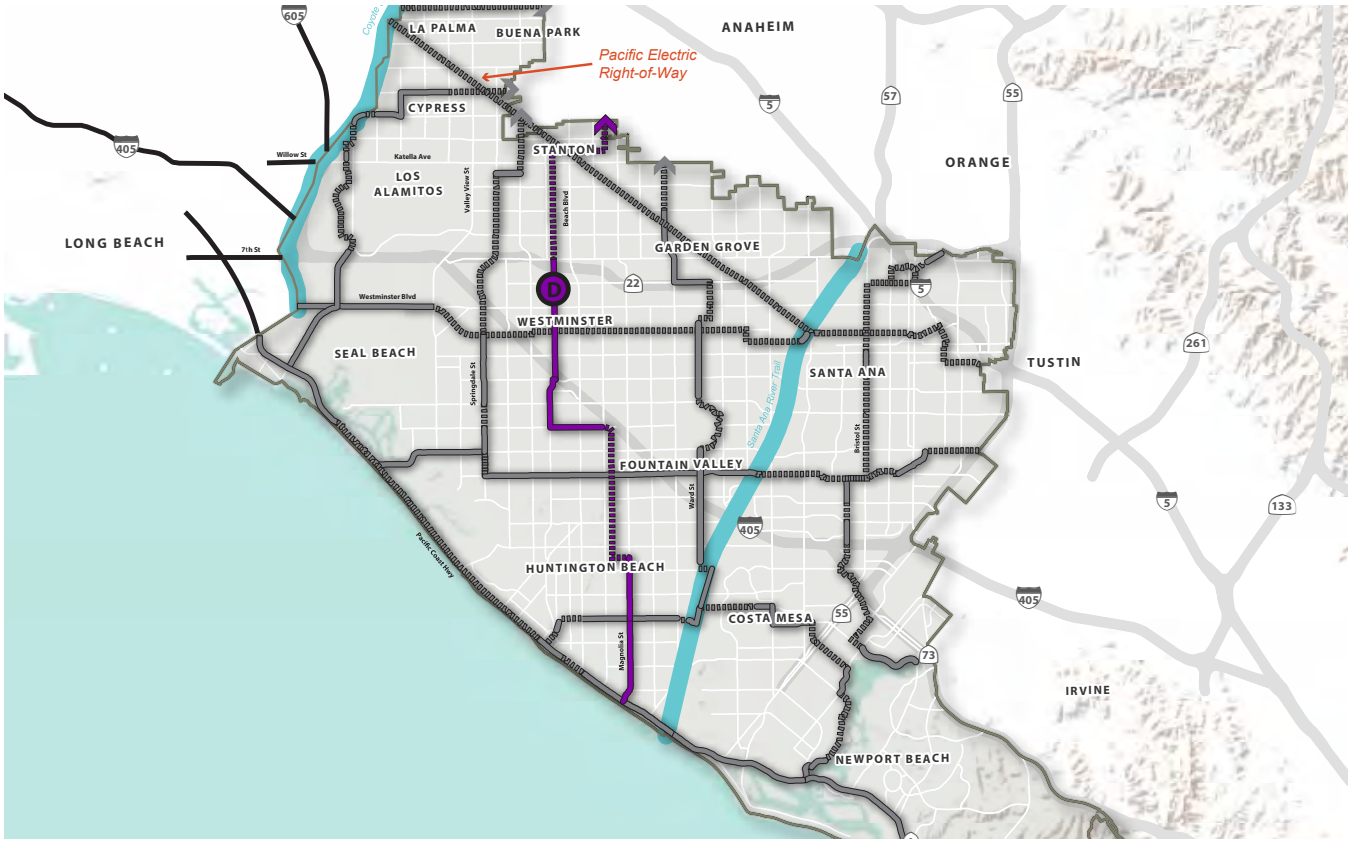
This proposed corridor runs north-south through the center of the study area, utilizing both roadways and off-street paths. The corridor would connect with several other proposed routes, including the Pacific Electric Right-of-Way, Westminster-Hazard, Slater-Segerstrom, Bristol-Bear, Indianapolis-Fairview, and Pacific Coast Highway corridors. The existing Hoover Street trail would be used to cross under the SR-22 freeway, and the railroad right-of-way would be used to cross under the I-405 freeway. **Figure 3-5** shows Corridor D.

Opportunities, Constraints, and Estimated Costs

The Magnolia-Hoover Corridor spans 15.0 miles, with a total estimated cost ranging between $4.7 and $5.7 million. Existing bikeways comprise 8.4 miles of the corridor, including the Hoover Street bike path and a long segment of Class II on-street lanes along Magnolia Street. This corridor would be a vital north-south connection across the county, linking to a proposed corridor in District 4 and would cross under both the SR-22 and I-405 freeways. Development of the corridor might be constrained by the need to gain easements from utility entities in various locations and coordination of trails-adjacent rails for approximately six miles of the corridor. Alternative on-street alignments to the proposed off-street portion within the Edison Transmission Line right-of-way are illustrated on Figure 3-5 to provide flexibility in the proposed alignment depending on future feasibility review. There are right-of-way constraints along segments of Magnolia Street, particularly at the I-405 overcrossing. Widening and enhancements are needed to improve the condition of an existing portion of off-street trail provided adjacent to the existing railroad between Garden Grove Boulevard and Bolsa Avenue.

Major Regional Destinations

Major destinations along the Magnolia-Hoover corridor include the Stanton City Hall, Golden West Transportation Center, Golden West College, Bella Terra shopping center, Edison High School, and coastal beaches along the Pacific Coast Highway.



Corridor D Inset Map

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CORRIDOR D: MAGNOLIA-HOOVER

OCTA Districts 1 and 2 Bikeways Collaborative

Figure 3-5

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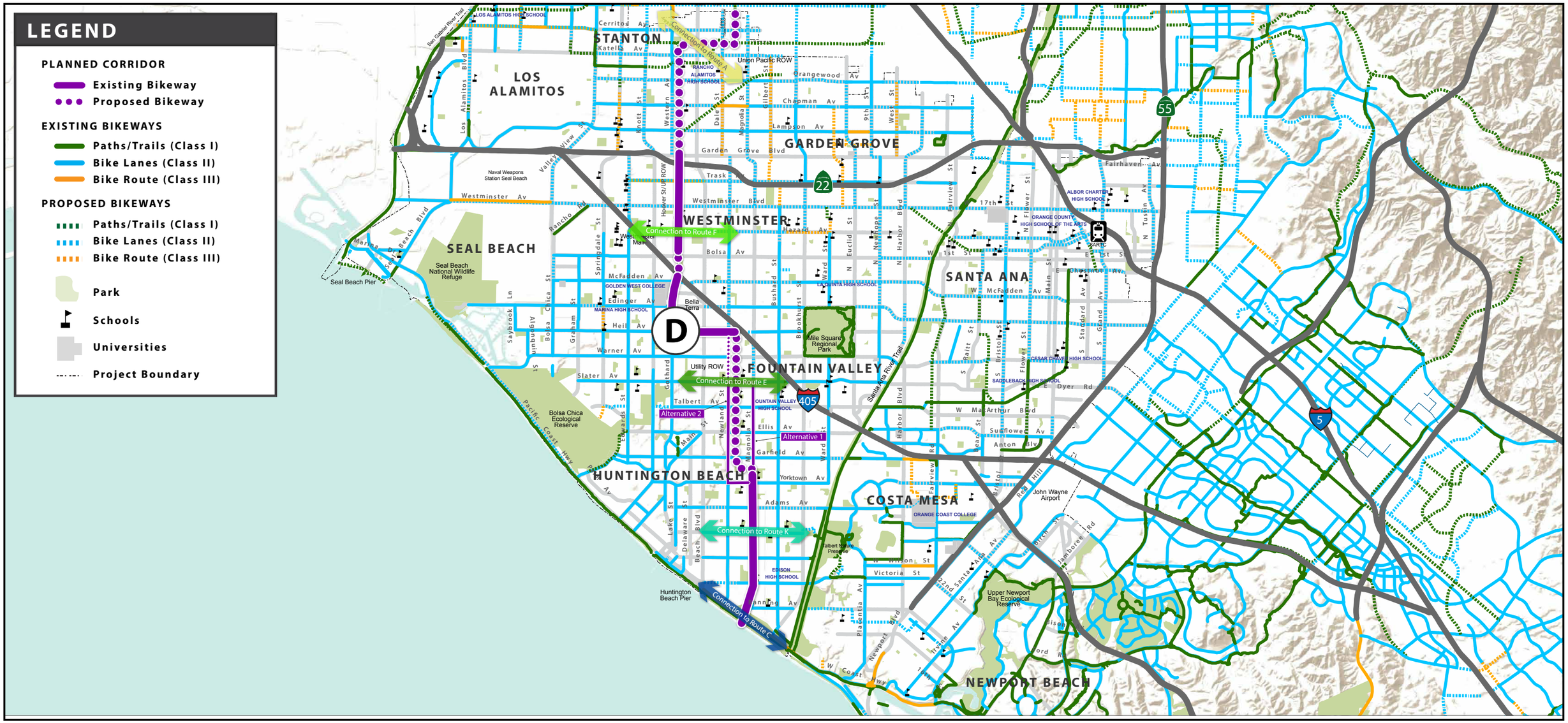


Corridor D
Bikeway Improvement Details

- .1 miles of new bike lanes
- 6.5 miles of new trails
- 8.4 miles of existing bikeway

= 15.0 miles of bikeway

19
Schools + Universities within 1/4-mile Served

41
Parks within 1/4-mile Served

97k
People within 1/4-mile Served (approx.)

6.6 miles
Of Bikeway Improvements

$4.7-5.7 million
Project Cost

3.1.5 Corridor E: Slater-Segerstrom

Jurisdictions:	Distance:
• County of Orange • Fountain Valley • Huntington Beach • Santa Ana	• 13.5 miles
	Cost:
	• $16.2–19.9 million

Overview

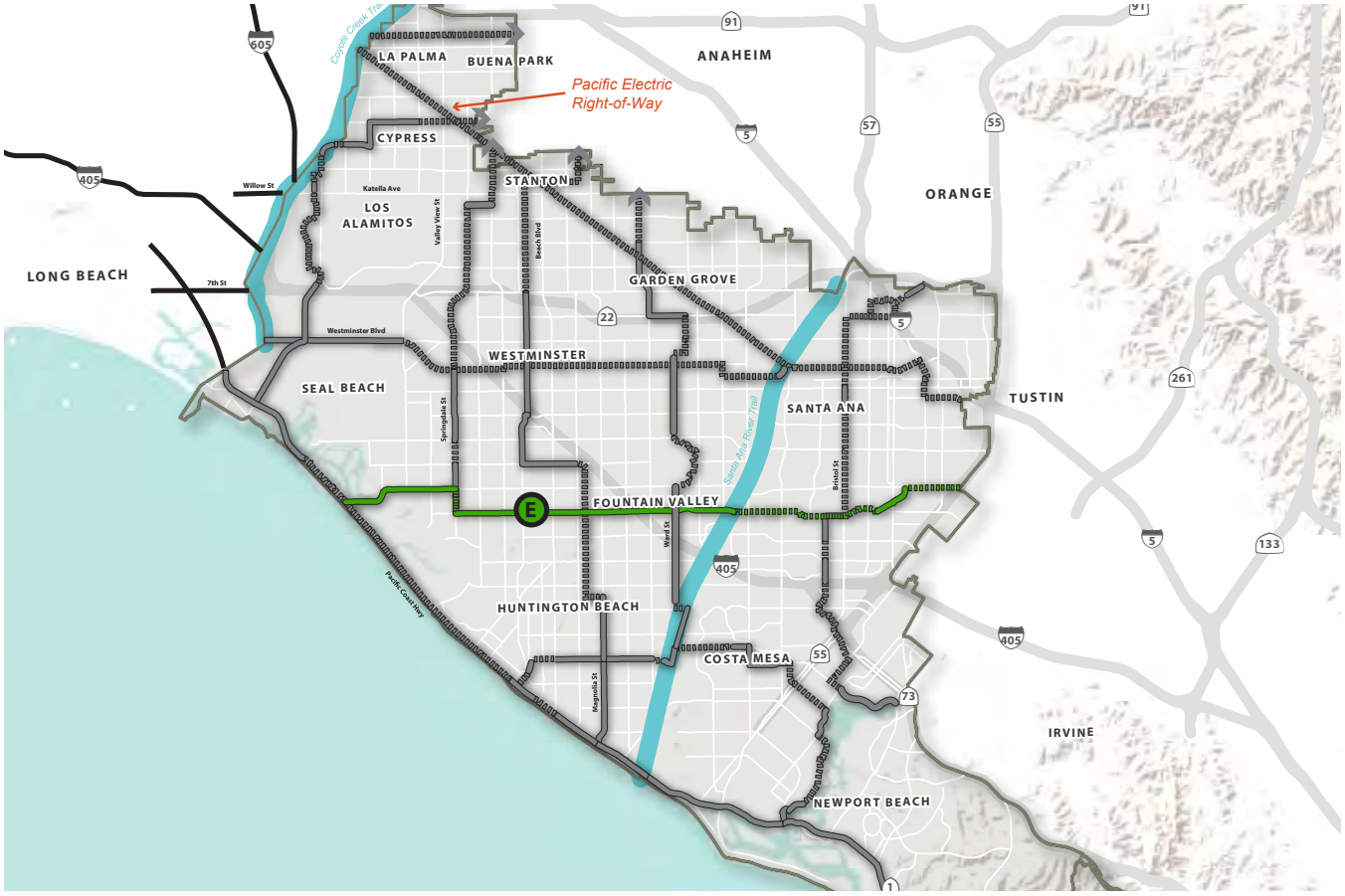
The proposed Slater-Segerstrom corridor travels mostly east-west through the cities of Huntington Beach, Fountain Valley, and Santa Ana. The corridor would mostly consist of Class II on-street bikeways along Slater and Segerstrom Avenues, and it would connect with the Pacific Coast Highway, Springdale Holder, Magnolia-Hoover, Bristol-Bear, and Westminster-Hazard corridors. In addition, the corridor crosses over the I-405 freeway via Slater Avenue. **Figure 3-6** shows Corridor E.

Opportunities, Constraints, and Estimated Costs

This 13.5-mile corridor takes advantage of 8.1 miles of existing bicycle facilities, including Class II bike lanes on Slater Avenue and a Class I off-street path in Santa Ana. The estimated construction cost ranges between $16.2 and $19.9 million and includes approximately 2.2 miles of roadway widening (consistent with current City & regional plans). The Slater-Segerstrom corridor has an opportunity to connect bikeways between Fountain Valley and Santa Ana, while also providing improved bicycle access to several large parks and high schools. A challenge will be providing a comfortable facility for cyclists at Warner Avenue on the west and the east ends of the corridor.

Major Regional Destinations

The Slater-Segerstrom corridor would link the coastal beaches at Pacific Coast Highway, Bolsa Chica Ecological Reserve, Huntington Central Park, Valley Vista High School, Fountain Valley Civic Center, Mile Square Park, Santa Ana River Trail, and Saddleback High School.



Corridor E Inset Map

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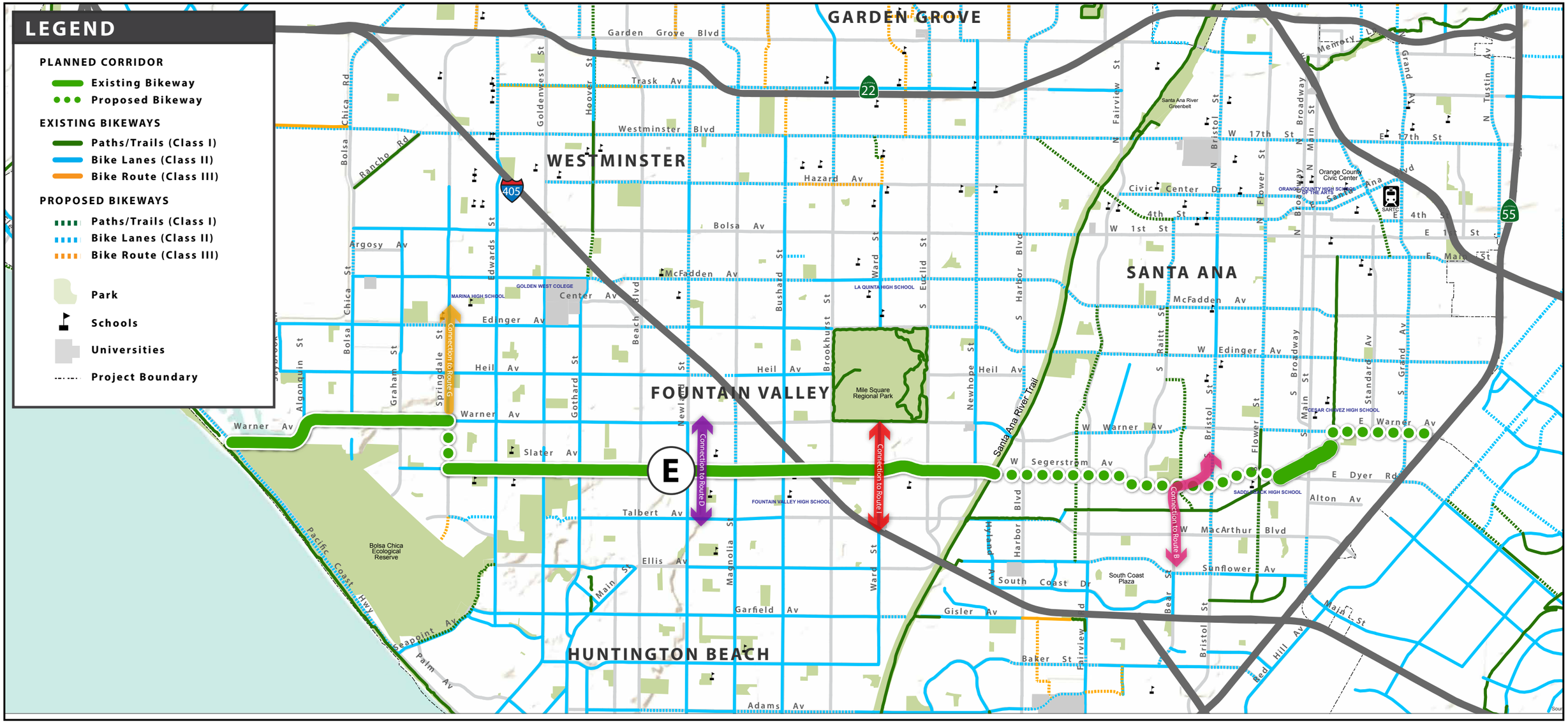
CORRIDOR E: SLATER-SEGERSTROM

OCTA Districts 1 and 2 Bikeways Collaborative

Figure 3-6



Corridor E Bikeway Improvement Details

- 4.6 miles of new bike lanes
- 0.8 miles of improved trails
- 8.1 miles of existing bikeway

= 13.5 miles of bikeway

20
Schools + Universities within 1/4-mile Served

17
Parks within 1/4-mile Served

93k
People within 1/4-mile Served (approx.)

5.4 miles
Of Bikeway Improvements

$16-20 million
Project Cost

3.1.6 Corridor F: Westminster-Hazard

Jurisdictions:	Distance:
• Garden Grove • Huntington Beach • Santa Ana • Seal Beach • Westminster	• 11.4 miles
	Cost:
	• $6.0–7.4 million

Overview

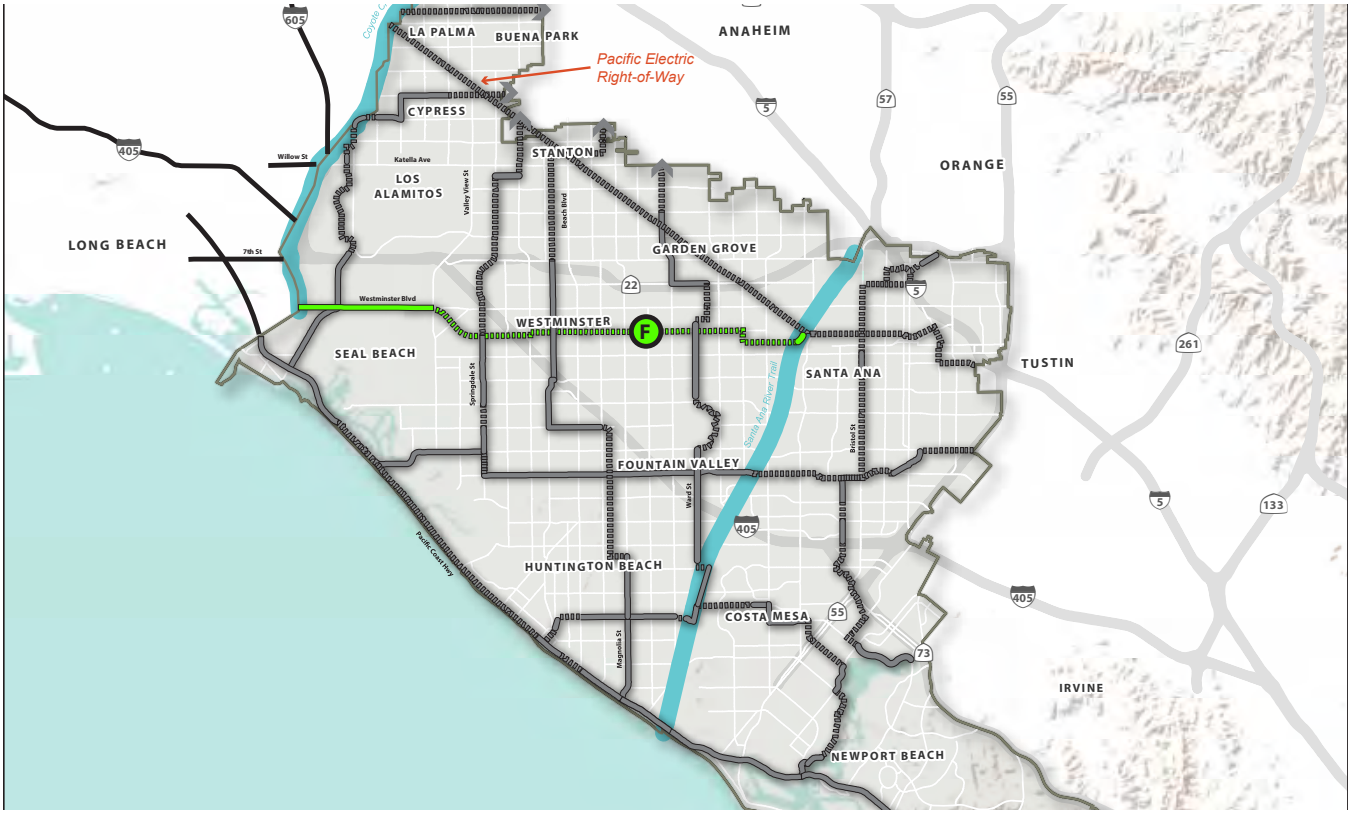
This east-west corridor passes through the cities of Seal Beach, Westminster, and Fountain Valley, with a small segment in western Santa Ana that links to the proposed Pacific Electric Right-of-Way corridor. Most of the corridor enhancements would be new Class II on-street bike lanes, primarily along Westminster Boulevard and Hazard Avenue. This route connects with the proposed Seal Beach-Orange Avenue, Knott-Springdale, Magnolia-Hoover, Brookhurst-Ward, and PE ROW corridors. **Figure 3-7** shows Corridor F.

Opportunities, Constraints, and Estimated Costs

The Westminster-Hazard corridor spans 11.4 miles, with a total estimated cost ranging between $6.0 and $7.4 million, including one new bridge structure. The route has significant potential to create many miles of continuous bikeways where none currently exist, and it would provide a new off-street trail crossing under the I-405 freeway near Westminster High School. Working with military representatives to gain access to abandoned rail right-of-way between Bolsa Chica Street and Goldenwest Street will likely be a key constraint in the western end of the corridor.

Major Regional Destinations

This proposed corridor would link the San Gabriel River Trail and its recreational opportunities with the Santa Ana River Trail. The corridor would also provide connections to the Westminster Mall, Westminster High School, and Westminster's Little Saigon district near the Magnolia Street/Hazard Avenue intersection.



Corridor F Inset Map

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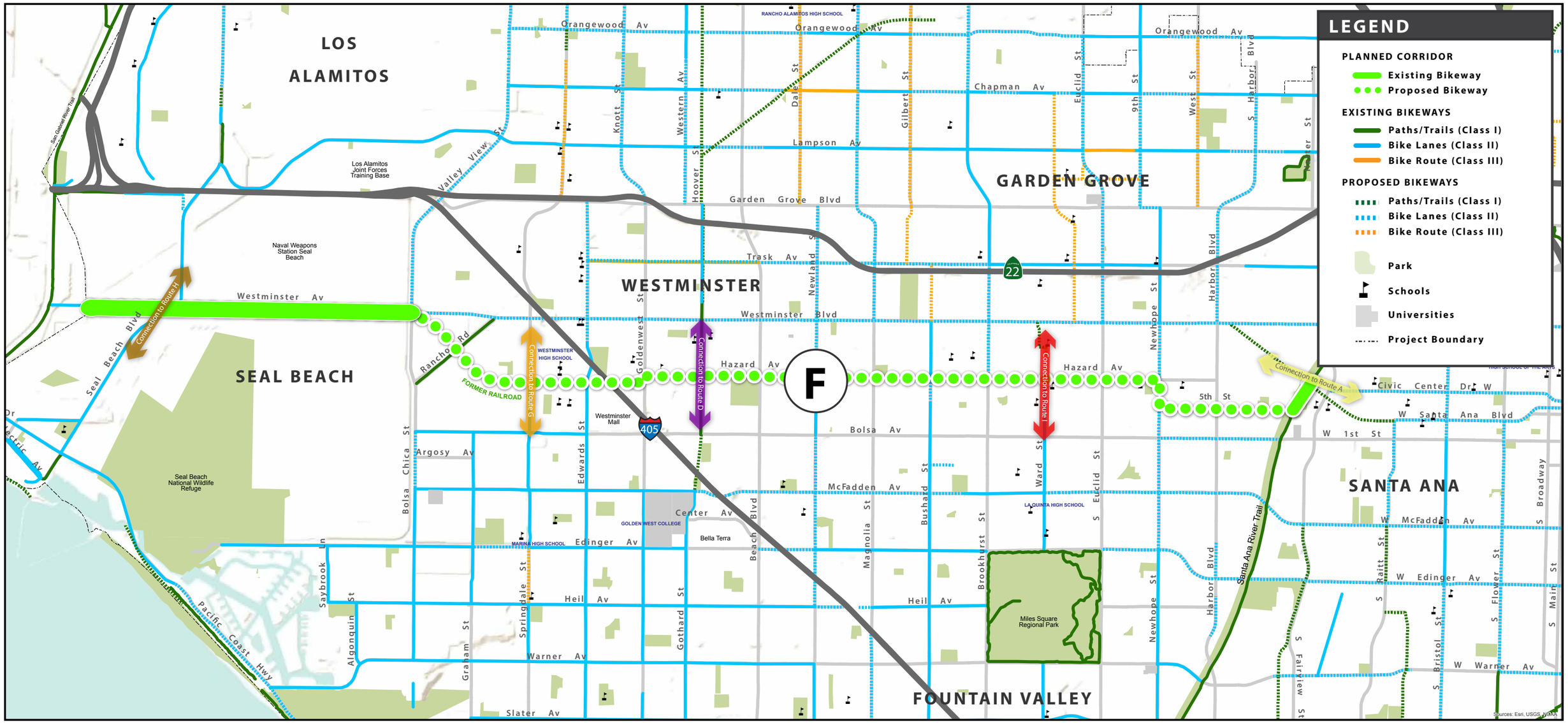
CORRIDOR F: WESTMINSTER-HAZARD

OCTA Districts 1 and 2 Bikeways Collaborative

Figure 3-7



LEGEND

PLANNED CORRIDOR
- Existing Bikeway
- Proposed Bikeway

EXISTING BIKEWAYS
- Paths/Trails (Class I)
- Bike Lanes (Class II)
- Bike Route (Class III)

PROPOSED BIKEWAYS
- Paths/Trails (Class I)
- Bike Lanes (Class II)
- Bike Route (Class III)

- Park
- Schools
- Universities
- Project Boundary

Corridor F Bikeway Improvement Details

- 8.0 miles of new bike lanes
- 2.2 miles of new trails
- 1.2 miles of existing bikeway

= 11.4 miles of bikeway

15
Schools + Universities within 1/4-mile Served

14
Parks within 1/4-mile Served

59k
People within 1/4-mile Served (approx.)

10.2 miles
Of Bikeway Improvements

$6.0-7.4 million
Project Cost

3.1.7 Corridor G: Knott-Springdale

Jurisdictions:	Distance:
• Anaheim (District 4) • Cypress • Garden Grove • Huntington Beach • Stanton • Westminster	• 8.1 miles
	Cost:
	• $1.0–1.2 million

Overview

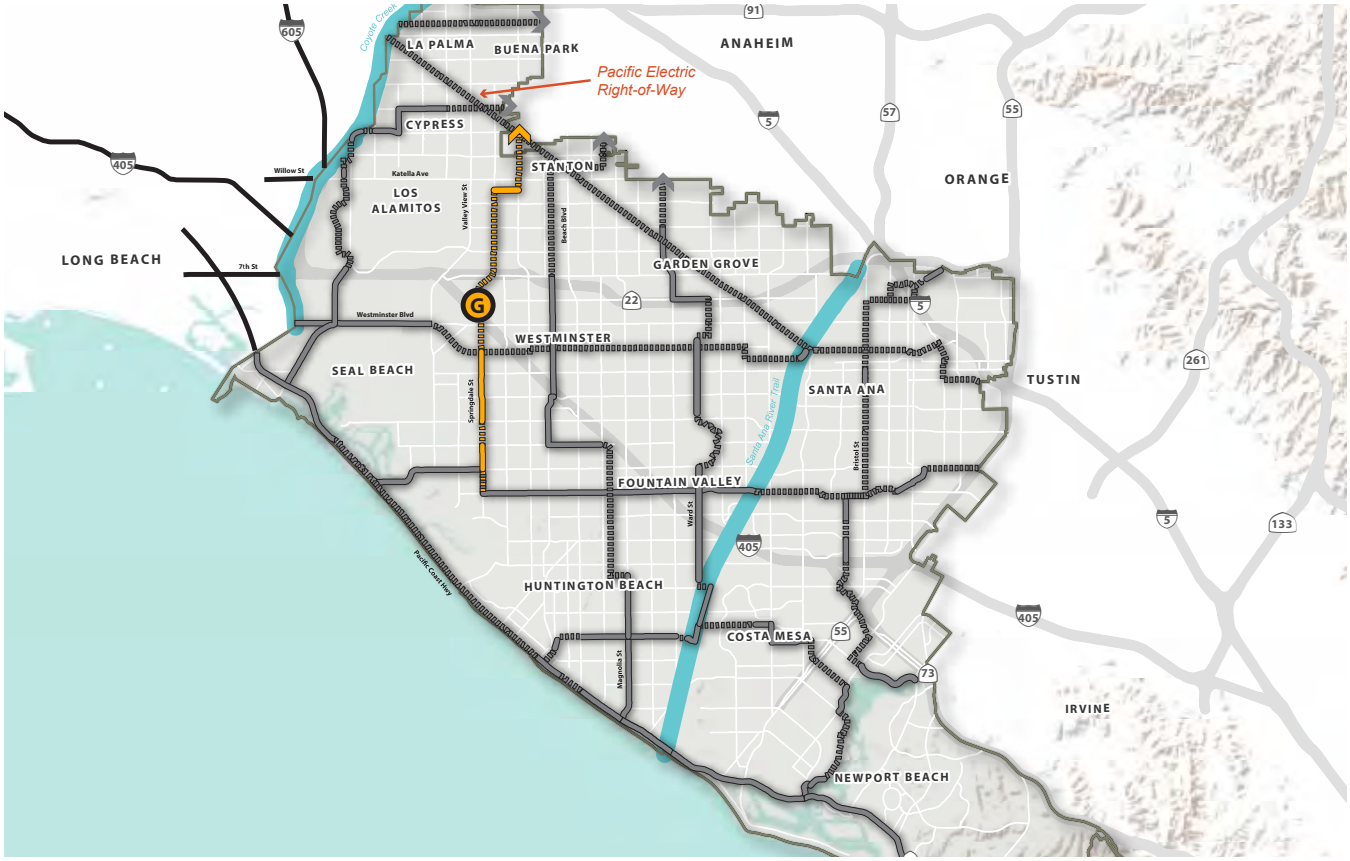
The proposed Knott-Springdale corridor runs north and south between the PE ROW (Corridor A) and Slater Avenue (Corridor E). Additional corridor connections could be made to the proposed Westminster-Hazard corridor. This corridor would consist mostly of Class II on-street bike lanes. **Figure 3-8** shows Corridor G.

Opportunities, Constraints, and Estimated Costs

This 8.1-mile corridor would provide north-south linkage across several cities in northwest Orange County. Corridor G has a total estimated cost ranging between $1.0 and $1.2 million. Only 2.6 miles of the corridor have existing bike lanes, so completion of the proposed 5.5 miles could potentially attract many new users. Suggested bikeways enhancements would also improve the existing southbound I-405 freeway off-ramp intersection.

Major Regional Destinations

The Knott-Springdale corridor will provide a quality bikeway connection to the PE ROW (Corridor A), the large office center near the Valley View Street/Katella Avenue intersection in Cypress, Pacifica High School, and Marina High School. Additionally, linkage from the southern terminus of Corridor G to Pacific Coast Highway is provided through existing bikeways on Edwards Street and Seapoint Street.



Corridor G Inset Map

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CORRIDOR G: KNOTT-SPRINGDALE

OCTA Districts 1 and 2 Bikeways Collaborative

Figure 3-8

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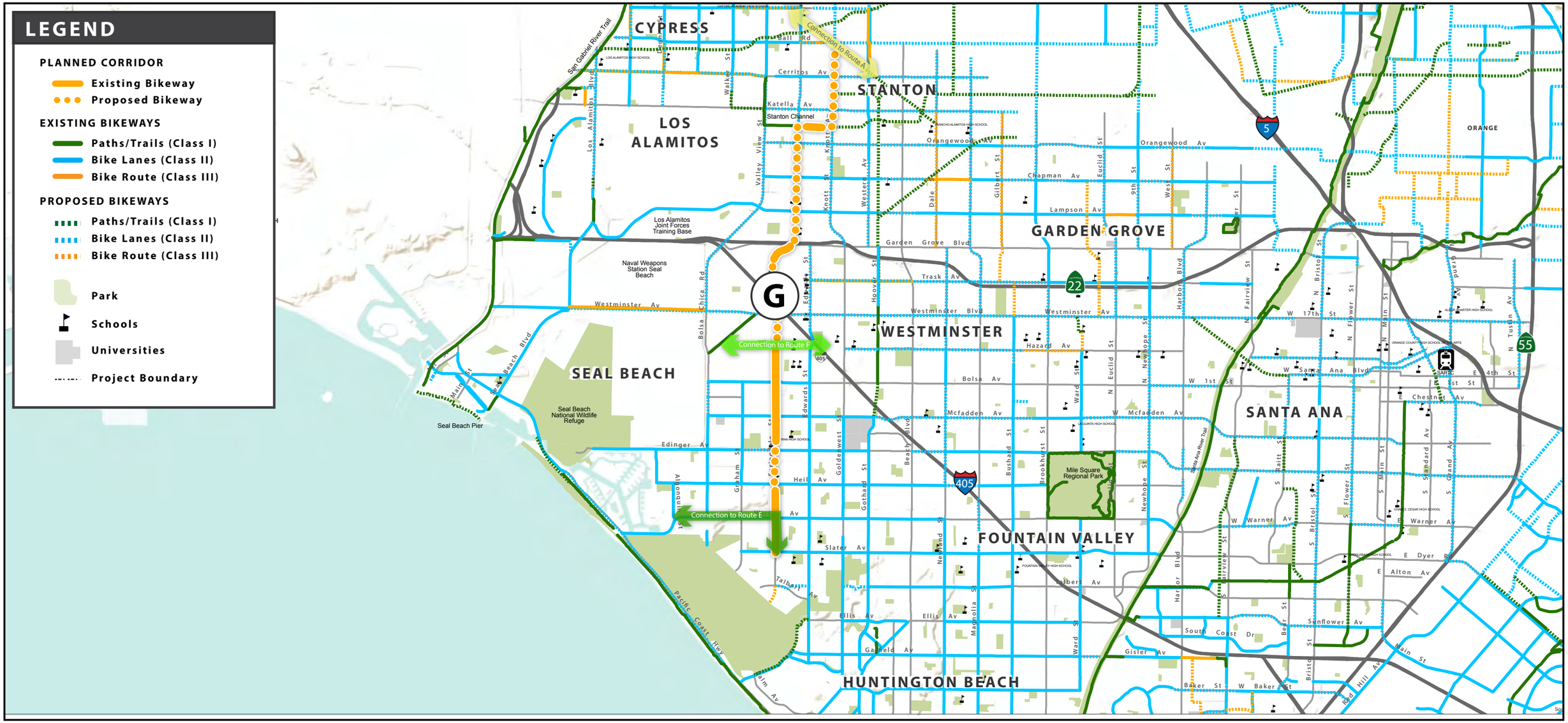


Corridor G Bikeway Improvement Details

5.5 miles of new bike lanes
2.6 miles of existing bikeway

= 8.1 miles of bikeway

20
Schools + Universities within 1/4-mile Served

13
Parks within 1/4-mile Served

61k
People within 1/4-mile Served (approx.)

5.5 miles
Of Bikeway Improvements

$1.0-1.2 million
Project Cost

3.1.8 Corridor H: Seal Beach-Orange Avenue

Jurisdictions:	Distance:
• Buena Park • County of Orange • Cypress • Los Alamitos • Seal Beach	• 10.0 miles
	Cost:
	• $2.7–3.3 million

Overview

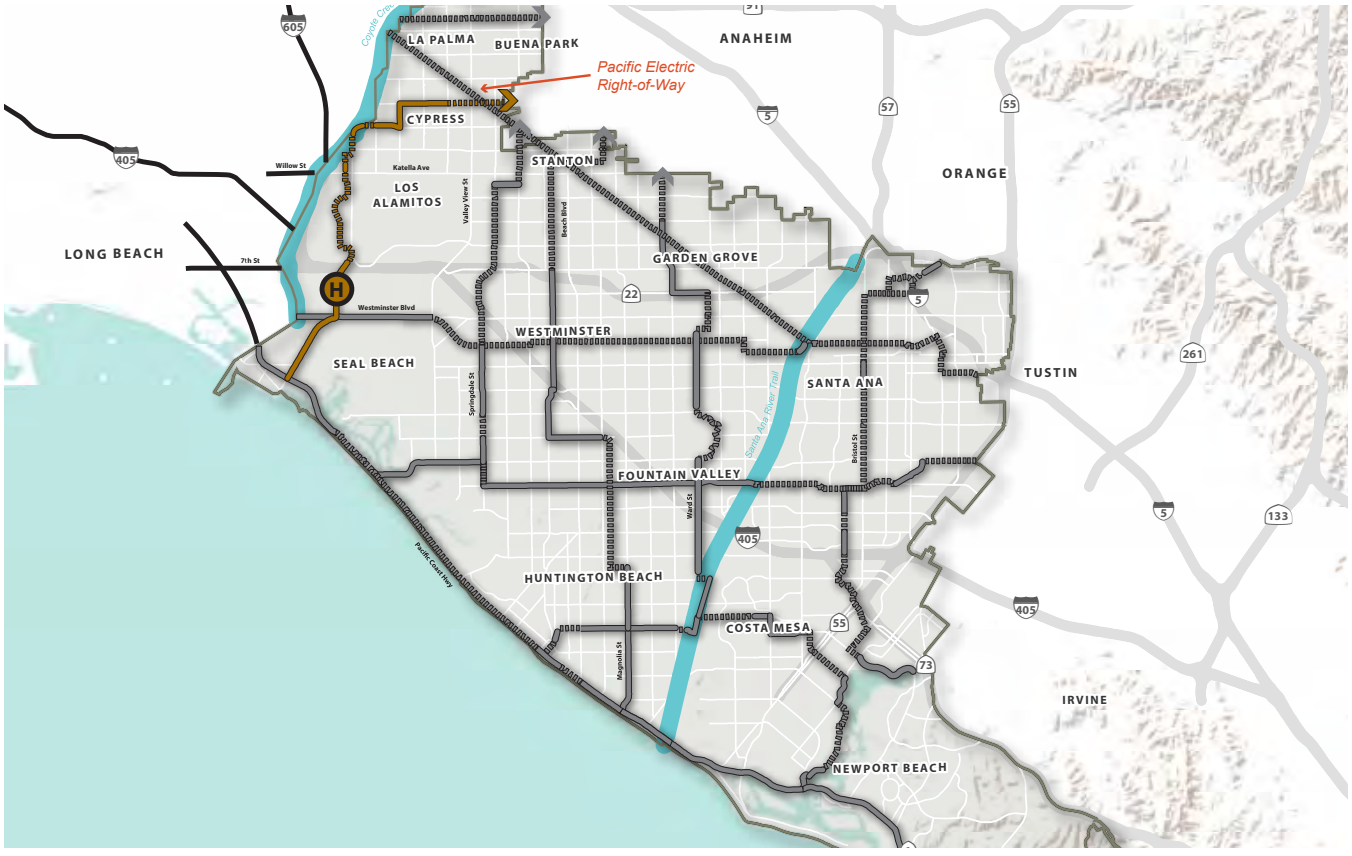
This corridor has both a north-south segment through Los Alamitos and Seal Beach and an east-west portion in the City of Cypress. The Seal Beach-Orange Avenue route would connect with the proposed PCH, Westminster-Hazard, PE ROW, and Knott-Springdale corridors. **Figure 3-9** shows Corridor H.

Opportunities, Constraints, and Estimated Costs

This proposed 10.0-mile corridor would close a large bikeways gap by providing on-street facilities across I-405 to points north of Seal Beach, while utilizing 5.3 miles of existing bicycle facilities on Seal Beach Boulevard, Ball Road, Denni Street and Orange Avenue, as well as a portion of the Coyote Creek Trail. The corridor would detour off of Los Alamitos Boulevard and follow several neighborhood streets through Los Alamitos and the Rossmoor area of unincorporated Orange County, creating a "bicycle boulevard." The northeastern end of the proposed corridor would link with District 4's Orange-La Palma Corridor. Key obstacles associated with this corridor are crossing of the I-405 freeway and high traffic volumes on Los Alamitos Boulevard-Seal Beach Boulevard. In addition, the West County Connectors project is under construction in the project vicinity and is scheduled for completion in Summer 2014. Corridor H has an estimated construction cost ranging between $2.7 and $3.3 million, which includes approximately 0.3 miles of roadway widening.

Major Regional Destinations

The corridor will link Cypress College, Cypress High School, Los Alamitos High School, the Los Alamitos Medical Center, the Rossmoor Neighborhood, Downtown Seal Beach, and the beaches via the Pacific Coast Highway.



Corridor H Inset Map

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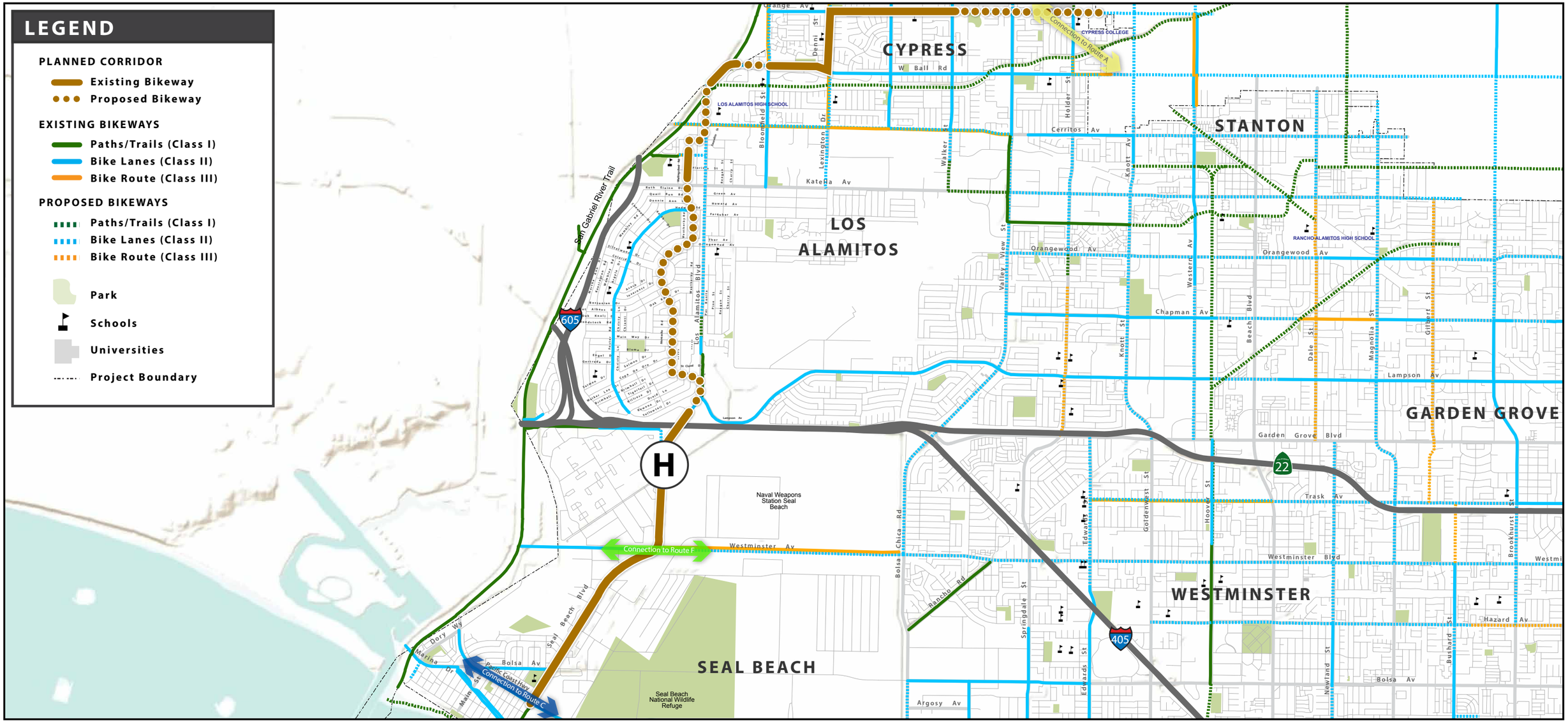
CORRIDOR H: SEAL BEACH-ORANGE AVENUE

OCTA Districts 1 and 2 Bikeways Collaborative

Figure 3-9



Corridor H Bikeway Improvement Details

4.7 miles of new bike lanes
5.3 miles of existing bikeway

= 10.0 miles of bikeway

14
Schools + Universities within 1/4-mile Served

13
Parks within 1/4-mile Served

44k
People within 1/4-mile Served (approx.)

4.7 miles
Of Bikeway Improvements

$2.7-3.3 million
Project Cost

3.1.9 Corridor I: Brookhurst-Ward

Jurisdictions:	Distance:
• County of Orange • Fountain Valley • Garden Grove • Huntington Beach • Westminster	• 11.8 miles
	Cost:
	• $2.8–3.4 million

Overview

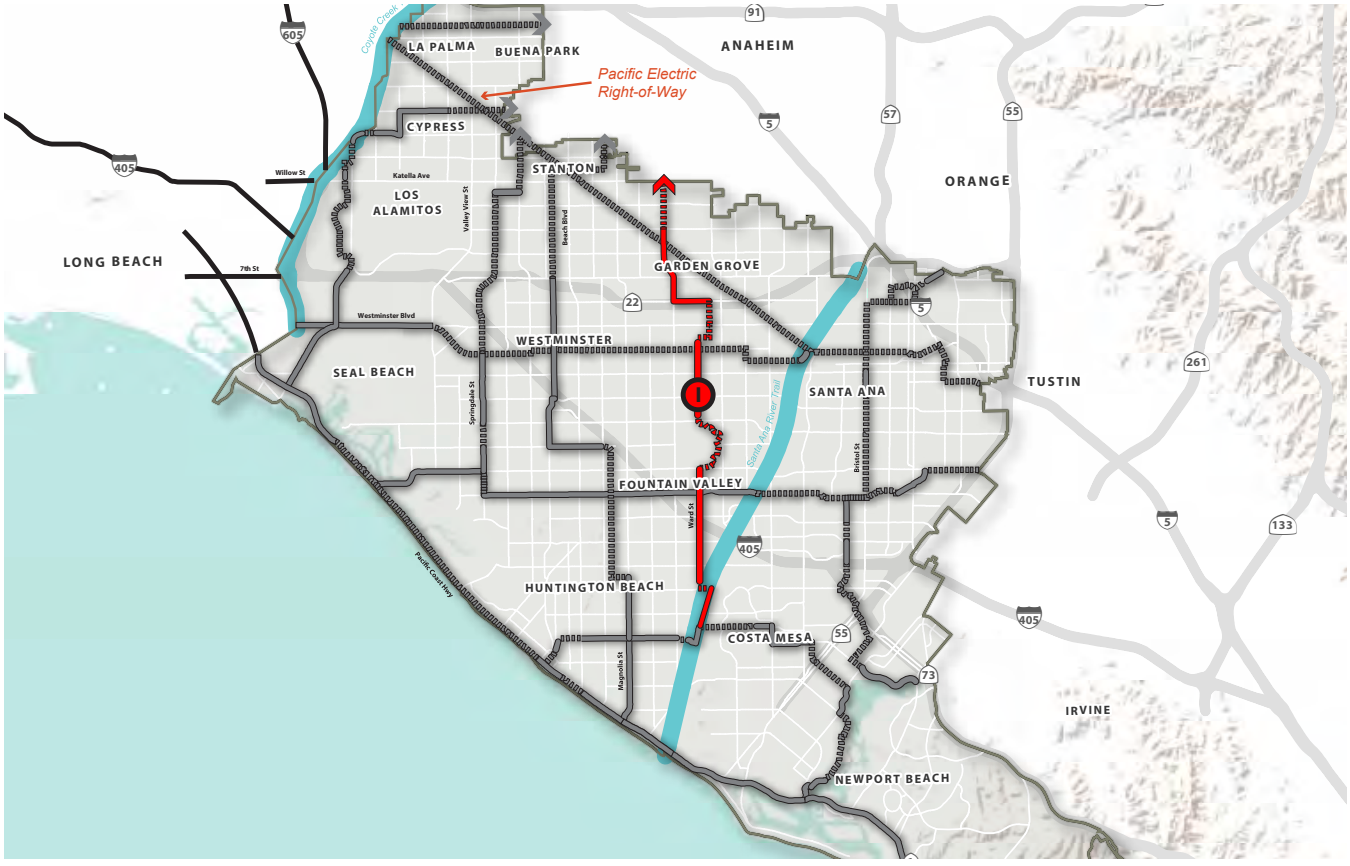
The Brookhurst-Ward corridor runs primarily north-south from Katella Avenue to the Santa Ana River Trail at Garfield Avenue, via Mile Square Regional Park. The route traverses Garden Grove, Westminster, Fountain Valley, and Huntington Beach, near Fairview Park. The Brookhurst-Ward corridor would connect with the PE ROW, Westminster-Hazard, Slater-Segerstrom, and Indianapolis-Fairview corridors; the northern end would link to District 4's Brookhurst-Gilbert Corridor. Most of the improvements would be Class II on-street bike lanes, with a small segment of off-street trail. **Figure 3-10** shows Corridor I.

Opportunities, Constraints, and Estimated Costs

This corridor covers a total of 11.8 miles, with existing bikeways on 6.7 miles of the route. Corridor I has a total estimated cost ranging between $2.8 and $3.4 million. A crucial benefit of this corridor is to connect the large Mile Square Park to more neighborhoods and destinations. The corridor also directs cyclists to a low-stress undercrossing of the SR-22 freeway at Taft Street. A challenge is gaining access to the flood channel near Morningside Elementary School south of Westminster Avenue. Additionally, enhancements are likely needed on Brookhurst Avenue at high traffic intersections with Chapman Avenue, Garden Grove Boulevard, and Trask Avenue.

Major Regional Destinations

Mile Square Park is a major destination in this part of Orange County, and the Brookhurst-Ward corridor would provide enhanced access for residents coming from other parts of the county. This corridor would also connect to La Quinta High School, Fountain Valley Civic Center, the Santa Ana River Trail and Fairview Park.



Corridor I Inset Map

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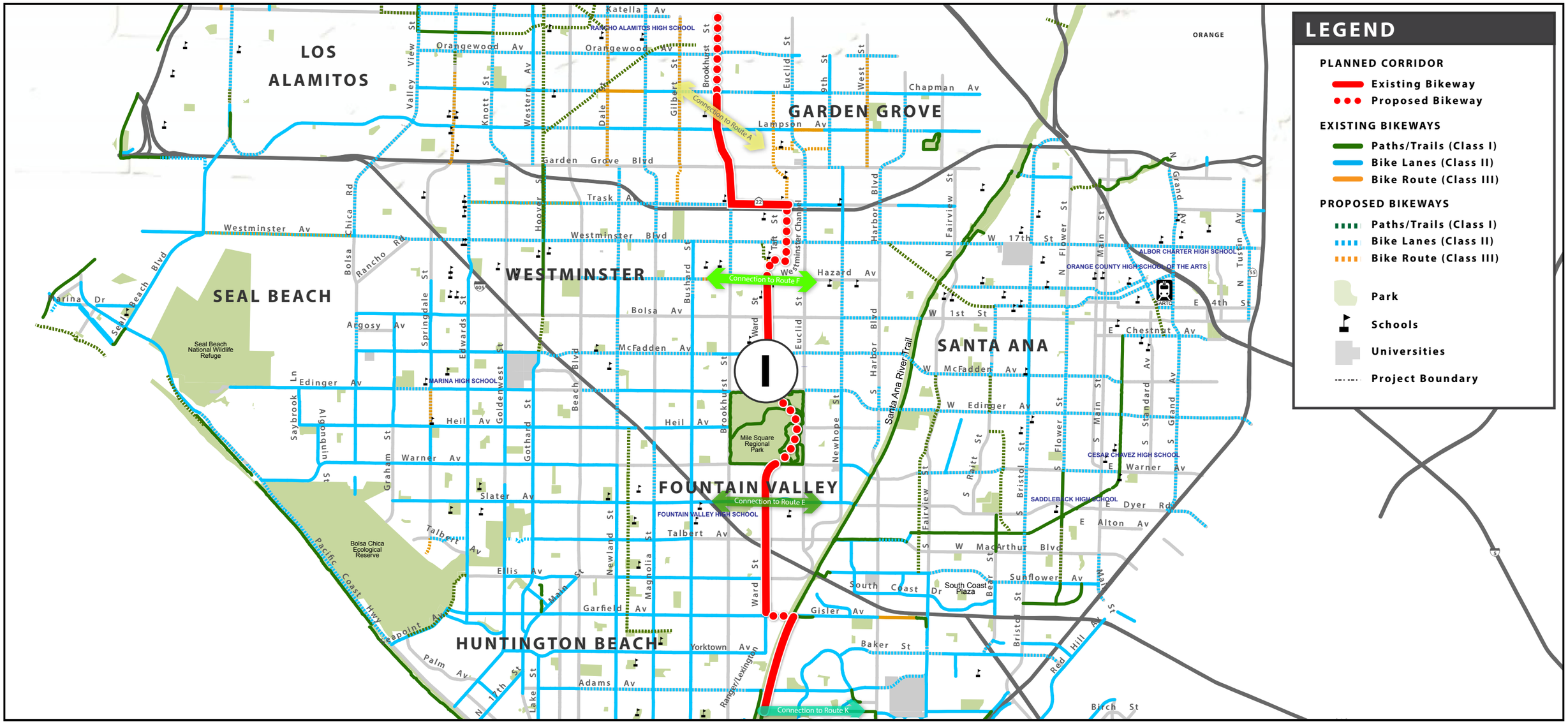
CORRIDOR I: BROOKHURST-WARD

OCTA Districts 1 and 2 Bikeways Collaborative

Figure 3-10



LEGEND

PLANNED CORRIDOR
- Existing Bikeway
- Proposed Bikeway

EXISTING BIKEWAYS
- Paths/Trails (Class I)
- Bike Lanes (Class II)
- Bike Route (Class III)

PROPOSED BIKEWAYS
- Paths/Trails (Class I)
- Bike Lanes (Class II)
- Bike Route (Class III)

- Park
- Schools
- Universities
- Project Boundary

Corridor I Bikeway Improvement Details

- 1.8 miles of new bike lanes
- 3.3 miles of new trails
- 6.7 miles of existing bikeway

= 11.8 miles of bikeway

12
Schools + Universities within 1/4-mile Served

8
Parks within 1/4-mile Served

62k
People within 1/4-mile Served (approx.)

5.1 miles
Of Bikeway Improvements

$2.8-3.4 million
Project Cost

3.1.10 Corridor J: Edison Transmission Line

Jurisdictions:	Distance:
• Buena Park • La Palma	• 2.8 miles
	Cost:
	• $2.2–2.7 million

Overview

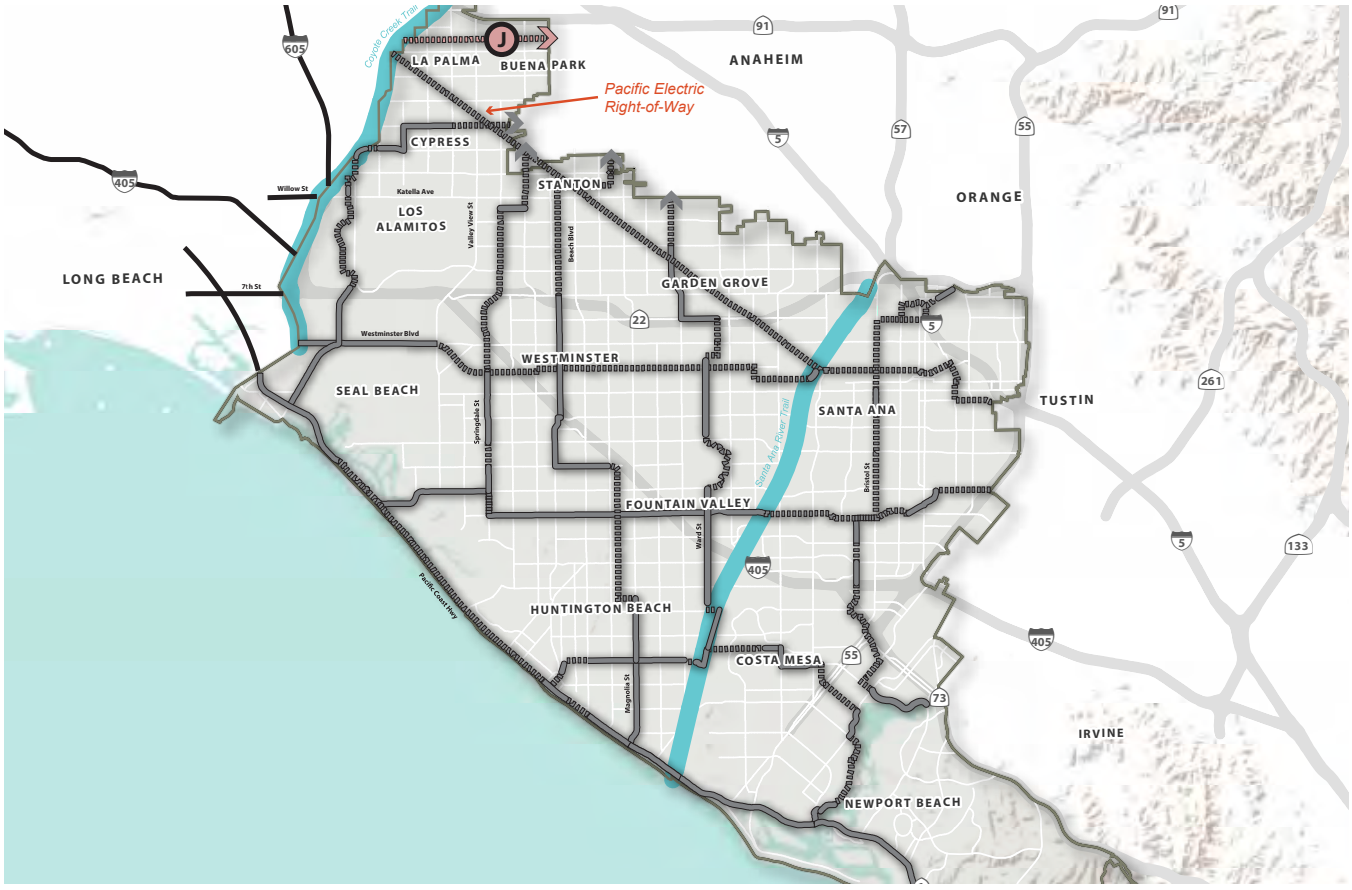
This is a relatively short east-west off-street path that would use an existing Southern California Edison transmission right-of-way in the cities of La Palma and Buena Park. The corridor would connect to the District 4 Edison Transmission Line Corridor. **Figure 3-11** shows Corridor J.

Opportunities, Constraints, and Estimated Costs

The District 4 Bikeways Strategy identified the Edison Transmission Line as a priority corridor, and extending the corridor into District 1 would provide the continuity and linkage to the City of La Palma and potentially to the Coyote Creek Trail. Corridor J covers a total of 2.8 miles, and the proposed improvements have a total estimated cost ranging between $2.2 and $2.7 million. While some of the Corridor J provides an off-street pedestrian walkway, it is not designated an off-street bikeway (Class I). Construction of a bikeway and reconfiguring the pedestrian walkway to accommodate a bikeway will require longer-term implementation efforts by the Cities of Buena Park and La Palma. Challenges with the corridor include designating/upgrading the existing pedestrian pathway to a bikeway, arterial crossings and coordination with Los Angeles County agencies and cities to link to the Coyote Creek Trail. Further, the City of Buena Park's current license agreement with Southern California Edison (SCE) does not support the long-term use of the corridor as a bikeway. That license agreement is renewed every 5 years and can be cancelled at any time by SCE.

Major Regional Destinations

This corridor would connect to La Palma City Hall, to existing parks such as El Rancho Verde Park, the Coyote Creek Trail, and Gilbert West High School.



Corridor J Inset Map

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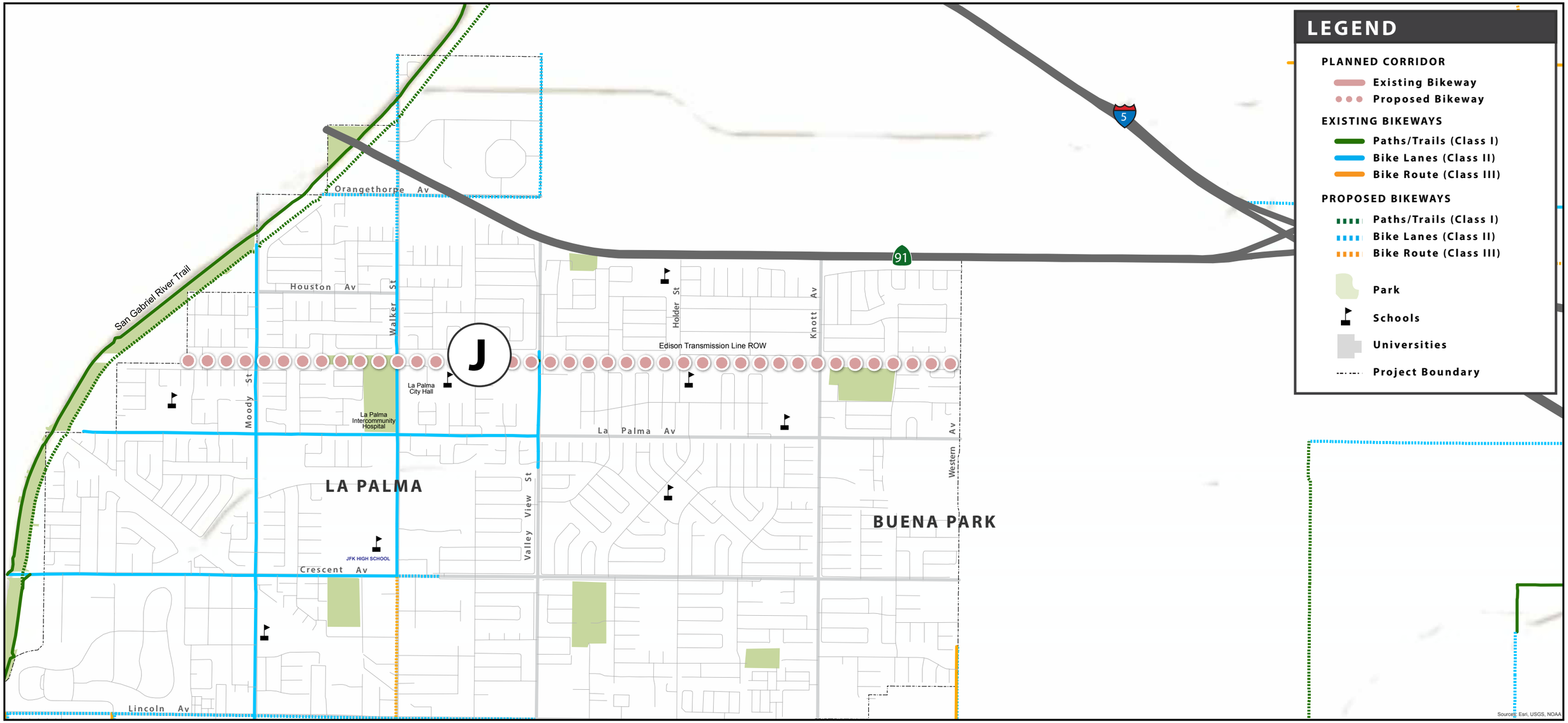
CORRIDOR J: EDISON TRANSMISSION LINE

OCTA Districts 1 and 2 Bikeways Collaborative

Figure 3-11



Corridor J
Bikeway Improvement Details

2.8 miles of new trails

= 2.8 miles of bikeway

4
Schools + Universities within 1/4-mile Served

3
Parks within 1/4-mile Served

15k
People within 1/4-mile Served (approx.)

2.8 miles
Of Bikeway Improvements

$2.2-2.7 million
Project Cost

3.1.11 Corridor K: Indianapolis-Fairview

Jurisdictions:	Distance:
• County of Orange • Costa Mesa • Huntington Beach • Newport Beach	• 11.1 miles
	Cost:
	• $1.5–1.8 million

Overview

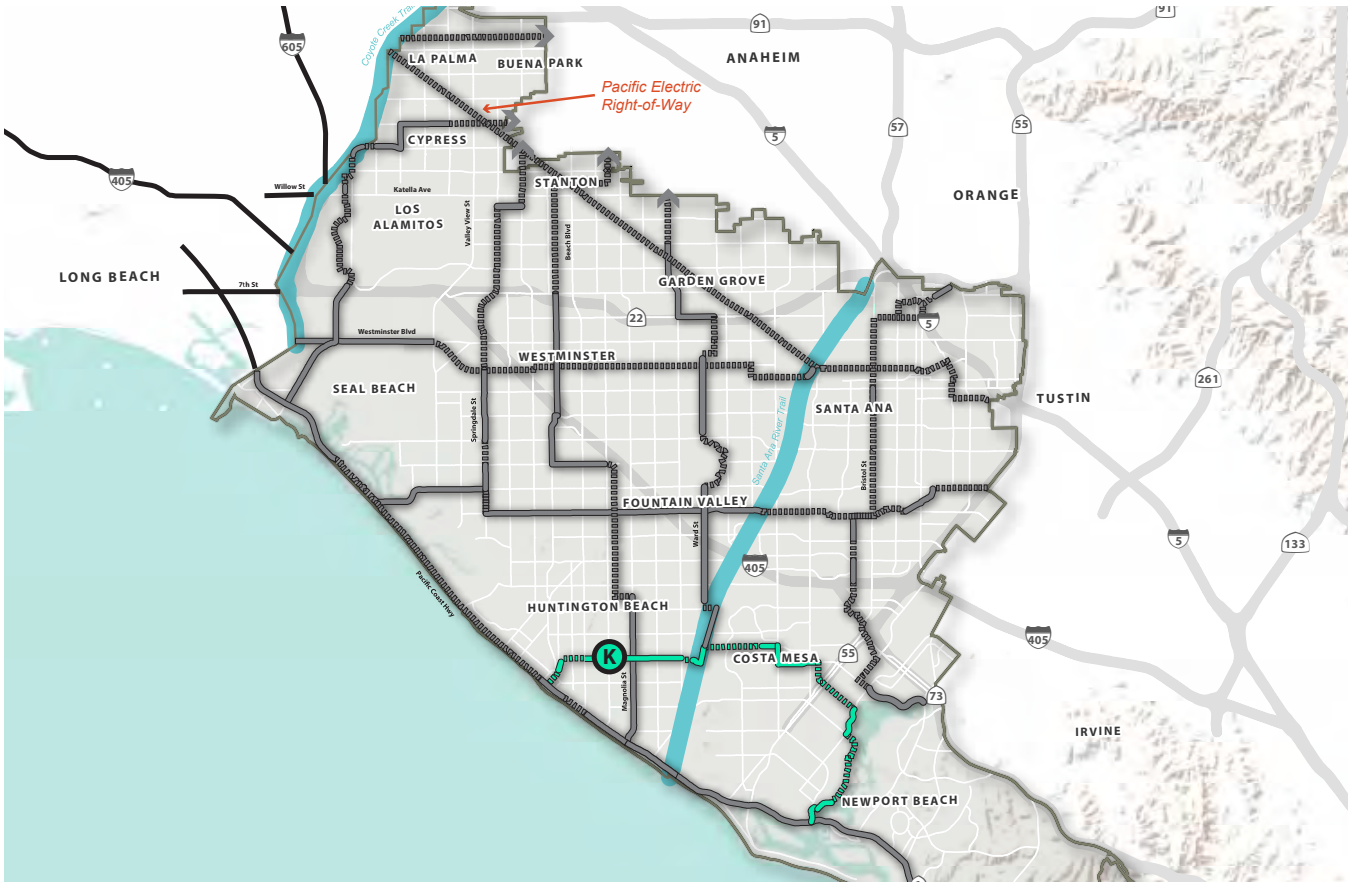
This corridor forms a loop that connects to the PCH corridor in downtown Huntington Beach and Newport Beach at Back Bay, while also crossing near recreational and civic uses in Costa Mesa. It travels along Indianapolis Avenue, crosses the Santa Ana River Trail, passes on the northern edge of Fairview Park, passes along the western side of the Upper Newport Bay before linking to Pacific Coast Highway at Dover Drive. The Indianapolis-Fairview corridor would intersect with the PCH, Magnolia-Hoover, and Brookhurst-Ward corridors. The corridor will utilize a combination of existing Class I and II bicycle facilities, as well as proposed Class I paths in various locations. **Figure 3-12** shows Corridor K.

Opportunities, Constraints, and Estimated Costs

Corridor K covers a total of 11.1 miles, with existing bikeways on 5.4 miles of the corridor, has a total estimated cost ranging between $1.5 and $1.8 million. The Indianapolis-Fairview corridor provides an inland bicycle route for the coastal cities of Huntington Beach, Costa Mesa, and Newport Beach, better serving residential neighborhoods. The corridor utilizes an existing bicycle/pedestrian bridge between Cynthia Drive in Huntington Beach and Fairview Park in Costa Mesa, and would use a proposed shared-use path along the northern boundary of Fairview Park. Bicycle enhancements would be needed at the Harbor Boulevard/Fair Drive intersection where heavy westbound to northbound automobile maneuvers occur at the traffic signal.

Major Regional Destinations

The Indianapolis-Fairview corridor serves Downtown Huntington Beach and other coastal destinations, Fairview Park, Estancia High School, Fairview Developmental Center, the Orange County Fair, Costa Mesa Civic Center, Vanguard University of Southern California, and Upper Newport Bay, Newport Harbor High School, and PCH.



Corridor K Inset Map

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CORRIDOR K: INDIANAPOLIS-FAIRVIEW

OCTA Districts 1 and 2 Bikeways Collaborative

Figure 3-12

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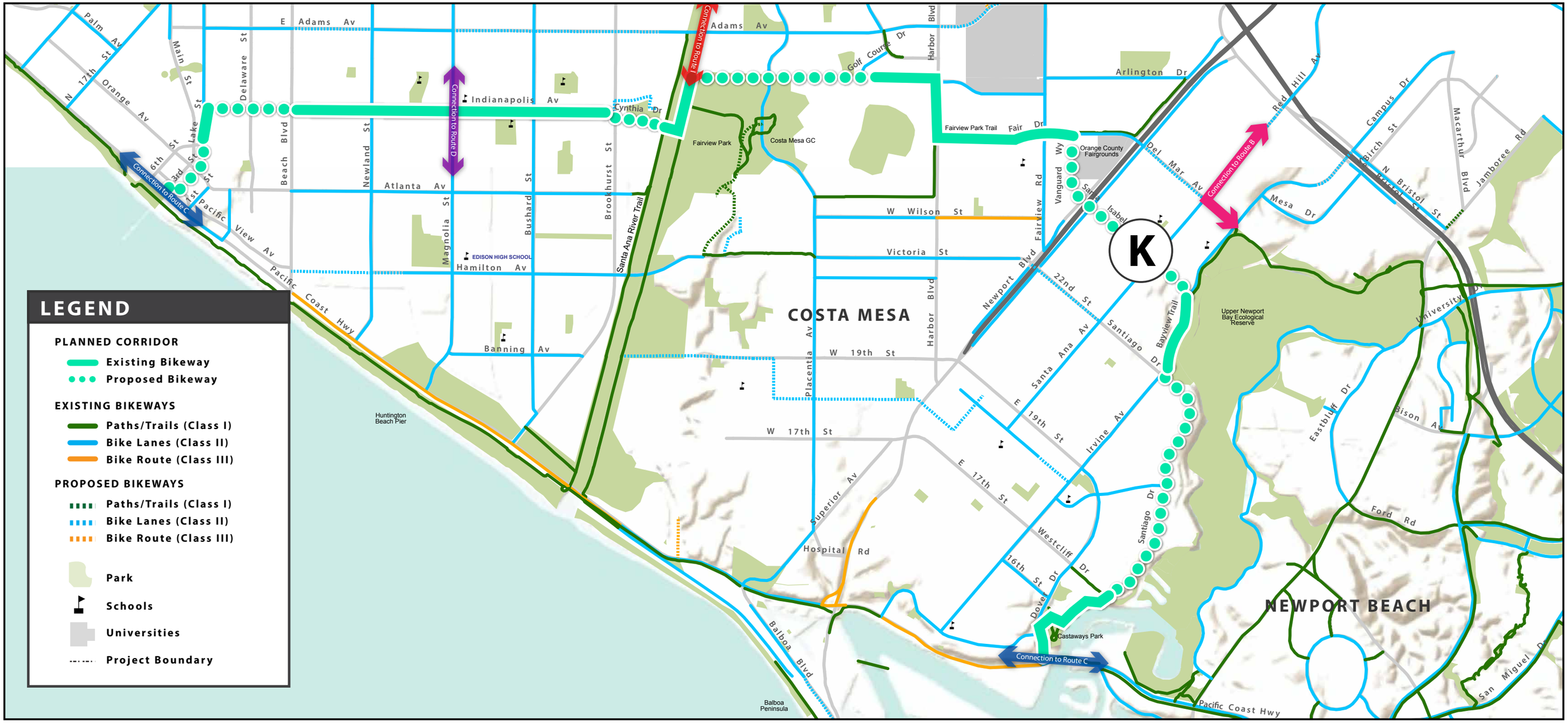


Corridor K Bikeway Improvement Details

- 4.1 miles of new bike lanes
- 1.2 miles of new trails
- 5.8 miles of existing bikeway

= 11.1 miles of bikeway

9
Schools + Universities within 1/4-mile Served

25
Parks within 1/4-mile Served

45k
People within 1/4-mile Served (approx.)

5.3 miles
Of Bikeway Improvements

$1.5-1.8 million
Project Cost

3.2 Evaluation and Ranking

Each of the proposed regional bikeway corridors were evaluated using a set of criteria that are consistent with OCTA's 2009 CBSP and the goals of the Districts 1 and 2 Bikeways Collaborative and build off those used for the District 4 Bikeways Collaborative. The criteria were developed through discussions with the PDT members, and public feedback received during Workshop #1. The criteria below account for a range of opportunities, constraints, and other factors that could influence usage and implementation:

- Trip Demand
- Level of Traffic Stress
- Reported Collisions
- Public Support
- Physical Constraints
- Completes the Corridor
- Completes the Network
- Economic Efficiency

Based on these criteria, the regional corridors were ranked to help guide the implementing cities in prioritizing bikeway improvements. The evaluation process determined which corridors would provide the greatest relative potential benefit to cyclists in terms of regional connectivity, access to key destinations, and improved safety, while also possessing significant public support and limited physical constraints that could hinder implementation. The top proposed corridors will be further studied for feasibility in the second phase of the Districts 1 & 2 Bikeways Collaborative. While feasibility review isn't immediately being provided for all the corridors, cities may respectively advance study of corridors where there is interest and desire to continue the efforts of the strategy.

3.2.1 Criteria and Weighting

Below is a brief discussion of the criteria and weighting utilized in the ranking analysis. A weighting of 1.0 is full weight, while 0.5 indicates half the importance of a fully weighted criterion. Please refer to Appendix D for additional details regarding the criteria.

- Trip Demand: based on the Bicycle Priority Index (BPI), a measure of population and employment density, land use, local schools and transit that influences usage. Proposed weight: 1.0
- Level of Traffic Stress (LTS): addresses perceived safety related to traffic volume and existing bikeway type. In addition to serving as a proxy for safety, the existing bikeway factor is a measure of existing network supply. Refer to the appendix for more information on the LTS analysis. Proposed weight: 1.0
- Reported Collisions: address safety through five years of reported data, normalized by crashes per mile. Unlike automobile crashes, the lower volume of bike crashes and lack of robust, long term exposure data (i.e. number of bicyclists using each corridor) means that this dataset is not as statistically sound. However, it is still commonly reported and easily understood. Proposed weight: 0.5
- Public Support: incorporate public priorities through a Public Demand Index. Weighting may be reduced depending on the extent of public interest. Proposed weight: 0.5
- Constraints: tally physical constraints such as right-of-way, on-street parking, and other "chokepoints". Fewer constraints results in a higher score as the corridor will be easier to implement. Proposed weight: 0.5
- Completes the Corridor: proportion of the corridor that is already built to at least minimum Caltrans standard for the bikeway type that is proposed – this helps to prioritize corridors which are already partially built. This factor is also part of the LTS Index (criterion 2). Proposed weight: 0.5
- Completes the Network: regional corridors which link to other regional and local bikeways help complete the network – measured by number of intersections with other existing and proposed bikeways. Existing bikeways would be weighted more heavily. Proximity to the bikeway network is also included in the BPI (criterion 1). Proposed weight: 0.5
- Economic Efficiency: measure the financial benefits associated with corridor, normalized by the number of anticipated users (in turn a product of the facility type and length), and divided by the rough order construction cost estimates. Proposed weight: 1.0

3.2.2 Cost Estimate Assumptions

Planning level cost estimates were prepared for each corridor for use in the economic efficiency criteria. The costs utilized in the ranking analysis include high-level estimates based on national averages for similar facilities. Estimates include right-of-way costs and anticipated construction costs including bridges, but do not include environmental clearance, design, utility impacts or maintenance costs. Refer to the Appendix for detailed cost estimate assumptions for each corridor.

The following are key assumptions utilized during the preparation of the cost estimates by facility type:

Class I (off-street bike path):

- Existing Facilities
    - Upgrade wayfinding along existing routes, including additional bike lane signage and signage for regional corridor
- Proposed Facilities
    - Construction of new Class I path with 10-foot-wide pavement and 2-foot-wide shoulders on each side, per Caltrans standards. While Caltrans allows Class I facilities 8-foot-wide, input from cities during the project indicated the additional width allows for better accommodation of maintenance vehicles and provides enhanced space allocation for heavily utilized corridors.
    - Signage for bike path and for wayfinding
    - Street crossings were assumed to be at grade either using nearby existing signalized intersections or a new crosswalk (enhanced crosswalks assumed in limited locations); no new traffic signal assumed.
    - Bridges over flood channels assumed where appropriate

Class II (on-street bike lanes):

- Existing Facilities
    - Upgrade wayfinding along existing routes, including additional bike lane signage (particularly at intersections) and signage for regional corridor
- Proposed Facilities
    - Stripe new Class II on-street bike lane with standard white stripe at locations where the curbside travel lane is greater than 16 feet wide; no buffer or colored lanes assumed at this time
    - Widening of street by 4 feet to accommodate new Class II on-street bike lane with standard white stripe at locations where the curbside travel lane is less than 16 feet wide; with cost represented on a per linear foot basis assuming general costs for widening and right-of-way acquisition. Assumed right-of-way costs of $92/square foot were assumed for the cost estimates, reflecting Orange County conditions and landscape frontage takes, but not building impacts.
    - Signage for bike lane and for wayfinding
    - Where on-street parking exists, initial cost assumes removal of on-street parking instead of street widening

Class III (on-street bike routes):

- Existing Facilities
    - Upgrade wayfinding along existing routes, including additional bike lane signage, sharrows and signage for regional corridor
    - Based on preliminary input from agency staff, additional costs were assumed for upgrades and enhancements of Class III facilities along PCH
- Proposed Facilities
    - Implementation of sharrows, bike route signage, and wayfinding signage
    - More enhanced bike boulevard treatments such as traffic circles, roundabouts, and bikeway channels were not included in cost estimate pending more detailed feasibility review

3.2.3 Bicycle Collisions Near Corridors

Baseline bicycle collision analysis is provided in Section 2.3. This section analyzes reported bicyclist-involved crash data in proximity to the proposed bikeway corridors, using 2007-2011 data obtained from the California Statewide Integrated Traffic Records System (SWITRS).[1]

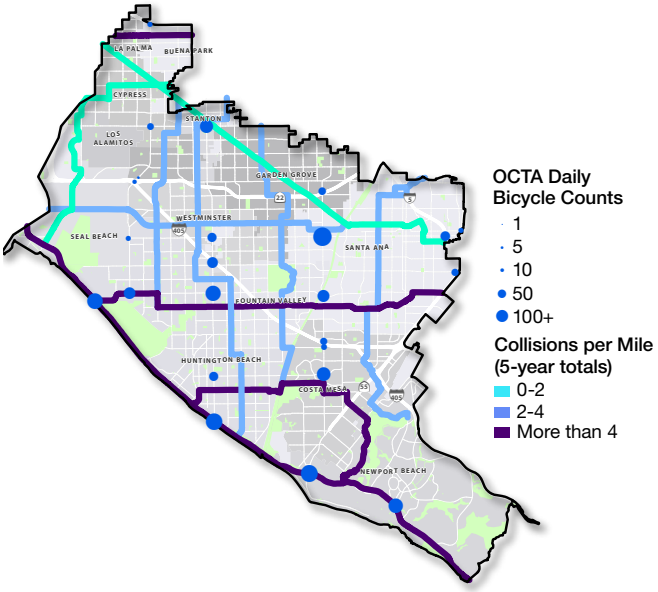
Table 3-1 identifies bicycle collisions in Districts 1 and 2 that occurred within 100 feet of the project's proposed key corridors. A total of 611 collisions occurred on or within 100 feet of the proposed corridors, an average of approximately one bicyclist-involved collision every three days over the five-year period. These collisions represent approximately 20 percent of the total collisions in Districts 1 and 2, despite the corridors and their respective 100-foot buffers accounting for only three percent of the land area within the Districts.

It should be noted there were no reported bicycle collisions along the entirety of Corridor J (it is entirely off-street), therefore, collisions reported on the nearest parallel arterial were utilized in the analysis.

In an effort to examine trends in the reported data, the consultant team examined the SWITRS coding for the 611 incidents reported within 100 feet of the proposed corridors. A brief summary of the key findings from the analysis is presented below:

- There were 41 severe injuries and four fatalities.

1 The number of collisions measured (one year of data along the corridor and adjacent corridors) was used in the District 4 study.



Graphic 4: Bicycle Counts and Collisions per Mile in Districts 1 and 2.

- 20 collisions occurred in anything other than dry roadway conditions (three percent).
- Wednesday was the most frequent day of the week for collisions, accounting for 19 percent of the collisions, followed by Saturday at 16 percent.
- 88 percent of the collisions listed a Vehicle Code Violation as the Primary Collision Factor.
- 20 of the 611 incidents (three percent) took place on roads with unusual conditions. Seven of these 20 occurred in construction or repair zones.

Table 3-1: Bicycle Collision Data by Proposed Corridor, 2007-2011

Corridor ID	Corridor Name	Bike Collisions	Total Miles	Collisions / Mile	Collisions/ Month
J	Edison ROW	0 (34)	2.8	0 (12.1)	0 (0.20)
C	PCH	195	21.3	9.2	0.15
E	Slater-Segerstrom	71	13.5	5.3	0.09
K	Indianapolis-Fairview	46	11.1	4.1	0.07
B	Bristol-Bear	49	12.3	4.0	0.07
G	Springdale-Holder	32	8.1	4.0	0.07
F	Westminster-Hazard	43	11.4	3.8	0.06
I	Brookhurst-Ward	43	11.8	3.6	0.06
D	Magnolia-Hoover	52	15.0	3.5	0.06
H	Seal Beach-Orange Ave	19	10.0	1.9	0.03
A	PE ROW	27	15.6	1.7	0.03

While bicycle collision data is presented above, the review of collisions relative to the amount of cycling activity is unavailable due to limited bicycle usage data. Therefore, certain roadways, corridors, or cities may appear to have a high number of bicycle collisions due to overall roadway usage for bicycle trips as well as potential challenges related to reporting of bicycle collisions. It is recommended that local agency staff work with cyclists to identify difficult intersections, crossings, and roadways for enhancements to clarify right-of-way for cyclists, increase visibility of cyclists, and improve the overall experience while bicycling within the project study area.

3.2.4 Results of Criteria Ranking

Table 3-2 summarizes the detailed ranking evaluation, with raw and weighted scores shown. The weighted scores account for normalizing between 0 and 100, and weighting of each criterion. As shown in the table, Corridor A received the highest total score at 75 out of 100 points.

The evaluation process determined that the corridors below would provide the greatest relative potential benefit to cyclists in terms of regional connectivity, access to key destinations, and improved safety, while also possessing significant public support and limited physical constraints that could hinder implementation.

The following top ranked corridors will be further studied for feasibility in the second phase of the Districts 1 & 2 Bikeways Collaborative:

- **Corridor C:** Pacific Coast Highway;
- **Corridor A:** Pacific Electric Right-of-Way;
- **Corridor D:** Magnolia-Hoover; and
- **Corridor E:** Slater-Segerstrom.

These four corridors traverse the majority of the project cities. While feasibility review is not immediately being provided for all the corridors, cities may advance study of any corridor where there is interest in continuing the efforts of the strategy.

Note: Before being implemented, all segments of proposed corridors will be studied and further refined during feasibility studies. Preliminary feasibility analyses may determine that segments of certain corridors should be shifted to parallel roadways, depending upon circumstances and/or constraints. Thus, the eleven corridors here are only conceptual and their exact alignments may change in subsequent stages of planning and design. This design flexibility will ensure that the best possible routes are included in transportation plans and applications for construction funds.

Table 3-3 summarizes the results of the criteria ranking for the eleven proposed corridors within Districts 1 and 2 with length and a range of costs shown.

Table 3-2: Corridor Scoring

Criteria		Rank	Score	Economic Efficiency		Trip Demand		Level of Traffic Stress		Public Input		Physical Constraints		Completes the Corridor		Completes the Network		Reported Collisions	
Best Possible Score			Total	RS	WS	RS	WS	RS	WS	RS	WS	RS	WS	RS	WS	RS	WS	RS	WS
			100	4.3	18	6.0	18	3.8	18	69	9	1	9	17%	9	2.1	9	12.1	9
C	PCH	1	75	1.8	8	3.4	10	3.8	18	69	9	1	9	17%	9	1.1	5	9.2	7
A	PE ROW	2	73	4.3	18	6.0	18	3.7	18	46	6	4	2	100%	2	1.8	8	1.7	1
D	Magnolia-Hoover	3	61	2.2	9	4.0	12	3.2	15	32	4	2	5	44%	4	2.1	9	3.5	3
E	Slater-Segerstrom	4	60	2.2	9	3.7	11	3.4	17	30	4	3	3	34%	5	1.6	7	5.3	4
B	Bristol-Bear	5	58	1.7	7	4.4	13	3.4	16	62	8	3	3	79%	2	1.4	6	4.0	3
G	Knott-Springdale	6	56	1.0	4	3.2	10	3.6	17	12	2	1	9	67%	2	2.0	9	4.0	3
H	Seal Beach - Orange Ave	7	53	1.1	5	3.5	11	2.6	13	31	4	1	9	47%	3	1.5	7	1.9	1
I	Brookhurst - Ward	7	53	1.3	5	3.4	10	2.9	14	12	2	1	9	43%	4	1.3	6	3.6	3
K	Indianapolis - Fairview	7	53	2.5	11	3.4	10	2.1	10	32	4	2	5	47%	3	1.6	7	4.1	3
F	Westminster-Hazard	10	49	1.3	5	3.3	10	3.4	16	30	4	2	5	90%	2	0.9	4	3.8	3
J	Edison Transmission	11	48	0.4	2	2.4	7	3.0	14	8	1	2	5	100%	2	1.8	8	12.1	9

*Note: RS = Raw Score; WS = Weighted Score

Table 3-3: Corridor Ranking

Corridor ID	Corridor Name	Rank	Weighted Score	Length (miles)	Cost Range (millions)
C	PCH	1	75	21.3	$1.4 - $1.7
A	PE ROW	2	73	15.6	$26.3 - $32.1
D	Magnolia-Hoover	3	61	15.0	$4.7 - $5.7
E	Slater-Segerstrom	4	60	13.5	$16.2 - $19.9
B	Bristol-Bear	5	58	12.3	$17.0 - $20.8
G	Knott-Springdale	6	56	8.1	$1.0 - $1.2
H	Seal Beach - Orange Ave	7	53	10.0	$2.7 - $3.3
I	Brookhurst - Ward	7	53	11.8	$2.8 - $3.4
K	Indianapolis - Fairview	7	53	11.1	$1.5 - $1.8
F	Westminster-Hazard	10	49	11.4	$6.0 - $7.4
J	Edison Transmission	11	48	2.8	$2.2 - $2.7
TOTAL				132.9	**$81.8 - $100.0**

Note: The costs shown above are high-level estimates based on national averages for similar facilities. Costs include right-of-way, anticipated bridges and construction costs, but do not include environmental clearance, design, utility impacts or maintenance costs.

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4 Action Plan

4.1 Potential Near-Term Efforts

This section identifies potential near-term projects that can be implemented by each of the cities within Districts 1 and 2 to begin implementation of the proposed corridors. Potential near-term projects are those expected to have low construction costs that can be implemented in relatively short order as funds become available. Each jurisdiction would be responsible for the implementation of their respective projects and strategies for funding these projects. OCTA would assist local jurisdictions through such things as letters of support, grant notifications and guidance, and design solutions. Coordination between jurisdictions is encouraged to implement linkages simultaneously.

Each of the corridors has been reviewed at a conceptual level to identify "potential near-term" projects expected to require minimum capital investment, little or no right-of-way acquisition, and may require minimal environmental review. These may include restriping a street to implement a Class II bikeway, signing a street to designate it as a Class III bikeway, or signing and striping an existing paved off-street path or maintenance road of sufficient width to serve as a Class I off-street bikeway.

The list below and **Table 4-1** summarize the proposed near-term improvements along with estimated costs and jurisdictional responsibilities. **Figure 4-1** shows the locations of the proposed near-term improvements.

- Corridor A (PE ROW): Since the majority of this corridor is within the former railroad right-of-way, the near-term improvements are limited to the portions on the east where Corridor A traverses roadways near SARTC. Chestnut Avenue could be reduced in travel lanes/width between Santa Fe Street to Elk Lane to accommodate striped bike lanes. Provide a bicycle boulevard on Chestnut Avenue from Santa Fe Street to Standard Avenue. Along Civic Center Drive, reduce the number of travel lanes west of Bristol Street and stripe for on-street bike lanes.
- Corridor B (Bristol-Bear): Along Santa Ana Avenue, a reduction in the number of travel lanes in the southbound direction between the Delhi Channel and Mesa Drive can accommodate striped bike lanes.

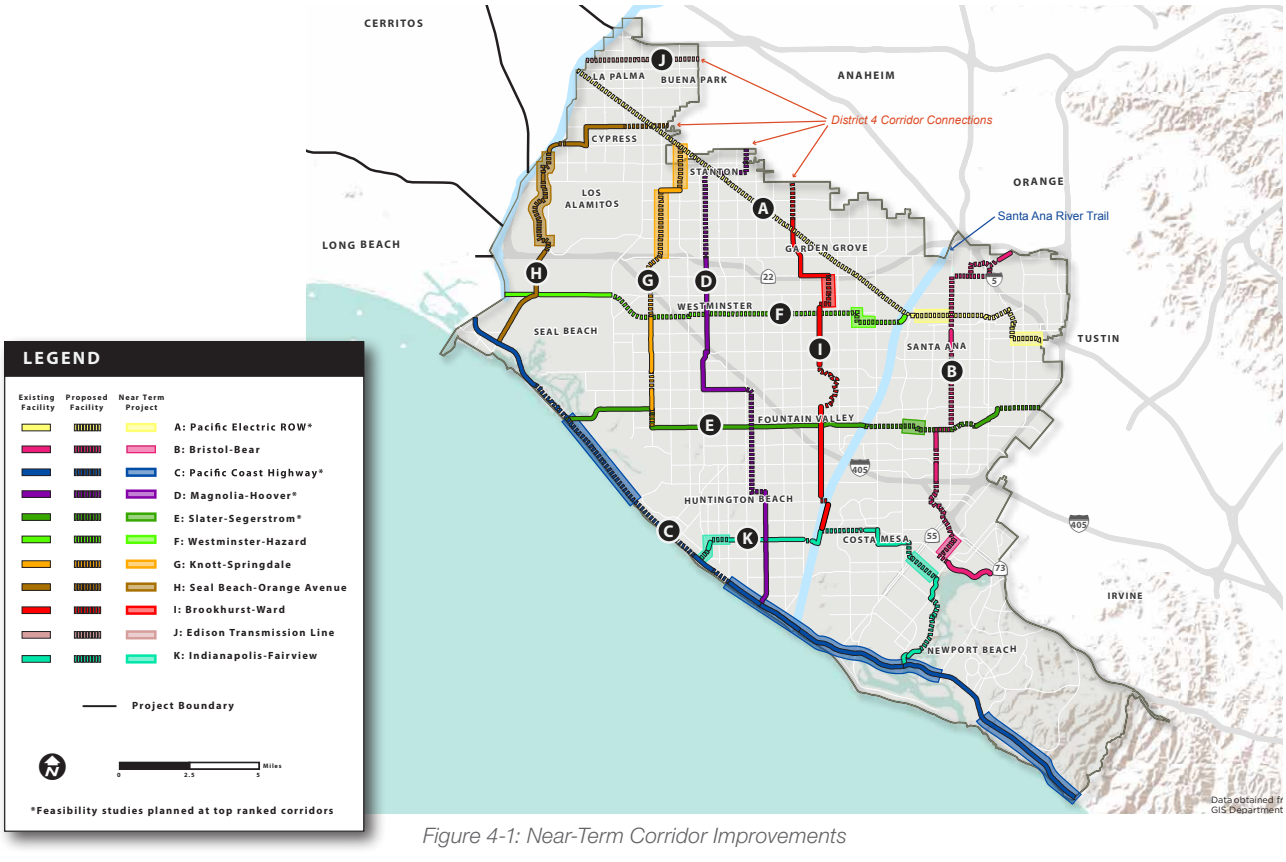


Figure 4-1: Near-Term Corridor Improvements

Table 4-1: Proposed Near-Term Improvements

Corridor	Location	Owner/ Operator	Proposed Improvement	Length (feet)	Bike Lane Total	Bike Blvd/ Class III Total
A: PE ROW	Chestnut Ave. (Elk Ln. to Santa Fe St.)	Santa Ana	Class II (on-street, striping)	3,186	$43,446	--
	Chestnut Ave. (Santa Fe St. to Standard Ave.)	Santa Ana	Bicycle Boulevard	840	--	$8,025
	Civic Center Dr. (Bristol St. to Fairview St.)	Santa Ana	Class II (on-street, striping)	5,405	$181.747	--
B: Bristol-Bear	Santa Ana Ave. (Delhi Channel to Mesa Dr.)	County of Orange/ Newport Beach	Class II (on-street, striping)	2,060	$66,950	--
	Santa Ana Ave. (Mesa Dr. to University Dr.)	Newport Beach/ Costa Mesa	Bicycle Boulevard	1,315	--	$9,713
C: Pacific Coast Highway	PCH (South City Limit to Seaward Rd.)	Caltrans/ Newport Beach	Class II (on-street, striping)	11,994	$163,020	--
	PCH (Jamboree Rd. to Dover Dr.)	Caltrans/ Newport Beach	Class II (on-street, striping)	5,130	$69,732	--
	PCH (Dover Dr. to Newport Blvd.)	Caltrans/ Newport Beach	Class II and III (on-street, striping, signing)	7,391	$100,139	--
	PCH (Newport Blvd. to Santa Ana River Bridge)	Caltrans/ Newport Beach	Class II (on-street, striping)	9,585	$129,675	
	PCH (Santa Ana River Bridge to Beach Blvd.)	Caltrans/ Huntington Beach	Class II (on-street, striping)	11,230	$150,046	--
	PCH (Seapoint St. to Warner Ave.)	Caltrans/ Huntington Beach	Class II (on-street, striping)	14,790	$194,298	--
E: Slater-Segerstrom	Segerstrom Ave. (Fairview St. to Raitt St.)	Santa Ana	Class II (on-street, striping)	3,282	$47,736	--
F: Westminster-Hazard	Newhope St. (Hazard Ave. to 5th St.)	Santa Ana	Class II (on-street, striping)	1,265	$19,487	--
	5th St. (Harbor Blvd. to Newhope St.)	Santa Ana	Class III (on-street, signage, striping)	2,540	--	$34,034
G: Knott-Springdale	Knott Ave. (PE ROW to Stanton Storm Channel just north of Orangewood Ave.)	Anaheim/ Cypress/ Stanton/	Class II (on-street, striping)	6,270	$88,488	--
	Holder Ave. (Stanton Storm Channel to Orangewood Ave.)	Cypress	Class II (on-street, striping)	1,245	$21,135	--
	Holder St./Springdale St. (Orangewood Ave. to SR-22)	Cypress/ Garden Grove	Class II (on-street, striping)	7,596	$105,726	--

Corridor	Location	Owner/ Operator	Proposed Improvement	Length (feet)	Bike Lane Total	Bike Blvd/ Class III Total
H: Seal Beach-Orange Avenue	Los Alamitos Blvd. (Coyote Creek to Sausalito St.)	Los Alamitos	Class II (on-street, striping)	1,937	$27,209	--
	Sausalito St. (Los Alamitos Blvd. to Walnut St.)	Los Alamitos	Bicycle Boulevard	735	--	$6,339
	Walnut St. (Sausalito St. to Katella Ave.)	Los Alamitos	Bicycle Boulevard	1,930	--	$16,986
	Wallingsford Rd. (Katella Ave. to Hedwig Rd.)	County of Orange	Bicycle Boulevard	1,005	--	$8,333
	Hedwig Rd. (Wallingsford Rd. to Weatherby Rd.)	County of Orange	Bicycle Boulevard	270	--	$2,904
	Weatherby Rd. (Hedwig Rd. to Orangewood Ave.)	County of Orange	Bicycle Boulevard	1,540	--	$13,195
	Orangewood Ave. (Weatherby Rd. to Shakespeare Dr.)	County of Orange	Class II (on-street, striping) or Bicycle Boulevard	1,386	$19,032	--
	Montecito Rd. (Shakespeare Dr. to Tigertail Dr.)	County of Orange	Class II (on-street, striping) or Bicycle Boulevard	4,865	$67,301	--
	St. Cloud Dr. (Tigertail Dr. to Seal Beach Blvd.)	County of Orange	Class II (on-street, striping) or Bicycle Boulevard	1,189	$17,485	--
I: Brookhurst-Ward	Taft St. (Trask Ave. to Westminster Ave.)	Garden Grove	Bicycle Boulevard	2,543	--	$22,424
K: Indianapolis-Fairview	Indianapolis Ave. (Beach Blvd. to Lake St.)	Huntington Beach	Bicycle Boulevard	2,782	--	$28,739
	Lake St. (Indianapolis Ave. to Orange Ave.)	Huntington Beach	Bicycle Boulevard	2,100	--	$20,061
	3rd St. (Orange Ave. to Walnut Ave.)	Huntington Beach	Bicycle Boulevard	760	--	$7,434
	Walnut Ave. (3rd St. to Main St.)	Huntington Beach	Bicycle Boulevard	260	--	$2,830
	Santa Isabel Ave. (Newport Blvd. To Irvine Ave.)	Costa Mesa	Bicycle Boulevard	4,215	--	$35,684

Install signing and striping improvements on Santa Ana Avenue between Mesa Drive and University Drive to establish a direct link with the Back Bay Trail at the Irvine Avenue/University Drive intersection.

- Corridor C (Pacific Coast Highway): Work with Caltrans staff to restripe shoulder line on PCH to a Class II bike lane from South City Limit to Seaward Road, Jamboree Road to Dover Drive, Newport Boulevard to Beach Boulevard and from Seapoint Street to Warner Avenue. Work with Caltrans to designate shoulder as Class II bike lane and make signage & striping improvements from Dover Drive to Newport Boulevard. Work with Caltrans to improve signage and striping for bicyclists at free and dedicated right-turn movements along PCH.
- Corridor D (Magnolia-Hoover): Since much of the on-street bike lanes exist within Corridor D, the remaining improvements are generally related to off-street trail improvements adjacent to railroad corridors or within the Edison transmission line corridor. Therefore, near-term improvements along Corridor D are limited.
- Corridor E (Slater-Segerstrom): Stripe on-street bike lanes on Segerstrom Avenue between Fairview Street and Raitt Street.
- Corridor F (Westminster-Hazard): Stripe on-street bike lanes on Newhope Street between Hazard Avenue and 5th Street. Install signing and striping improvements on 5th Street between Harbor Boulevard and Newhope Street to establish a bike route (Class III facility).
- Corridor G (Knott-Springdale): Stripe on-street bike lanes on Knott Avenue between PE ROW and flood channel (just north of Orangewood Avenue). Reduce the number of travel lanes on Holder Street to accommodate bike lanes between the flood channel (on north) and Orangewood Avenue. Stripe on-street bike lanes on Holder Street-Springdale Street between Orangewood Avenue and SR-22.
- Corridor H (Seal Beach-Orange Avenue): Restripe Los Alamitos Boulevard to accommodate bike lanes between Coyote Creek and Sausalito Street. Install signing and striping improvements on Walnut Street, Wallingsford Road, Hedwig Road, and Weatherby Road to establish a bike boulevard. Consider reducing the number of travel lanes (and restripe for on-street bike lanes) or creating a bike boulevard on Orangewood Avenue, Montecito Road, and St. Cloud Drive.
- Corridor I (Brookhurst-Ward): Install signing and striping improvements on Taft Street between Trask Avenue and Westminster Avenue to establish a bike boulevard.
- Corridor J (Edison Transmission Line): While some of Corridor J provides an off-street pedestrian walkway, it is not designated an off-street bikeway (Class I). Reconfiguring the walkway to accommodate a bikeway will require longer-term implementation efforts by the Cities of Buena Park and La Palma. Therefore, near-term improvements along Corridor J are limited.
- Corridor K (Indianapolis-Fairview): Install signing and striping improvements to establish a bike boulevard on Indianapolis Avenue (between Beach Boulevard and Lake Street), Lake Street, 3rd Street, and Walnut Avenue in Downtown Huntington Beach. Implement signing and striping improvements to establish a bike boulevard on Santa Isabel Avenue between Newport Boulevard and Irvine Avenue in Costa Mesa.

Pursuit of funding is a near-term effort that can be led by project study area cities with support from OCTA. OCTA can help with grant applications and letters of support. Refer to Section 6 for more details on funding grant programs and opportunities.

4.2 Consistency with Local and Regional Plans

As required by the California Complete Streets Act, cities and counties, when updating their General Plan Circulation Element must ensure that those plans account for the needs of all roadway users. Upon updates to the General Plan Circulation Element, OCTA recommends the project cities and County include the corridors proposed in this report.

Additionally, the implementation of the proposed corridors needs to consider the build out of the Orange County Master Plan of Arterial Highways (MPAH). As administrator of the MPAH, OCTA is responsible for working with cities and the County to ensure that the integrity of the regional circulation system is maintained. However, as right-of-way has become increasingly constrained and travel demand has increased for all modes, increased challenges have emerged for jurisdictions wanting to comply with both Measure M2

eligibility requirements for the MPAH and the California Complete Streets Act. To address this challenge, OCTA has considered a Context Sensitive Solutions[1] approach to the MPAH on a case-by-case basis.

This approach can be applied on an MPAH facility where active transportation concepts are being proposed, and there is no "one-size fits all" solution. In working with jurisdictions on a case-by-case basis, OCTA has provided a flexible approach to address this issue. This includes the following:

- **MPAH Reclassification.** MPAH implementation is at the discretion of cities and the County. If future traffic demand does not require build-out to an ultimate MPAH classification, cities can request reclassification of roadways, where they wish to use the right-of-way for other uses.
- **Interim Letter Agreements.** Letter agreements may provide flexibility to a City where a formal MPAH amendment is not being sought, and the City can document that future traffic demand does not require build-out of the MPAH. The city can issue a letter stating that should future traffic demand later require build-out to the ultimate MPAH classification, that the road would be restored to its full MPAH capacity. However, in the interim, the facility could incorporate active transportation components. OCTA has done this for bike lane projects on several roadways throughout the County, where jurisdictions are testing implementation of bike lanes and active transportation concepts prior to pursuit of a full MPAH amendment. OCTA may require that the arterial be monitored by the requesting agency to ensure that the demand does not exceed the capacity. If conditions remain unchanged, the agency could potentially return with an MPAH reclassification request if it is determined that the proposed restriping requires greater permanency than is currently anticipated.
- **Functional Equivalency.** Providing overall functional equivalency entails reclassifying one MPAH facility to accommodate proposed bike lanes or pedestrian improvements, and then as mitigation the city could upgrade an immediately parallel arterial. This ensures the same level of overall arterial capacity, while providing flexibility for active transportation.
- **Divided Collector.** Previously the MPAH Guidance only allowed four-lane undivided secondary arterials to be reclassified downward to two-lane undivided collector arterials to incorporate active transportation concepts. As this typically resulted in traffic impacts assuming future (higher) traffic volumes those local agencies were either uncomfortable dealing with or could not afford to mitigate. However, with the latest MPAH Guidance update, OCTA incorporated the two-lane divided collector arterial concept as an interim capacity step which would reduce potential mitigation requirements for local agencies wanting to implement bike lanes and pedestrian improvements on low-volume arterials. Local agencies may downgrade a Secondary arterial to a Divided-Collector classification through the MPAH amendment process.
- **Narrower Lane Widths.** Cities may use narrower lane widths on MPAH facilities to free up enough right-of-way to accommodate bike lanes and/or pedestrian improvements. Measure M2 MPAH determinations are not based on specific lane widths, but rather planned through capacity. This option is ultimately an engineering and public policy decision that is at the discretion of cities or the County.

4.3 Programmatic Recommendations

Of the Five E's of bicycle planning, four are related to programs: encouragement, education, enforcement and evaluation. Programs should complement engineering improvements such as bike paths, lanes and routes by giving Orange County residents the tools they need to safely and confidently use the bikeway network. All of the Five E's work together to enhance the bicycling experience. Based on community input and coordination with agency staff, programmatic recommendations have been provided to complement the infrastructure recommendations associated with the defined corridors. The following recommendations include continuation of current programs, as well additional programs that have proven to be popular and effective in other bicycle-friendly cities.

4.3.1 Encouragement

Safe Routes to School Program

Helping children walk and bicycle to school is good for children's health and can reduce congestion, traffic dangers and air pollution caused by parents driving

1 *http://www.ite.org/css/*

Safe Routes to School programs increase the number of children walking and biking to school and improve traffic safety near schools

children to school. Safe Routes to School programs use a "5 E's" approach using Engineering, Education, Enforcement, Encouragement, and Evaluation strategies to improve safety and encourage children walking and biking to school. The programs are usually run by a coalition of city government, school and school district officials, and teachers, parents, students, and neighbors.

Resource Guide: National Center for Safe Routes to School: http://www.saferoutesinfo.org/

Bike to Work Day / Month / Bike Rallies

Bike to Work Day is a region wide event promoting bicycling to work and is typically held in May. OCTA hosts an Annual Bike Rally for Bike to Work Month. Cities can also host such rallies to highlight new or improved bikeways and promote bicycling. Additionally, a Bike Festival was hosted by OCTA at the Huntington Beach Pier on April 28. The bike festival included vendor booths to learn about equipment, bicycle safety, and basic maintenance skills. Free bike safety inspections and giveaway prizes were provided to guests to the booths. Newport Beach also hosts a Bike to Work Day in the City every May.

The 2013 OCTA Bike Rally on Bike to Work Day.

Employer-Based Encouragement Programs

OCTA and participating cities can work with or provide information to employers about commuting by bicycle. Popular employer-based encouragement programs include hosting a bicycle user group ("BUG") to share information about how to bicycle to work and to connect experienced bicyclists with novice bicyclists. Employers can host bicycle classes and participate in Bike to Work day.

Employers may also subsidize monthly pass costs for public transportation (Metrolink, OCTA buses, etc.) to encourage their employees to try commuting through transportation hubs and bicycling to work. The financial incentive would promote a lifestyle change and demonstrate the convenience of public transit connections.

Launch Party for New Bikeways

When a new bikeway is built, some residents will become aware of it and use it, while others may not realize that they have improved bikeway options available. A launch party/campaign is a good way to inform residents about a new bikeway and can also be an opportunity to share other bicycling materials (such as maps and brochures) and answer resident questions about bicycling. It can also be a media-friendly event, with elected official appearances, ribbon cuttings, and a press release that includes information about the new facility, other existing and future facilities, and any timely information about bicycling.

Sample Program: When a new bikeway is built, the City of Vancouver throws a neighborhood party to celebrate. Cake, t-shirts, media and festivities are provided and all neighbors are invited as well as city workers (engineers, construction staff, planners) who participated in project planning and implementation.

Open Street Events

Open streets events have many names: Sunday Parkways, Ciclovias, Summer Streets, and Sunday Streets. Sunday Parkways are periodic street closures

Closing streets for an open streets community event creates a temporary park for walking, cycling, skating, dancing, etc.

(usually on Sundays) that create a temporary park that is open to the public for walking, bicycling, dancing, hula hooping, roller-skating, etc. They have been very successful internationally and are rapidly becoming popular in the United States. Car-free street events promote health by creating a safe and attractive space for physical activity and social contact, and are cost-effective compared to the cost of building new parks for the same purpose. Events can be weekly events or one-time occasions, and are generally very popular and well attended.

Sample Programs:

- Open Streets Project: http://openstreetsproject.org/
- CicLAvia: http://www.ciclavia.org/
- San Francisco Sunday Streets: http://sundaystreetssf.com/
- Oakland's Oaklavia http://oaklavia.org/
- New York City Summer Streets: http://www.nyc.gov/html/dot/summerstreets/html/home/home.shtml
- Portland Sunday Parkways: http://portlandsundayparkways.org/

Bicycle Friendly Community

The League of American Bicyclists (LAB) recognizes communities that improve bicycling conditions through education, encouragement, enforcement and evaluation programs. Communities can achieve platinum, gold, silver, or bronze status or an honorary mention. Bicycle friendliness can indicate that a community is healthy and vibrant. Like good schools and attractive downtowns, bicycle friendliness can increase property values, spur business growth and increase tourism. The City of Huntington Beach was designated a Bicycle Friendly Community (BFC) at the Bronze level in 2010, and Orange County was named a Bronze level BFC in October 2012.

Example: http://www.bikeleague.org/programs/bicyclefriendlyamerica/communities/

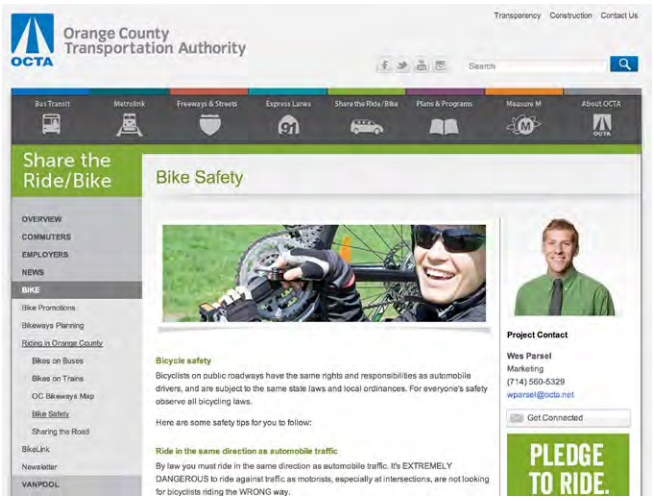
4.3.2 Education

Bicycle Resource Website

OCTA hosts several pages dedicated to bicycling: http://octa.net/Share-the-Ride/Bike/Overview/

Recommended improvements to the resource website include:

- Dynamic bikeway and bike parking map
- Advertise all bikeways after implementation
- Bicycling tips including information on how to:
  - Carry items using baskets and panniers
  - Properly lock a bicycle
  - Ride in the rain with help from fenders and rain gear
  - Tips can also include information on the importance of bicycle lights and reflectors.
- Bikeway maintenance and repair phone number



OCTA dedicates a page of its website to bicycle information.

- Bicycle events calendar
- Bicycle traffic skills classes information
- Spanish version

Marketing Concurrent with New Facilities
Education about new facilities can help notify and educate both cyclists and motorists about newly install bicycle facility treatments. For example, the City of Newport Beach recently installed sharrows in Corona del Mar, and created a small-format card explaining the sharrows for both motorists and cyclists. The cards were distributed through the City and to the Citizen's Bicycle Safety Committee. OCTA could provide a role in promoting new bicycle facilities throughout Orange County.

Bicycle Safety and Share the Road Campaigns
A marketing campaign that highlights bicyclist and pedestrian safety is an important part of creating awareness of bicycling and walking. This type of high-profile campaign is an effective way to reach the public, highlight bicycling and walking as viable forms of transportation, and reinforce safety for all road users.

A well-produced safety campaign will be memorable and effective. One good example is the Sonoma County Transit "You've got a friend who bikes!" campaign. It combines compelling ads with an easy-to-use website focused at motorists, pedestrians, and bicyclists. This type of campaign is particularly effective when kicked off in conjunction with other bicycling/walking events or back to school in the fall. The safety and awareness messages should be displayed near high-traffic corridors (e.g., on billboards), printed in local publications, broadcast as radio and/or television ads and be available in Spanish and other languages.

Sample program: Sonoma County (CA) Transit: http://www.sctransit.com/bikesafe/bikes.htm

Share the Road outreach is a way for cities to actively disseminate the rules of the road in person to residents. One way to conduct outreach is to conduct "checkpoints". Working with volunteers from a local advocacy group and the police department, officers could stop motorists and bicyclists to offer a brochure on the rules of the road as they pertain to motorists and bicyclists. An example of the Marin County Bicycle Coalition's Share the Road Checkpoints can be found at the link below.

Bicycle safety campaigns increase the general public's awareness of bicycling and can be used to promote safe roads by and for all users.

http://www.marinbike.org/Campaigns/ShareTheRoad/Index.shtml

Developed by the City of San Jose, StreetSmarts uses print media, radio spots and television spots to educate people about safe driving, bicycling and walking behavior. More information about StreetSmarts can be found at the link below.

http://www.getstreetsmarts.org/

Many other cities, counties, and states produce bicycle safety videos to educate riders and drivers. One such video from the Chicago Department of Transportation's Bicycle Program explains why cyclists should ride on the street rather than on the sidewalk[2]. A series of online videos from the City of Albuquerque, New Mexico, illustrates both the dangers of wrong-way cycling and how motorists should follow the City's 5-foot passing rule[3]; these were produced in both English and Spanish. One potential video that local agencies or jurisdictions in Orange County could produce is a guide for motorists on how to follow the recently adopted "Three Feet for Safety Act" in California, which requires that drivers provide at least 3 feet of clearance when overtaking and passing a bicycle that is traveling in the same direction.[4] The City of Roswell, Georgia, produced a similar video[5] to educate motorists about that state's 3-foot law. Other examples of "3 feet to pass" outreach campaigns include those by the City of Los Angeles[6], Bicycle Colorado[7], and bicycle advocates in Nevada's Lake Tahoe area.

2 *Chicago Dept. of Transportation - http://www.youtube.com/watch?v=aTZ1RtcH8_M*

3 *City of Albuquerque, ShareTheRoadABQ.com - http://youtu.be/74-NecLRcNo, http://youtu.be/ZsxOuy67ch8, http://youtu.be/05s4XoROkdc, http://youtu.be/bE6QaKqC16Q*

4 *http://leginfo.ca.gov/pub/13-14/bill/asm/ab_1351-1400/ab_1371_bill_20130923_chaptered.htm*

5 *http://www.bikeroswell.com/3-foot-law/*

6 *http://ladotbikeblog.wordpress.com/2010/08/24/mayor-launches-give-me-3-campaign*

7 *http://bicyclecolo.org/articles/bicycle-safety-law-tips-pg1028.htm*

Sticker given to bicyclists and motorists in the Lake Tahoe area of Nevada.

OCTA is currently considering the development of a bicycle use safety campaign for Orange County, starting with an instructional video on how to use sharrows. Additional concepts under consideration include efforts similar to those employed by LA County Metro promoting "Every lane is a bike lane"[8], a bicyclist anti-harassment ordinance like that in Los Angeles[9], and free bicycle safety training for motorists and bicyclists. Examples of free safety training classes include those offered in 2013 by LA County Metro[10] (through a partnership with the LA County Bicycle Coalition[11]) with grant funding from the California Office of Traffic Safety.

Adult Bicycling Traffic Skills Classes

Most cyclists do not receive any training on safe cycling practices, the rules of the road and bicycle handling skills. Bicycling skills classes can address this education gap. These can be employer hosted or provided by community members. The most common program is the League of American Bicyclists courses (including Road I, Road II, and Commuting), taught by League Certified Instructors. Courses cover bicycle safety checks, fixing a flat, on-bike skills, crash avoidance techniques, and traffic negotiation.

Senior bicycle education programs help older adults either re-learn bicycling or learn how to bicycle with less agility. Seniors who are no longer able to drive may still be able to bicycle shorter distances on either a regular two wheeled bicycle or an adult tricycle. The Portland Parks and Recreation Department hosts a free senior tricycle program that provides tricycles to senior centers and takes folks on guided rides.

Bicycle safety training was recently led by the Orange County Bicycle Coalition at the OCTA offices to improve safety and confidence for cyclists within Orange County. In addition, bicycle safety components were included in a free safety program at the Garden Grove Community Center in February of 2013. Sessions were held in English, Spanish, and Vietnamese.

Sample programs:

- League of American Bicyclists http://bikeleague.org/programs/education/courses.php
- Portland Senior Tricycle Program http://www.portlandonline.com/transportation/index.cfm?c=34772&a=155167

Adult bicycle skills courses can ensure that bicyclists have the information and skills they need to avoid hazards and follow the law.

8 http://www.metro.net/bikes/bikes-metro/safe-bicycling-tips/

9 City of Los Angeles Ordinance No. 181817 (http://cityclerk.lacity.org/lacityclerkconnect/index.cfm?fa=ccfi.viewrecord&cfnumber=09-2895)

10 http://www.metro.net/news/simple_pr/la-metro-office-of-traffic-safety-partner-to-offer/

11 http://la-bike.org/streetcyclingskills

Youth bicycle safety education provides children with knowledge and training about safe and proper bicycle use.

Santa Monica opened its public bicycle campus in 2012.

Youth Bicycle Skills Classes

Typical school-based bicycle education programs educate students about the rules of the road, proper use of bicycle equipment, biking skills, street crossing skills, and the benefits of biking. Education programs can be part of a Safe Routes to School program. These types of education programs are usually sponsored by a joint City/School District committee that includes appointed parents, teachers, student representatives, administrators, police, active bicyclists and engineering department staff. They are sometimes called "Bicycle Rodeos" and are often part of Safe Routes to School programs.

Sample programs:

- League of American Bicyclists: http://www.bikeleague.org/programs/education/courses.php#kids1
- Bicycle Transportation Alliance – Portland, OR: http://www.bta4bikes.org/resources/educational.php

The City of Costa Mesa was recently awarded an OCTA grant to hold bicycle skills workshops at each school in the district in 2013-14, in addition to larger citywide bike festivals and events.

Bicycle Skills Campus

A "bicycle campus" is an off-street learning area for people of all ages and abilities to become confident about their riding skills. The campuses help participants become familiar with a variety of bicycle-friendly design features and signage. These bicycle campuses are a resource for bicycle educators, schools, and other groups that wish to provide bicycle education. Local jurisdictions can utilize existing land, such as underused parking lots, to create a bicycle campus.

4.3.3 Enforcement

Bicycle Patrol

Police bicycle patrols not only increase the mobility of officers in dense areas but also provide law enforcement officers with an opportunity to display safe and legal bicycle skills. Bicycle patrols also show the community that the jurisdiction is engaged in sustainable transportation.

Speed Feedback Signs

Speed feedback signs help reduce the speed of passing motorists. They can also be utilized for traffic calming in residential streets and are cost effective means to reduce speeds where enforcement resources are limited.

Targeted Enforcement

Targeted enforcement is focused efforts of police officers at known locations where compliance is low. However, it should be noted that low compliance is often evidence of infrastructural deficiency. Sites should therefore be chosen carefully. The City of Newport Beach, for example, organizes targeted bicycle enforcement events throughout the year on multi-use trails.

Adult Bicycle Education Diversion Program
The City of Huntington Beach was the first city in California to implement a bicycle diversion program in which violators do not need court permission to participate. The Huntington Beach program gives law-breaking bicyclists the option of completing a traffic school session in lieu of going to court and paying fines. The two-hour class, which attendees are required to pay a small fee for, teaches rules of the road.

4.3.4 Evaluation

Evaluation programs measure and evaluate the impact of projects, policies and programs. Typical evaluation programs range from a simple year-over-year comparison of US Census Journey to Work data to bicycle counts and community surveys. Bicycle counts and community surveys act as methods to evaluate not only the impacts of specific bicycle improvement projects but can also function as way to measure progress towards reaching goals such as increased bicycle travel for trips one mile or less.

Surveys
Surveys are useful for eliciting infrastructural deficiency and attitudinal information. Typical survey formats are national (US Census, American Community Survey), local intercept interviews, community satisfaction surveys, parked bicycle counts and school “hands up” counts.

Counts
Annual bicycle counts are used in three typical ways:

Cordon counts give useful information but only represent a limited proportion of cycling activity occurring city-wide.

Screen line counts commonly follow natural or artificial barriers and if all potential crossing points are counted, they can be useful to check home interview or other transport survey data.

A sample of network locations selected to be generally representative of the range of trip purposes and geographic areas.

Bicycle traffic counts have historically been undertaken by means of manual (i.e. a human surveyor) counts. Sample sizes are necessarily limited by resource availability. This means that time-series (year-on-year) comparisons cannot be made at the site level, only in aggregate. The National Bicycle and Pedestrian Documentation Project (NBPD) is a useful source of information for setting up a manual count program: http://bikepeddocumentation.org/

At the project level, before and after bicycle, pedestrian and vehicle counts are useful to help determine the outcomes of treatments.

Automatic bicycle counters have a major advantage over manual counters in that the sample sizes are large enough for statistically significant comparisons of changes over time at the site level. In-pavement loop detectors accurately count on-street bicycle activity and infrared counters can count bicycle and pedestrian activities on paths. Automatic counting programs are cost effective if properly planned. Key parameters to be determined include type of technology, permanent versus short-term stations, rotating data loggers for maximum return on investment, the minimum duration of a short term count for statistically significant year-on-year comparisons, and more.

OCTA and the cities may also produce an annual report or ‘report card’ on bicycling activity. One California example is from San Francisco: http://www.sfbike.org/download/bike_count_2011/2011BicycleCountReportsml_002.pdf

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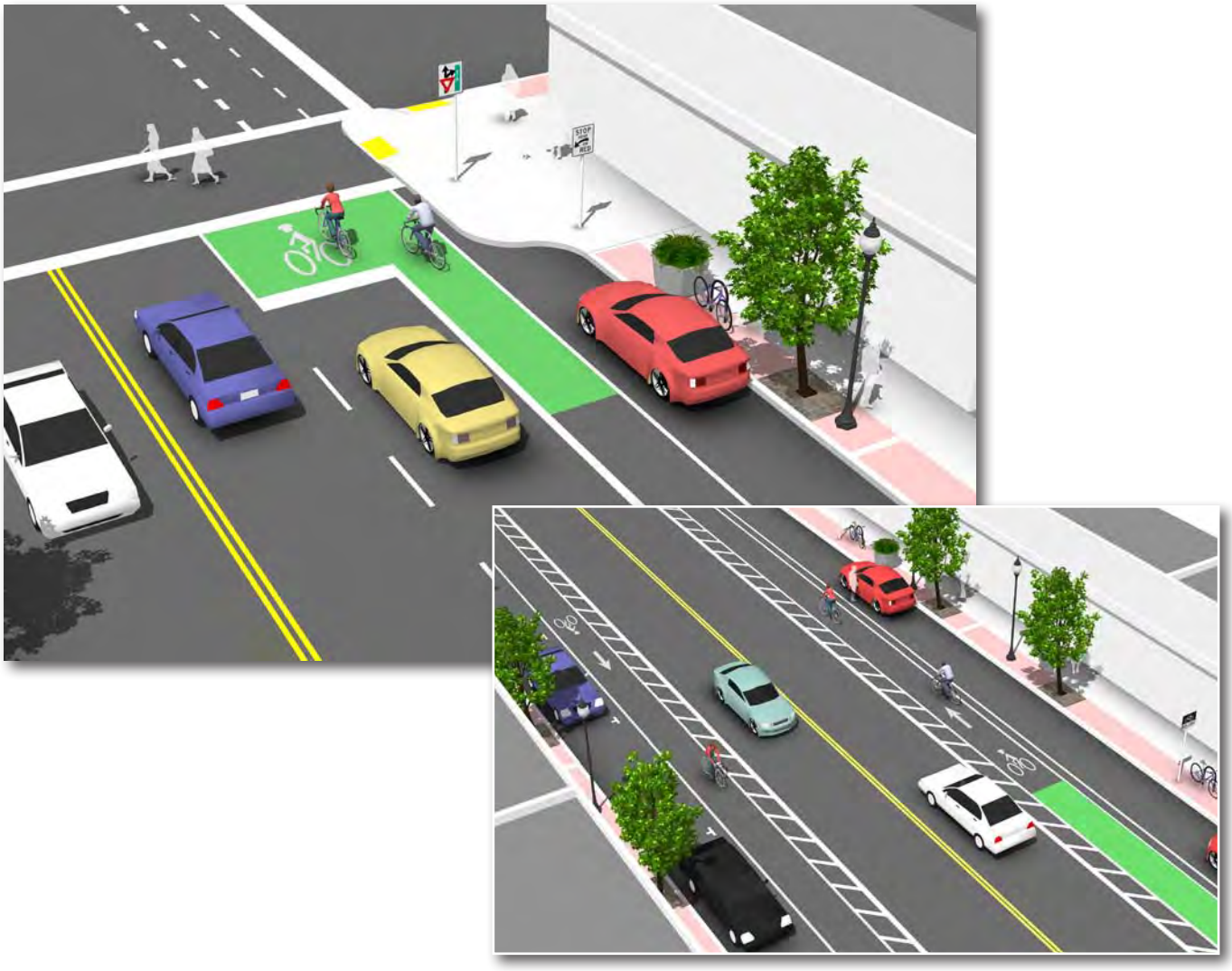
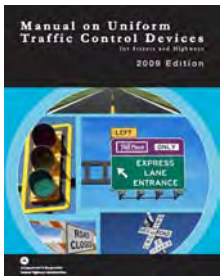
5 Bicycle Facility Toolkit

5.1 Introduction

This chapter is intended to assist the Orange County Transportation Authority and local jurisdictions within the District 1 & 2 study area in the selection and design of bicycle facilities. The following pages pull together best practices by facility type from public agencies and municipalities nationwide. Within the design section, treatments are covered within a single sheet tabular format relaying important design information and discussion, example photos, schematics (if applicable), and existing summary guidance from current or upcoming draft standards. Existing standards are referenced throughout and should be the first source of information when seeking to implement any of the treatments featured here.



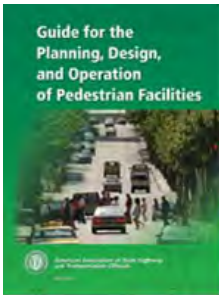
5.1.1 National Standards



The Federal Highway Administration's **Manual on Uniform Traffic Control Devices** (MUTCD) defines the standards used by road managers nationwide to install and maintain traffic control devices on all public streets, highways, bikeways, and private roads open to public traffic. The FHWA MUTCD forms the basis of the California MUTCD.

To further clarify the MUTCD, the FHWA created a table of contemporary bicycle facilities that lists various bicycle-related signs, markings, signals, and other treatments and identifies their official status (e.g., can be implemented, currently experimental). See **Bicycle Facilities and the Manual on Uniform Traffic Control Devices.**[1] The FHWA Guidance on Bicycle and Pedestrian Facility Design Flexibility explicitly supports the use of the AASHTO and NACTO bikeway design guides.[2]

Bikeway treatments not explicitly covered by the MUTCD are often subject to experiments, interpretations and official rulings by the FHWA. The **MUTCD Official Rulings** is a resource that allows website visitors to obtain information about these supplementary materials. Copies of various documents (such as incoming request letters, response letters from the FHWA, progress reports, and final reports) are available on this website.[3]



American Association of State Highway and Transportation Officials (AASHTO) **Guide for the Development of Bicycle Facilities**, updated in June 2012 provides guidance on dimensions, use, and layout of specific bicycle facilities. The standards and guidelines presented by AASHTO provide basic information, such as minimum sidewalk widths, bicycle lane dimensions, detailed striping requirements and recommended signage and pavement markings.

The National Association of City Transportation Officials' (NACTO) 2012 **Urban Bikeway Design Guide**[4] is the newest publication of nationally recognized bikeway design standards, and offers guidance on the current state of the practice designs. The intent of the guide is to offer substantive guidance for cities seeking to improve bicycle transportation in places where competing demands for the use of the right of way present unique challenges. All of the NACTO Urban Bikeway Design Guide treatments are in use internationally and in many cities around the US.

Meeting the requirements of the Americans with Disabilities Act (ADA) is an important part of any bicycle and pedestrian facility project. The United States Access Board's proposed **Public Rights-of-Way Accessibility Guidelines**[5] (PROWAG) and the **2010 ADA Standards for Accessible Design**[6] (2010 Standards) contain standards and guidance for the construction of accessible facilities. This includes requirements for sidewalk curb ramps, slope requirements, and pedestrian railings along stairs.

Some of these treatments are not directly referenced in the current versions of the AASHTO Guide or the MUTCD, although many of the elements of these treatments are found within these documents. In all cases, engineering judgment is recommended to ensure that the application makes sense for the context of each treatment, given the many complexities of urban streets.

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1 *FHWA. Bicycle Facilities and the Manual on Uniform Traffic Control Devices. 2011. http://www.fhwa.dot.gov/environment/bikeped/mutcd_bike.htm*

2 *FHWA. Guidance on Bicycle and Pedestrian Facility Design Flexibility. 2013. http://www.fhwa.dot.gov/environment/bicycle_pedestrian/guidance/design_guidance/design_flexibility.cfm*

3 *MUTCD Official Rulings. FHWA. http://mutcd.fhwa.dot.gov/orsearch.asp*

4 *http://nacto.org/cities-for-cycling/design-guide/*

5 *http://www.access-board.gov/prowac/*

6 *http://www.ada.gov/2010ADAstandards_index.htm*

5.1.2 State Standards and Guidelines

California Manual on Uniform Traffic Control Devices (MUTCD) (2012)

The California MUTCD 2012 an amended version of the FHWA MUTCD 2009 edition modified for use in California. While standards presented in the CA MUTCD substantially conform to the FHWA MUTCD, the state of California follows local practices, laws and requirements with regards to signing, striping and other traffic control devices.

California Highway Design Manual (HDM) (2012)

This manual establishes uniform policies and procedures to carry out highway design functions for the California Department of Transportation. The 2012 edition incorporated Complete Streets focused revisions to address the Department Directive 64 R-1.

Complete Intersections: A Guide to Reconstructing Intersections and Interchanges for Bicyclists and Pedestrians (2010)

This California Department of Transportation reference guide presents information and concepts related to improving conditions for bicyclists and pedestrians at major intersections and interchanges. The guide can be used to inform minor signage and striping changes to intersections, as well as major changes and designs for new intersections.

Main Streets: Flexibility in Design & Operations (2005)

This Caltrans booklet offers official guidance on how to make main streets more livable while still emphasizing safety and mobility. This document is currently being updated.

New Legislation for Experimentation: AB 819

AB 819 (Wieckowski), signed into law on September 28, 2012, creates a mechanism for California jurisdictions to implement innovative bikeway designs (such as cycle tracks) not currently included in the California Highway Design Manual (CA HDM). The process created by this legislation is similar to the experimentation process for the California Manual on Uniform Traffic Control Devices (CA MUTCD) through the California Traffic Control Devices Committee (CTCDC).

Under AB 819, Caltrans has until June 30, 2013 to formalize the committee reviewing experimentation, the membership of which has not yet been selected. Caltrans has communicated that the committee for AB 819 will differ from the CTCDC in that it will be a reviewing body. Cities seeking to experiment under AB 819 will need to submit requests to this body and make regular reports, but the body will not have the authority to reject submitted requests.

NCHRP Legal Digest 53: Liability Aspects of Bikeways (2010)

This digest is a useful resource for city staff considering innovative engineering solutions to localized issues. The document addresses the liability of public entities for bicycle collisions on bikeways as well as on streets and highways. The report will be useful to attorneys, transportation officials, planners, maintenance engineers and all persons interested in the relative rights and responsibilities of motorists and bicyclists on shared roadways.

5.1.3 Bicycle Facility Standards Compliance

Some of these bicycle facilities covered by these guidelines are not directly referenced in the current versions of the AASHTO Guide or the California MUTCD, although many of the elements of these treatments are found within these documents. An "X" marking in the following table identifies the inclusion of a particular treatment within the national and state design guides. A "–" marking indicates a treatment may not be specifically mentioned, but is compliant assuming MUTCD compliant signs and markings are used.

In all cases, engineering judgment is recommended to ensure that the application makes sense for the context of each treatment, given the many complexities of urban streets.

	California Manual of Uniform Traffic Control Devices (2012)	Guide for the Development of Bicycle Facilities (2012)	Urban Bikeway Design Guide (2012)
Signed Shared Roadway	X	X	
Marked Shared Roadway	X	X	X
Bicycle Boulevard	–	X	X
Bicycle Lane	X	X	X
Buffered Bicycle Lane	–	X	X
Cycle Tracks	–	Called "one-way sidepath"	X
Bike Box			X
Bike Lanes at Right Turn Only Lanes	X	X	X
Colored Bike Lanes in Conflict Areas	FHWA Interim Approval Granted	X	X
Combined Bike Lane/Turn Lane	–		X
Intersection Crossing Markings	X	X	X
Wayfinding Sign Types & Placement	X	X	X
Wayfinding Sign Placement	X	X	X
Shared-Use Path	X	X	
Active Warning Beacons	X	X	X
Pedestrian Hybrid Beacons	X	X	X

* Most NACTO treatments are compatible within AASHTO/MUTCD guidance, though some NACTO endorsed designs may not be permitted on state roads at this time. Refer to FHWA Guidance on Bicycle and Pedestrian Facility Design Flexibility (2013).[1]

1 *http://www.fhwa.dot.gov/environment/bicycle_pedestrian/guidance/design_guidance/design_flexibility.cfm*

5.1.4 Multimodal Level of Service

Description

Multimodal Level of Service (MMLOS) methods are used to inventory and evaluate existing conditions, or to forecast future conditions for roadway users under different design scenarios. While automobile-oriented LOS measures vehicle delay, Bicycle, Pedestrian and Transit LOS is oriented toward user comfort.

MMLOS scores different modes independently, but their results are interdependent, allowing an understanding of trade-offs between modes for different street designs. A compatible A-F scoring system makes comparison between modes simple.

There are a variety of Multimodal or Bicycle/Pedestrian LOS tools available for use. Different tools require different data and may present different or conflicting results. Despite potential limitations of MMLOS methodology, the results help jurisdictions better plan for all road users. OCTA allows for MMLOS analysis in determining MPAH consistency.

Guidance

MMLOS modeling is an emerging practice, and current methods may be improved on or revised. The knowledge of local residents and planners should be used to verify MMLOS model results.

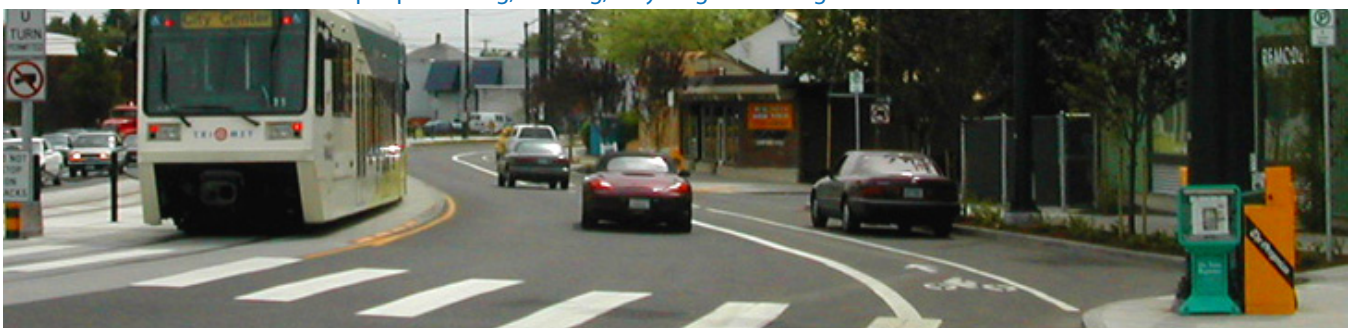
The 2000 Highway Capacity Manual includes dated LOS models for bicycle and pedestrian users. Methods presented in this edition and should not be used.

The current standard for MMLOS calculation is described in the 2010 Highway Capacity Manual (HCM 2010). This method has limitations, particularly for Bicycle LOS modeling. See *Discussion* below.

Consider using an alternative MMLOS method/tool if HCM 2010 is not appropriate for your community. Other multimodal "Service Quality" tools include:

- Florida DOT LOSPLAN
- LOS+
- Mineta Level of Traffic Stress (LTS) Analysis. (Bicycle only scoring)

A street with accommodation for people driving, walking, bicycling and taking transit will score well in a MMLOS evaluation.



Discussion

Limitations of the HCM 2010 model for Bicycle LOS calculations include:

- Gradients are not included in calculations.
- The presence of contemporary facility types included in this guide, such as shared lane markings, bike boxes or cycle tracks are not included, although the Florida LOSPLAN update does features cycle tracks.
- Scoring is for a "typical" adult bicyclist, and weights the presence of a bike lane very heavily. Results may not be appropriate in communities that seek to encourage bicycle travel by people of varying ages and abilities where bike lanes may not be adequate.

Additional References and Guidelines

Transportation Research Board. *Highway Capacity Manual*. 2010.
Florida Department of Transportation. LOSPLAN. 2012. http://www.dot.state.fl.us/planning/systems/sm/los/los_sw2m2.shtm
Fehr&Peers. LOS+ Multi-Modal Roadway Analysis Tool. http://www.fehrandpeers.com/losplus/
Mineta Transportation Institute. Low-Stress Bicycling and Network Connectivity. 2011. http://transweb.sjsu.edu/project/1005.html

5.2 Bicycle Facility Selection

There are no 'hard and fast' rules for determining the most appropriate type of bicycle facility for a particular location – roadway speeds, volumes, right-of-way width, presence of parking, adjacent land uses, and expected bicycle user types are all critical elements of this decision. Studies find that the most significant factors influencing bicycle use are motor vehicle traffic volumes and speeds. Additionally, most bicyclists prefer facilities separated from motor vehicle traffic or located on local roads with low motor vehicle traffic speeds and volumes. Because off-street pathways are physically separated from the roadway, they are perceived as safe and attractive routes for bicyclists who prefer to avoid motor vehicle traffic. Consistent use of treatments and application of bikeway facilities allow users to anticipate whether they would feel comfortable riding on a particular facility, and plan their trips accordingly. This section provides guidance on various factors that affect the type of facilities that should be provided.

This Section Includes:

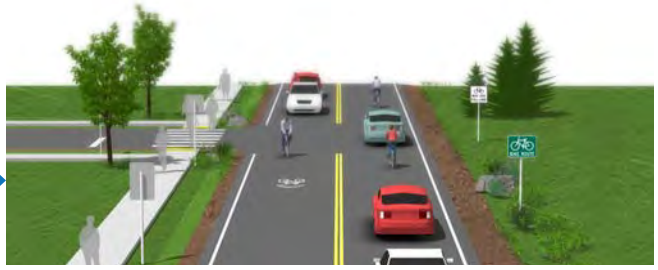
Facility Classification

Description

Consistent with bicycle facility classifications throughout the nation, these Bicycle Facility Design Guidelines identify the following classes of facilities by degree of separation from motor vehicle traffic.

Shared Roadways (No bikeway designation) are bikeways where bicyclists and cars operate within the same travel lane, either side by side or in single file depending on roadway configuration. In some instances, streets may be fully adequate and safe without bicycle specific signing and pavement markings.

Class III Bikeways (Bike Routes) are Shared Roadways configured with pavement markings, signage and other treatments including directional signage, traffic diverters, chicanes, chokers and /or other traffic calming devices to reduce vehicle speeds or volumes. Such enhanced treatments often are associated with **Bicycle Boulevards.**



Class II Bikeways (Bike Lanes) use signage and striping to delineate the right-of-way assigned to bicyclists and motorists. Bike lanes encourage predictable movements by both bicyclists and motorists. Buffered bike lanes use a 2'-3' wide hatched painted buffer to increase space between bicyclists and motor vehicles. Adding vertical separation such as bollards, flags or planters creates a physically protected bicycle lane.

Class I Bikeways (Cycle Tracks) are paths elevated from the roadway by a curb, for the exclusive use of bicyclists. Cycle tracks feature design elements that enhance safety and level of service beyond that provided by older "sidepath" designs.

Class 1 Bikeways (Shared-use Paths) are facilities separated from roadways for use by bicyclists and pedestrians.

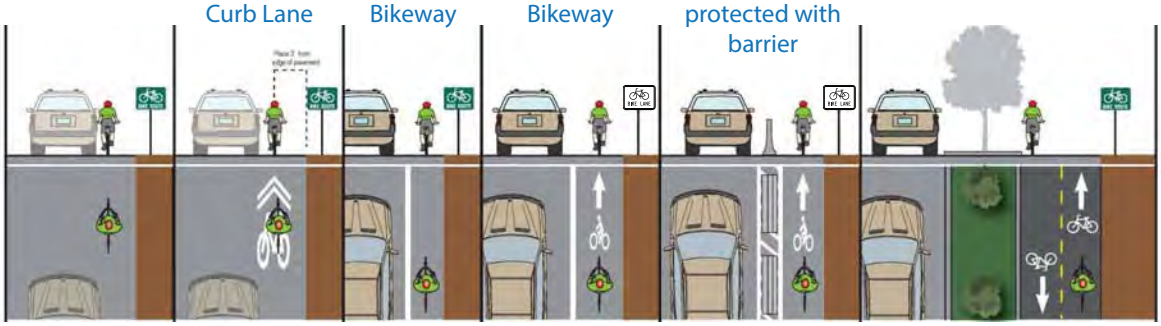
Facility Continua

The following continua illustrate the range of bicycle facilities applicable to various roadway environments, based on the roadway type and desired degree of separation. Engineering judgment, traffic studies, previous municipal planning efforts, community input and local context should be used to refine criteria when developing bicycle facility recommendations for a particular street. In some corridors, it may be desirable to construct facilities to a higher level of treatment than those recommended in relevant planning documents in order to enhance user safety and comfort. In other cases, existing and/or future motor vehicle speeds and volumes may not justify the recommended level of separation, and a less intensive treatment may be acceptable.

Least Protected → Most Protected

Arterial/Highway Bikeway Continuum (without curb and gutter)

Shared Lane | Marked Wide Curb Lane | Shoulder Bikeway | Wide Shoulder Bikeway | Cycle Track: protected with barrier | Shared-use Path



Arterial/Highway Bikeway Continuum (with curb and gutter)

Marked Wide Curb Lane | Conventional Bicycle Lane | Buffered Bicycle Lane | Cycle Track: at-grade, protected with parking | Cycle Track: protected with barrier | Cycle Track: curb separated

Collector Bikeway Continuum

Shared Lane | Marked Wide Curb Lane | Conventional Bicycle Lane | Wide Bicycle Lane | Buffered Bicycle Lane

5.3 Shared Roadways

On shared roadways, bicyclists and motor vehicles use the same roadway space. These facilities are typically used on roads with low speeds and traffic volumes, however they can be used on higher volume roads with wide outside lanes or shoulders. A motorist will usually have to cross over into the adjacent travel lane to pass a bicyclist, unless a wide outside lane or shoulder is provided.

Shared roadways employ a large variety of treatments from simple signage and shared lane markings to more complex treatments including directional signage, traffic diverters, chicanes, chokers, and/or other traffic calming devices to reduce vehicle speeds or volumes.

5.3.5 Bicycle Boulevards

Bicycle boulevards are a special class of shared roadways designed for a broad spectrum of bicyclists. They are low-volume local streets where motorists and bicyclists share the same travel lane. Treatments for bicycle boulevards are selected as necessary to create appropriate automobile volumes and speeds, and to provide safe crossing opportunities of busy streets.

This Section Includes:

Signed Shared Roadway

Description

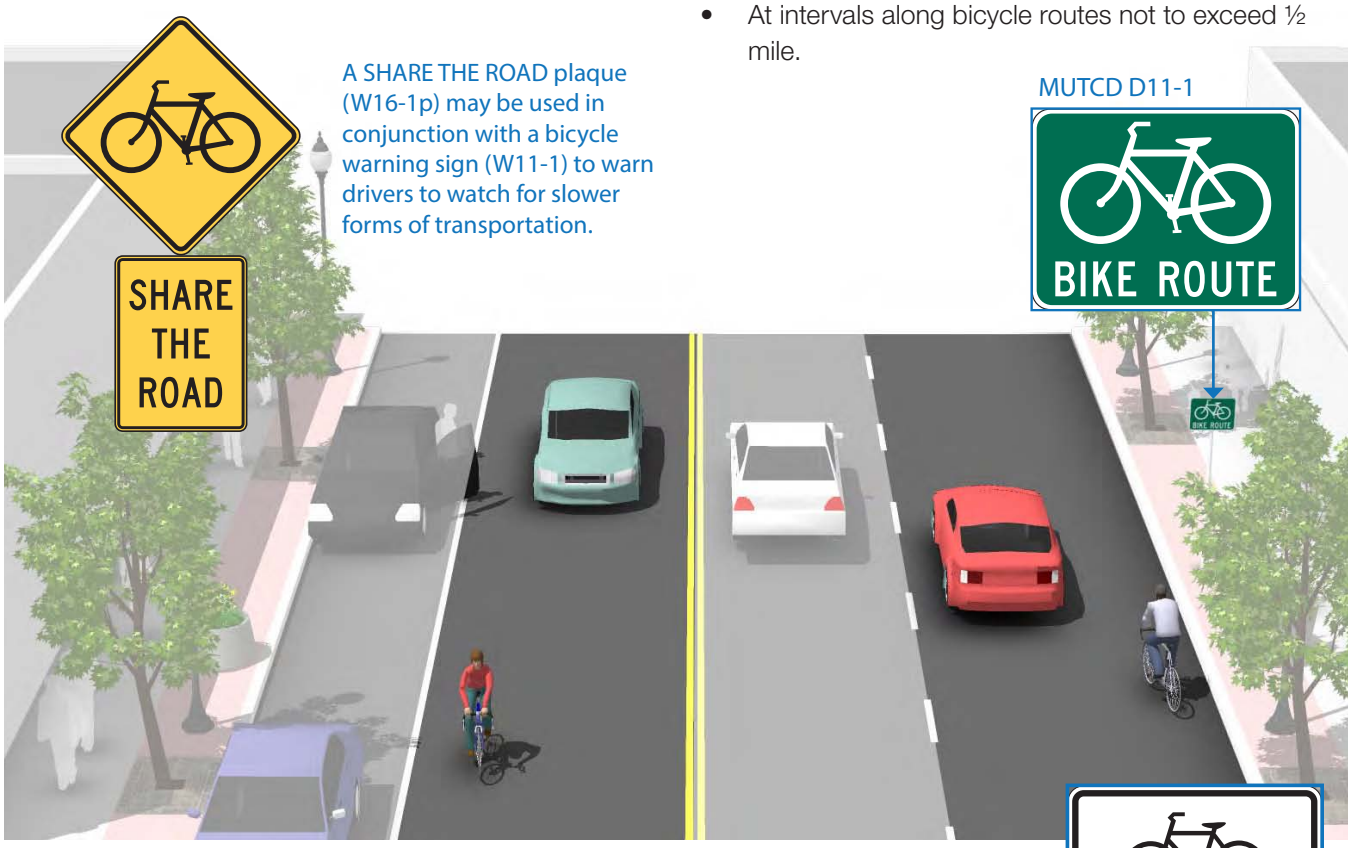
Signed Shared Roadways are facilities shared with motor vehicles. They are typically used on roads with low speeds and traffic volumes, however can be used on higher volume roads with wide outside lanes or shoulders. A motorist will usually have to cross over into the adjacent travel lane to pass a bicyclist, unless a wide outside lane or shoulder is provided.

Guidance

Lane width varies depending on roadway configuration.

Bicycle Route signage (D11-1) should be applied at intervals frequent enough to keep bicyclists informed of changes in route direction and to remind motorists of the presence of bicyclists. Commonly, this includes placement at:

- Beginning or end of Bicycle Route.
- At major changes in direction or at intersections with other bicycle routes.
- At intervals along bicycle routes not to exceed ½ mile.



A SHARE THE ROAD plaque (W16-1p) may be used in conjunction with a bicycle warning sign (W11-1) to warn drivers to watch for slower forms of transportation.

MUTCD D11-1

Discussion

A Bicycle May Use Full Lane sign (R4-11) may be used on a lane that is too narrow for a bicyclist and motorist to share the road side by side within the same lane.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
Caltrans *CA-MUTCD.* 2012
Caltrans. *California HDM.* 2012.

Materials and Maintenance

Maintenance needs for bicycle wayfinding signs are similar to other signs, and will need periodic replacement due to wear.

Marked Shared Roadway

Description

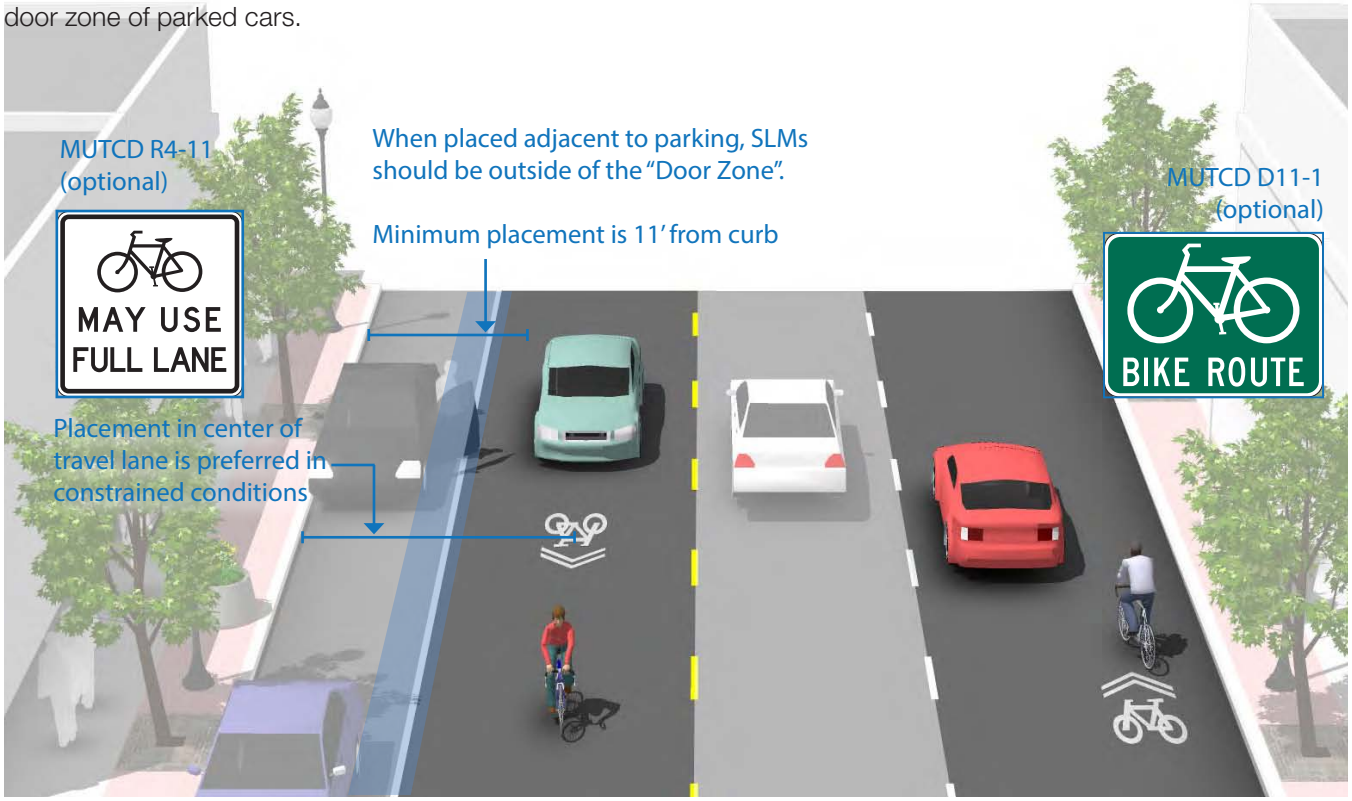
A marked shared roadway is a general purpose travel lane marked with shared lane markings (SLM, popularly known as “sharrows”) used to encourage bicycle travel and proper positioning within the lane.

In constrained conditions, the SLMs are placed in the middle of the lane to discourage unsafe passing by motor vehicles. On a wide outside lane, the SLMs can be used to promote bicycle travel to the right of motor vehicles.

In all conditions, SLMs should be placed outside of the door zone of parked cars.

Guidance

- In constrained conditions, preferred placement is in the center of the travel lane to minimize wear and promote single file travel.
- Minimum placement of SLM marking centerline is 11 feet from edge of curb where on-street parking is present, 4 feet from edge of curb with no parking. If parking lane is wider than 7.5 feet, the SLM should be moved further out accordingly.



Discussion

Bike Lanes should be considered on roadways with outside travel lanes wider than 15 feet, or where other lane narrowing or removal strategies may provide adequate road space. SLMs shall not be used on shoulders, on designated **Bike Lanes**, or to designate **Bicycle Detection** at signalized intersections. (MUTCD 9C.07)

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
Caltrans *CA-MUTCD.* 2012
NACTO. *Urban Bikeway Design Guide.* 2012.

Materials and Maintenance

Placing SLMs between vehicle tire tracks will increase the life of the markings and minimize the long-term cost of the treatment.

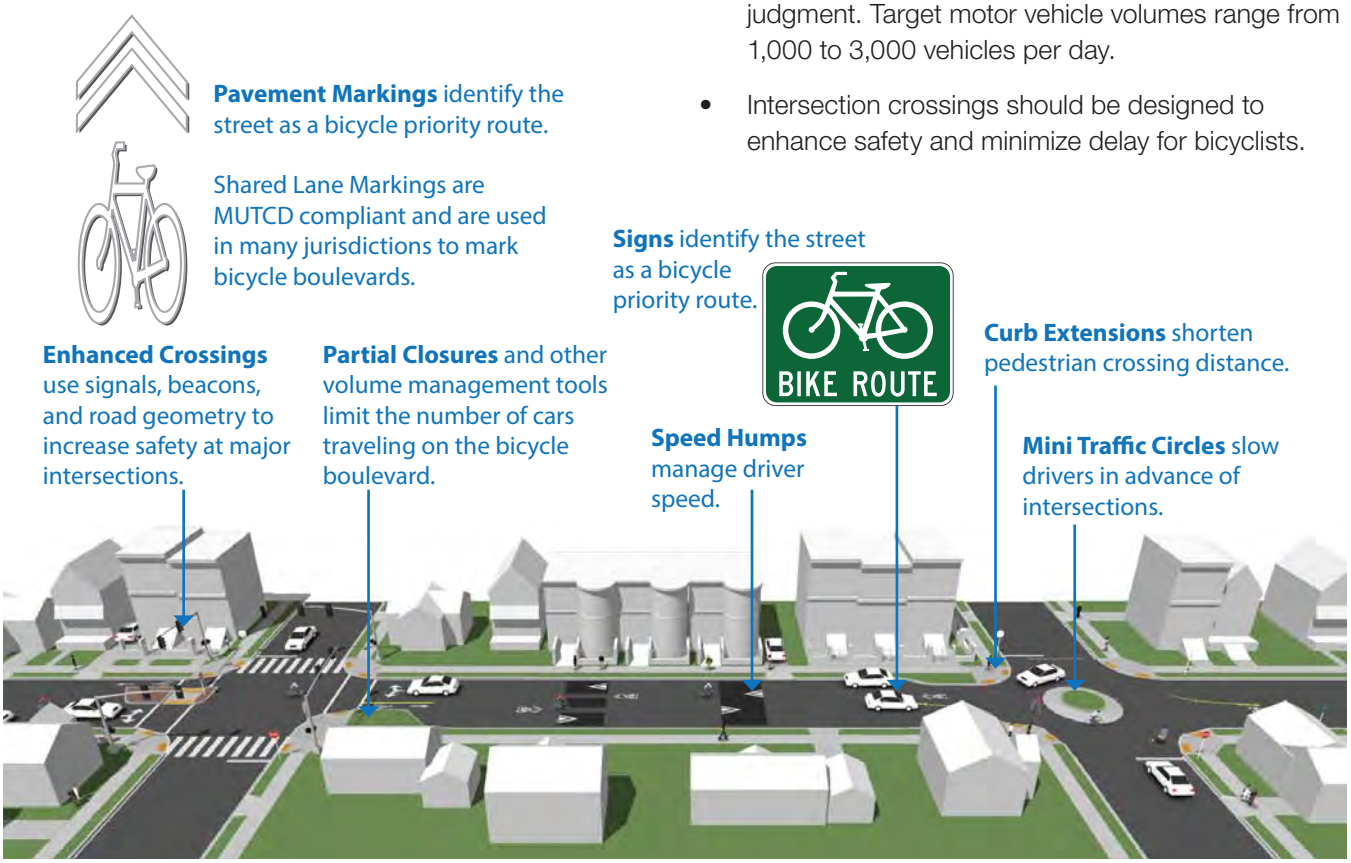
Bicycle Boulevard

Description

Bicycle boulevards (also known as "Neighborhood Greenways") are low-volume, low-speed streets modified to enhance bicyclist comfort by using treatments such as signage, pavement markings, traffic calming and/or traffic reduction, and intersection modifications. These treatments allow the through movement of bicyclists while discouraging similar through-trips by non-local motorized traffic.

Guidance

- Signs and pavement markings are the minimum treatments necessary to designate a street as a bicycle boulevard.
- Bicycle boulevards should have a maximum posted speed of 25 mph. Use traffic calming to maintain an 85th percentile speed below 22 mph.
- Implement volume control treatments based on the context of the bicycle boulevard, using engineering judgment. Target motor vehicle volumes range from 1,000 to 3,000 vehicles per day.
- Intersection crossings should be designed to enhance safety and minimize delay for bicyclists.



Discussion

Bicycle boulevard retrofits to local streets are typically located on streets without existing signalized accommodation at crossings of collector and arterial roadways. Without treatments for bicyclists, these intersections can become major barriers along the bicycle boulevard and compromise safety.

Additional References and Guidelines

NACTO. *Urban Bikeway Design Guide.* 2012.
Ewing, Reid and Brown, Steven. (2009). U.S. Traffic Calming Manual.

Materials and Maintenance

Vegetation should be regularly trimmed to maintain visibility and attractiveness.

5.4 Separated Bikeways

Designated exclusively for bicycle travel, separated bikeways are segregated from vehicle travel lanes by striping (Class II), or physical measures such as bollards or curbs (Class I Cycle Tracks). Separated bikeways are most appropriate on arterial and collector streets where higher traffic volumes and speeds warrant greater separation.

Separated bikeways can increase safety and promote proper riding by:

- Defining road space for bicyclists and motorists, reducing the possibility that motorists will stray into the bicyclists' path.
- Discouraging bicyclists from riding on the sidewalk.
- Reducing the incidence of wrong way riding.
- Reminding motorists that bicyclists have a right to the road.

This Section Includes:


Bicycle Lane


Bicycle Lane and Diagonal Parking


Buffered Bicycle Lane


Cycle Track

Bicycle Lane

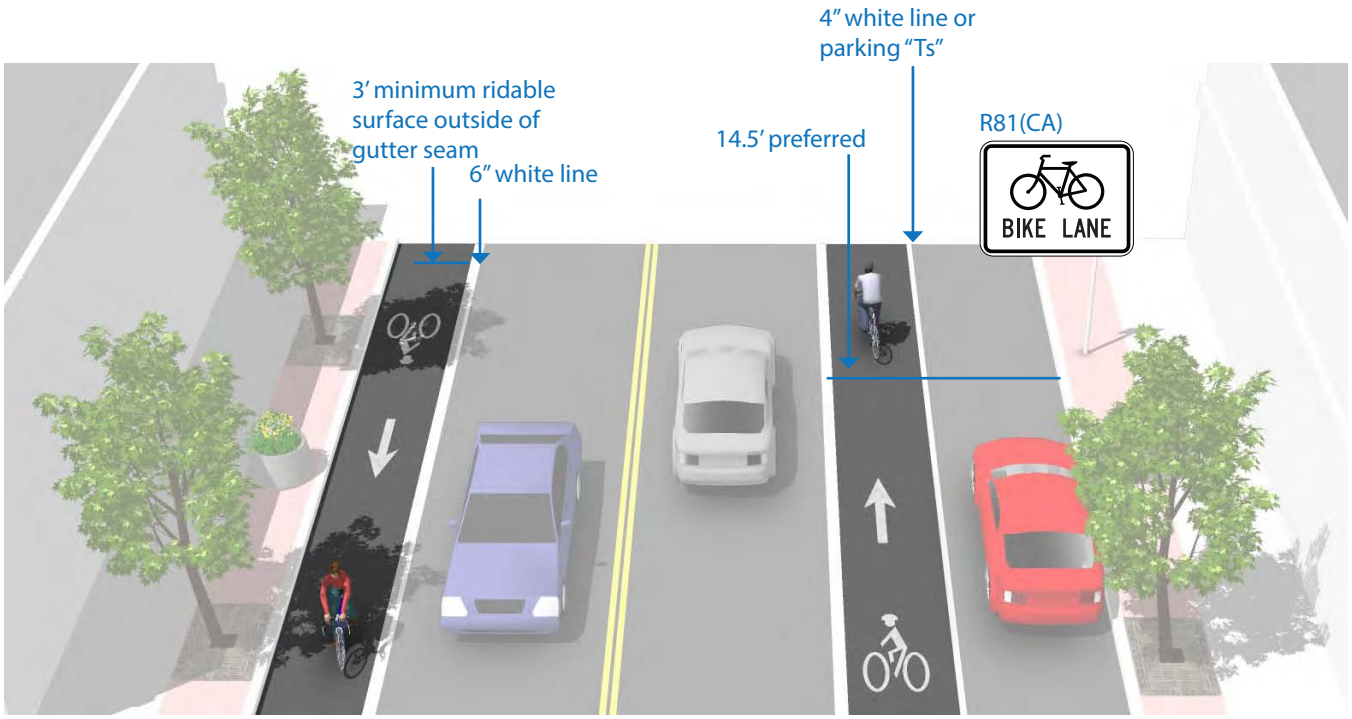
Description

Bike lanes designate an exclusive space for bicyclists through the use of pavement markings and signage. The bike lane is located adjacent to motor vehicle travel lanes and is used in the same direction as motor vehicle traffic. Bike lanes are typically on the right side of the street, between the adjacent travel lane and curb, road edge or parking lane.

Many bicyclists, particularly less experienced riders, are more comfortable riding on a busy street if it has a striped and signed bikeway than if they are expected to share a lane with vehicles.

Guidance

- 4 foot minimum when no curb and gutter is present.
- 5 foot minimum when adjacent to curb and gutter or 3 feet more than the gutter pan width if the gutter pan is wider than 2 feet.
- 14.5 foot preferred from curb face to edge of bike lane. (12 foot minimum).
- 7 foot maximum width for use adjacent to arterials with high travel speeds. Greater widths may encourage motor vehicle use of bike lane.



Discussion

Wider bicycle lanes are desirable in certain situations such as on higher speed arterials (45 mph+) to increase separation between passing vehicles and bicyclists. Consider **Buffered Bicycle Lanes** when further separation is desired.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
Caltrans *CA-MUTCD.* 2012
NACTO. *Urban Bikeway Design Guide.* 2012.
Caltrans. *California HDM.* 2012.

Materials and Maintenance

Paint can wear more quickly in high traffic areas; consider thermoplastic or epoxy materials for reduced life cycle costs.

Bicycle Lane and Diagonal Parking

Description

In certain areas with high parking demand such as urban commercial areas, diagonal parking can be used to increase parking supply.

Back-in diagonal parking improves sight distances between drivers and bicyclists when compared to conventional head-in diagonal parking. Back-in parking is best paired with a dedicated bicycle lane.

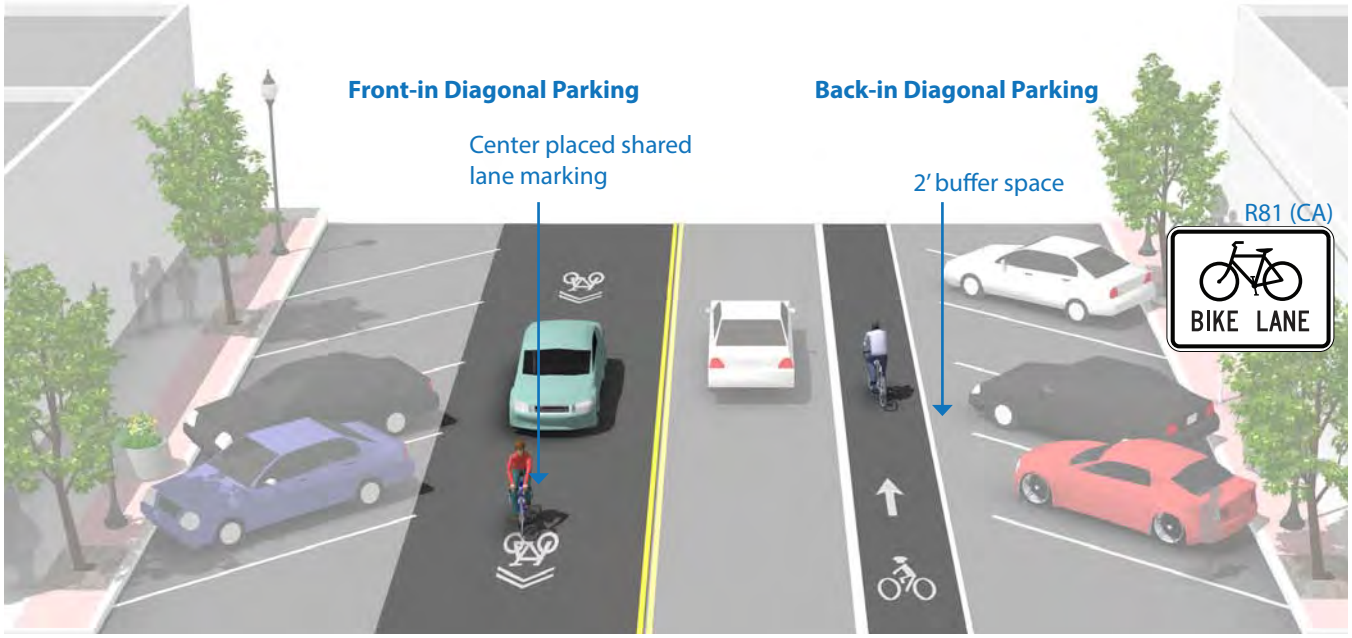
Guidance

Front-in Diagonal Parking

- Shared lane markings are the preferred facility with front-in diagonal parking

Back-in Diagonal Parking

- 5 foot minimum marked width of bike lane
- Parking bays are sufficiently long to accommodate most vehicles (so vehicles do not block bike lane)



Discussion

Conventional front-in diagonal parking is not compatible or recommended with the provision of bike lanes, as drivers backing out of conventional diagonal parking have limited visibility of approaching bicyclists. Under these conditions, shared lane markings should be used to guide bicyclists away from reversing automobiles. Examples of back-in diagonal parking within the State of California include the cities of Chico, Sacramento, San Francisco, and Ventura.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
Caltrans. *Main Streets.* 2005.

Materials and Maintenance

Paint can wear more quickly in high traffic areas; consider thermoplastic or epoxy materials for reduced life cycle costs.

Buffered Bicycle Lane

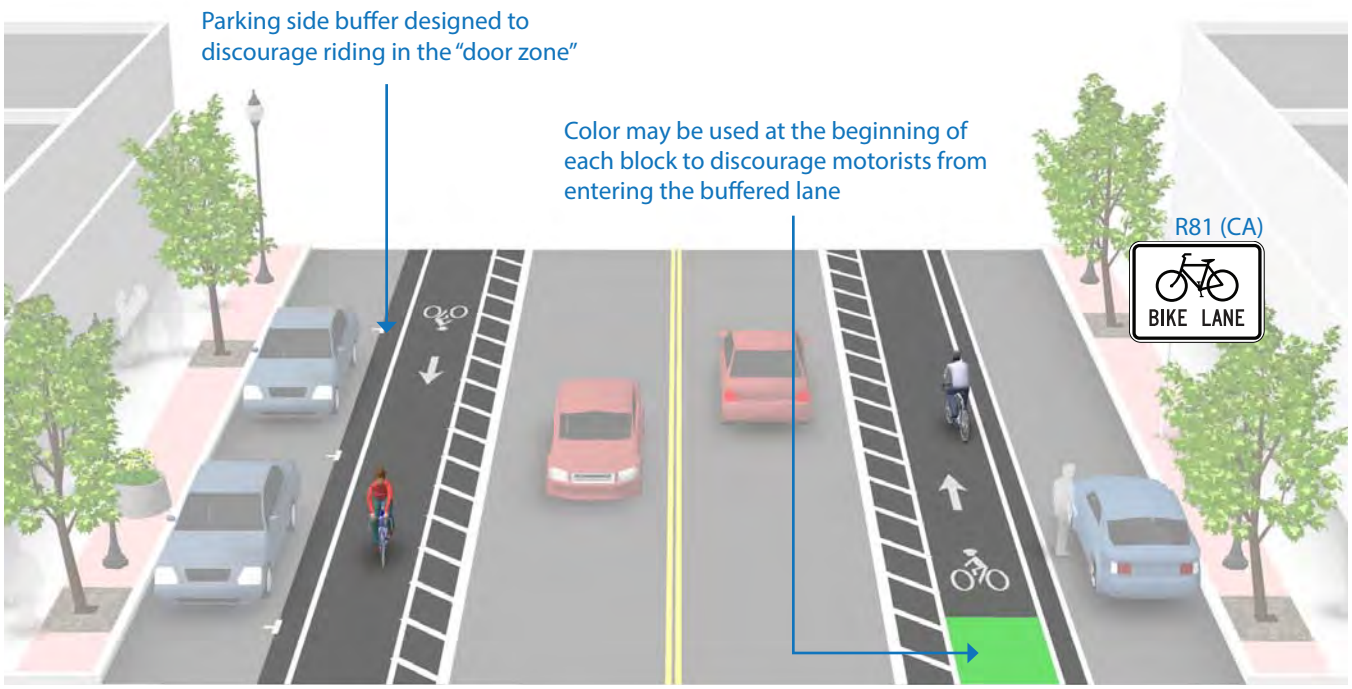
Description

Buffered bike lanes are conventional bicycle lanes paired with a designated buffer space, separating the bicycle lane from the adjacent motor vehicle travel lane and/or parking lane. Buffered bike lanes are allowed as per MUTCD guidelines for buffered preferential lanes (section 3D-01).

Buffered bike lanes are designed to increase the space between the bike lane and the travel lane or parked cars. This treatment is appropriate for bike lanes on roadways with high motor vehicle traffic volumes and speed, adjacent to parking lanes, or a high volume of truck or oversized vehicle traffic.

Guidance

- Where bicyclist volumes are high or where bicyclist speed differentials are significant, the desired bicycle travel area width is 7 feet.
- Buffers should be at least 2 feet wide. If 3 feet or wider, mark with diagonal or chevron hatching. For clarity at driveways or minor street crossings, consider a dotted line for the inside buffer boundary where cars are expected to cross.



Discussion

Commonly configured as a buffer between the bicycle lane and motor vehicle travel lane, a parking side buffer may also be provided to help bicyclists avoid the 'door zone' of parked cars.

Additional References and Guidelines

NACTO. *Urban Bikeway Design Guide.* 2012.
AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
Caltrans *CA-MUTCD.* 2012

Materials and Maintenance

Paint can wear more quickly in high traffic areas; consider thermoplastic or epoxy materials for reduced life cycle costs.

Cycle Track

Description

A cycle track is an exclusive bike facility that combines the user experience of a separated path with the on-street infrastructure of a conventional bike lane. A cycle track is physically separated from motor traffic and distinct from the sidewalk. Cycle tracks have different forms but all share common elements—they provide space that is intended to be exclusively or primarily used by bicycles, and are separated from motor vehicle travel lanes, parking lanes, and sidewalks.

Raised cycle tracks may be at the level of the adjacent sidewalk or set at an intermediate level between the roadway and sidewalk to separate the cycle track from the pedestrian area.

Guidance

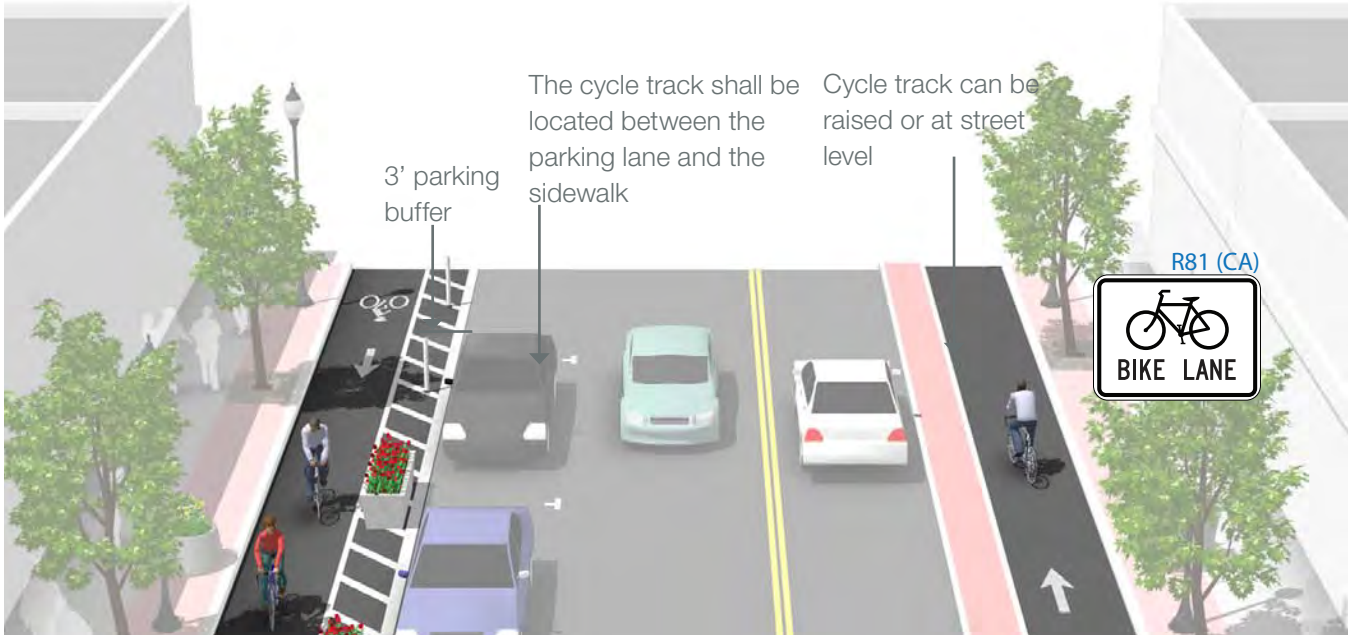
Cycle tracks should ideally be placed along streets with long blocks and few driveways or mid-block access points for motor vehicles.

One-Way Cycle Tracks

- 7 foot recommended width to allow passing; 5 foot minimum width in constrained locations. Add additional shy space if contained by vertical elements such as curbs.

Two-Way Cycle Tracks

- Cycle tracks located on one-way streets have fewer potential conflict areas than those on two-way streets.
- 12 foot recommended minimum for two-way facility. 8 foot minimum in constrained locations



Discussion

Special consideration should be given at transit stops to manage bicycle and pedestrian interactions. Driveways and minor street crossings are unique challenges to cycle track design. Parking should be prohibited within 30 feet of the intersection to improve visibility.

Additional References and Guidelines

NACTO. *Urban Bikeway Design Guide.* 2012.

Materials and Maintenance

In cities with winter climates, barrier separated and raised cycle tracks may require special equipment for snow removal.

5.5 Separated Bikeways at Intersections

Intersections are junctions at which different modes of transportation meet and facilities overlap. An intersection facilitates the interchange between bicyclists, motorists, pedestrians and other modes in order to advance traffic flow in a safe and efficient manner. Designs for intersections with bicycle facilities should reduce conflict between bicyclists (and other vulnerable road users) and vehicles by heightening the level of visibility, denoting clear right-of-way and facilitating eye contact and awareness with other modes. Intersection treatments can improve both queuing and merging maneuvers for bicyclists, and are often coordinated with timed or specialized signals.

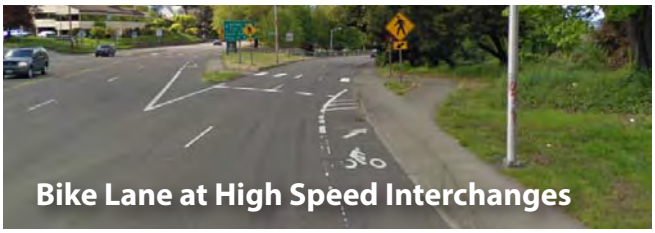
The configuration of a safe intersection for bicyclists may include elements such as color, signage, medians, signal detection and pavement markings. Intersection design should take into consideration existing and anticipated bicyclist, pedestrian and motorist movements. In all cases, the degree of mixing or separation between bicyclists and other modes is intended to reduce the risk of crashes and increase bicyclist comfort. The level of treatment required for bicyclists at an intersection will depend on the bicycle facility type used, whether bicycle facilities are intersecting, and the adjacent street function and land use.


Bike Lane at Right Turn Only Lanes


Colored Bike Lane in Conflict Areas

Combined Bike Lane / Turn Lane


Intersection Crossing Markings


Bike Lane at High Speed Interchanges

This Section Includes:


Bike Box


Diverging Diamond Interchanges Design

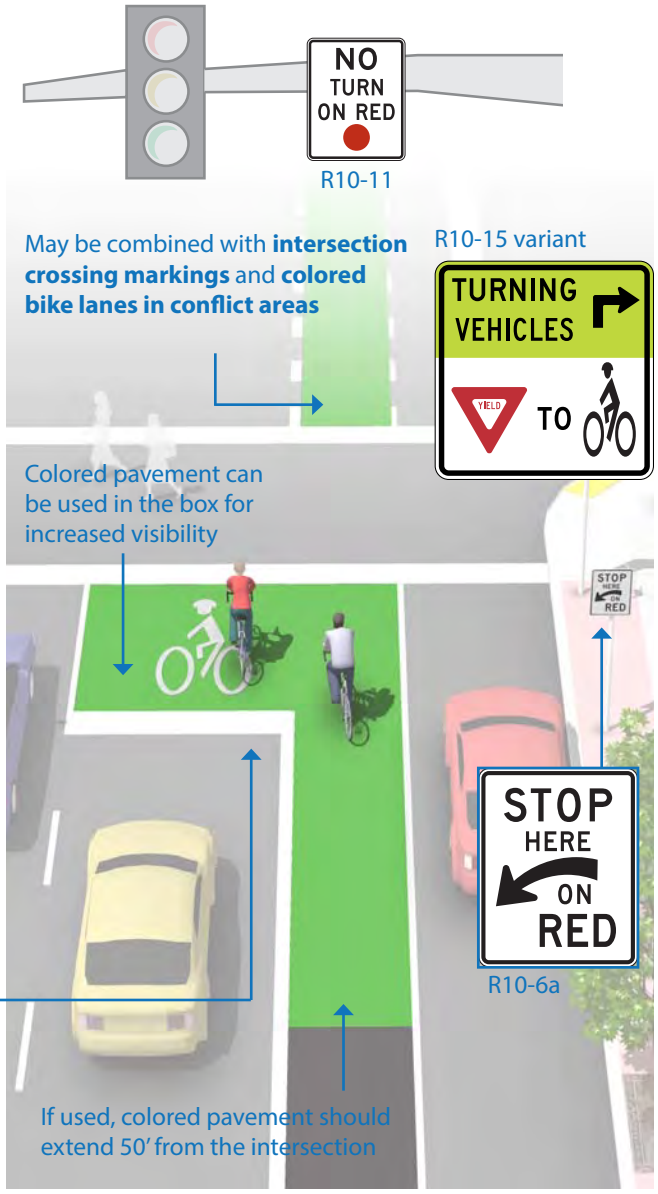
Bike Box

Description

A bike box is a designated area located at the head of a traffic lane at a signalized intersection that provides bicyclists with a safe and visible space to get in front of queuing motorized traffic during the red signal phase. Motor vehicles must queue behind the white stop line at the rear of the bike box.

Guidance

- 14 foot minimum depth
- A "No Turn on Red" (MUTCD R10-11) sign shall be installed overhead to prevent vehicles from entering the Bike Box.
- A "Stop Here on Red" sign should be post-mounted at the stop line to reinforce observance of the stop line.
- A "Yield to Bikes" sign should be post-mounted in advance of and in conjunction with an egress lane to reinforce that bicyclists have the right-of-way going through the intersection.
- An ingress lane should be used to provide access to the box.
- A supplemental "Wait Here" legend can be provided in advance of the stop bar to increase clarity to motorists.



Discussion

Bike boxes should be placed only at signalized intersections, and right turns on red shall be prohibited for motor vehicles. Bike boxes should be used in locations that have a large volume of bicyclists and are best utilized in central areas where traffic is usually moving more slowly.

Additional References and Guidelines

NACTO. *Urban Bikeway Design Guide.* 2012.
FHWA. *Interim Approval (IA-14).* 2011.

Materials and Maintenance

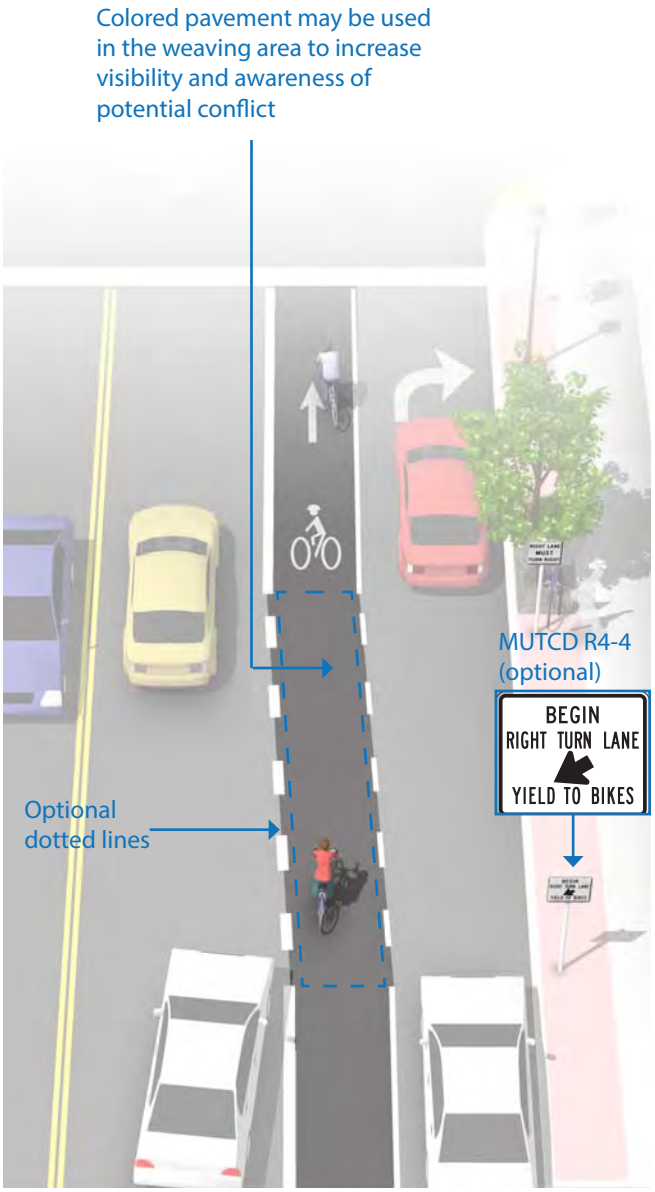
Because the effectiveness of markings depends entirely on their visibility, maintaining markings should be a high priority.

Bike Lane at Right Turn Only Lane

Description

The appropriate treatment at right-turn lanes is to place the bike lane between the right-turn lane and the right-most through lane or, where right-of-way is insufficient, to use a **shared bike lane/turn lane**.

The design (right) illustrates a bike lane pocket, with signage indicating that motorists should yield to bicyclists through the conflict area.



Guidance

At auxiliary right turn only lanes (add lane):

- Continue existing bike lane width; standard width of 5 to 6 feet or 4 feet in constrained locations.
- Use signage to indicate that motorists should yield to bicyclists through the conflict area.
- Consider using **colored conflict areas** to promote visibility of the mixing zone.

Where a through lane becomes a right turn lane:

- Do not define a dotted line merging path for bicyclists.
- Drop the bicycle lane in advance of the merge area.
- Use shared lane markings to indicate shared use of the lane in the merging zone.

Discussion

For other potential approaches to providing accommodations for bicyclists at intersections with turn lanes, please see **combined bike lane/turn lane**, **bicycle signals**, and **colored bike facilities**.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
Caltrans *CA-MUTCD.* 2012
NACTO. *Urban Bikeway Design Guide.* 2012.
Caltrans. *California HDM.* 2012.
Caltrans. *Complete Intersections.* 2010.

Materials and Maintenance

Because the effectiveness of markings depends entirely on their visibility, maintaining markings should be a high priority.

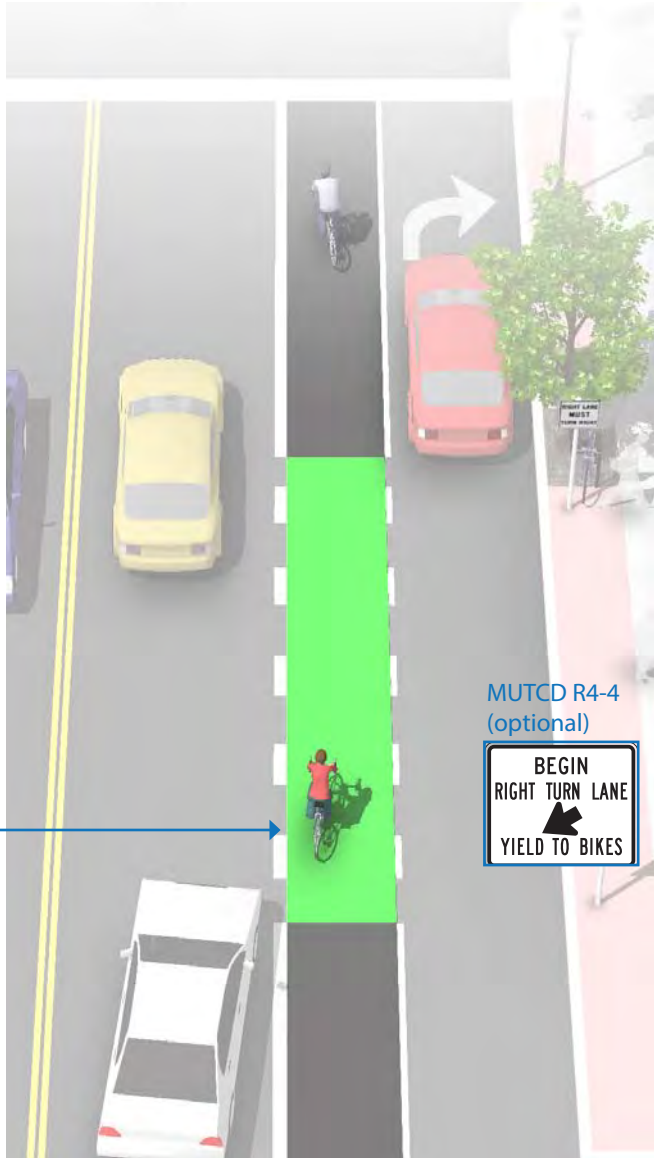
Colored Bike Lane in Conflict Areas

Description

Colored pavement within a bicycle lane increases the visibility of the facility and reinforces priority of bicyclists in conflict areas.

Guidance

- Green colored pavement was given interim approval by the Federal Highways Administration in March 2011. See interim approval for specific color standards.
- The colored surface should be skid resistant and retro-reflective.



Discussion

Evaluations performed in Portland, OR, St. Petersburg, FL and Austin, TX found that significantly more motorists yielded to bicyclists and slowed or stopped before entering the conflict area after the colored treatment.

Additional References and Guidelines

FHWA. *Interim Approval (IA-14).* 2011.
NACTO. *Urban Bikeway Design Guide.* 2012.

Materials and Maintenance

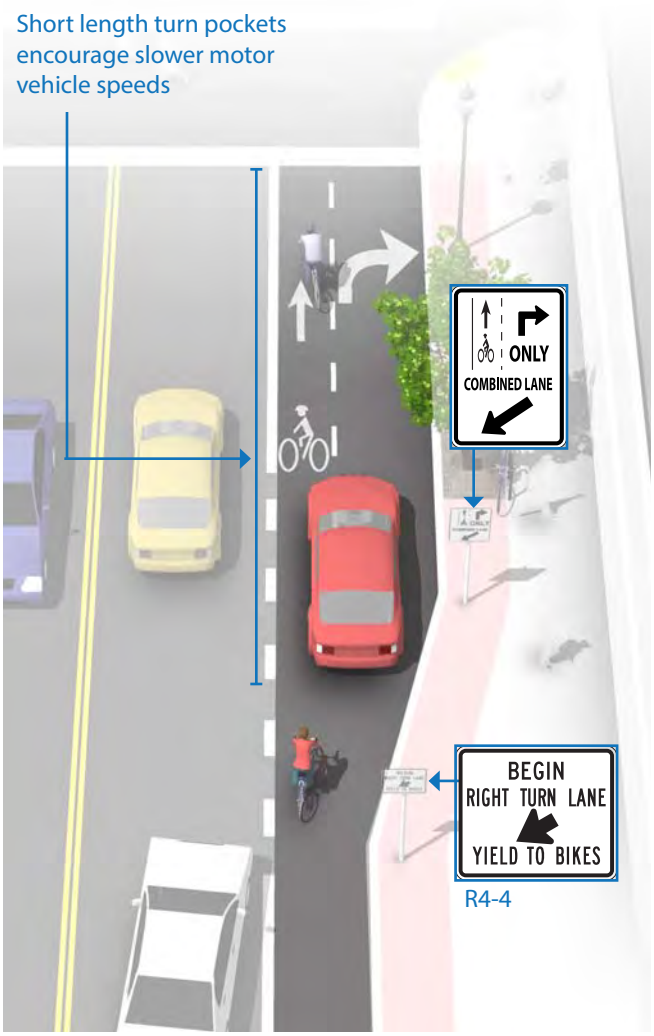
Because the effectiveness of markings depends entirely on their visibility, maintaining markings should be a high priority.

Combined Bike Lane / Turn Lane

Description

The combined bicycle/right turn lane places a standard-width bike lane on the left side of a dedicated right turn lane. A dotted line delineates the space for bicyclists and motorists within the shared lane. This treatment includes signage advising motorists and bicyclists of proper positioning within the lane.

This treatment is recommended at intersections lacking sufficient space to accommodate both a standard **through bike lane** and right turn lane.



Guidance

- Maximum shared turn lane width is 13 feet; narrower is preferable.
- Bike Lane pocket should have a minimum width of 4 feet with 5 feet preferred.
- A dotted 4 inch line and bicycle lane marking should be used to clarify bicyclist positioning within the combined lane, without excluding cars from the suggested bicycle area.
- A "Right Turn Only" sign with an "Except Bicycles" plaque may be needed to make it legal for through bicyclists to use a right turn lane.

Discussion

Case studies cited by the Pedestrian and Bicycle Information Center indicate that this treatment works best on streets with lower posted speeds (30 MPH or less) and with lower traffic volumes (10,000 ADT or less). May not be appropriate for high-speed arterials or intersections with long right turn lanes.

Additional References and Guidelines

NACTO. *Urban Bikeway Design Guide.* 2012.
AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.

Materials and Maintenance

Because the effectiveness of markings depends on their visibility, maintaining markings should be a high priority.

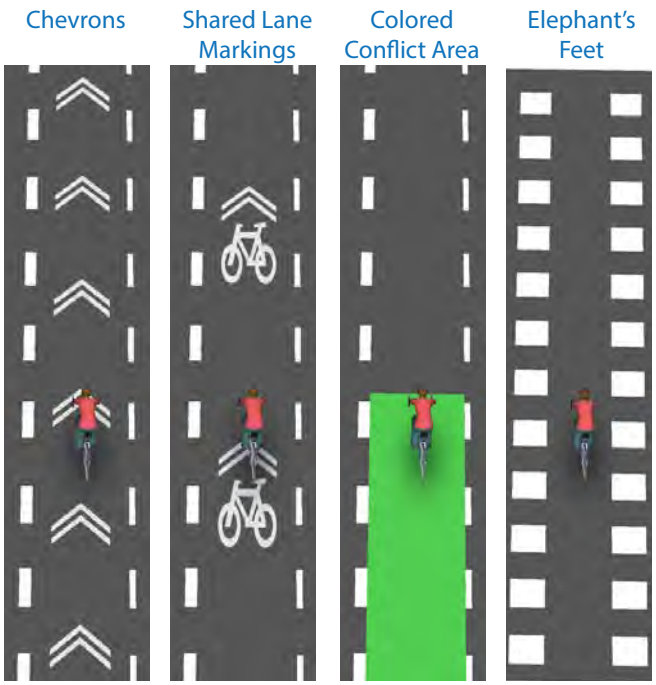
Intersection Crossing Markings

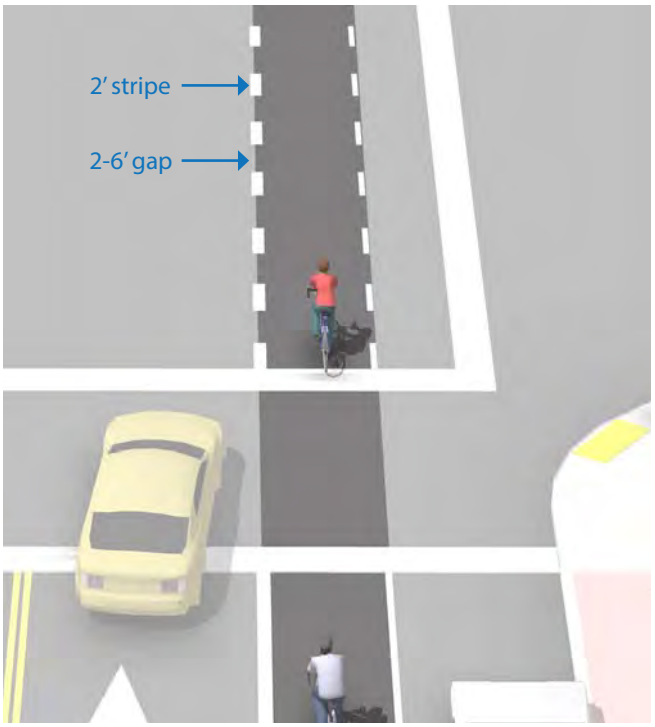
Description

Bicycle pavement markings through intersections indicate the intended path of bicyclists through an intersection or across a driveway or ramp. They guide bicyclists on a safe and direct path through the intersection and provide a clear boundary between the paths of through bicyclists and either through or crossing motor vehicles in the adjacent lane.

Guidance

- See MUTCD Section 3B.08: "dotted line extensions"
- Crossing striping shall be at least six inches wide when adjacent to motor vehicle travel lanes. Dotted lines should be two-foot lines spaced two to six feet apart.
- Chevrons, shared lane markings, or **colored bike lanes in conflict areas** may be used to increase visibility within conflict areas or across entire intersections. Elephant's Feet markings are common in Europe and Canada.





Discussion

Additional markings such as chevrons, shared lane markings, or **colored bike lanes in conflict areas** are strategies currently in use in the United States and Canada. Cities considering the implementation of markings through intersections should standardize future designs to avoid confusion.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
Caltrans *CA-MUTCD.* 2012
NACTO. *Urban Bikeway Design Guide.* 2012.

Materials and Maintenance

Because the effectiveness of marked crossings depends entirely on their visibility, maintaining marked crossings should be a high priority.

Two-Stage Turn Box

Description

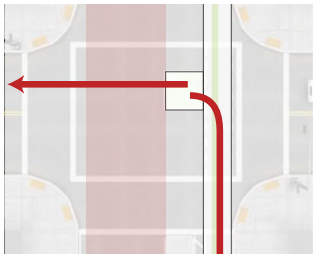
A two-stage turn box offers bicyclists a safe way to make left turns at multi-lane signalized intersections from a right side cycle track or bike lane.

On right side cycle tracks, bicyclists are often unable to merge into traffic to turn left due to physical separation, making the provision of two-stage left turn boxes critical. Design guidance for two-stage turns apply to both bike lanes and cycle tracks.

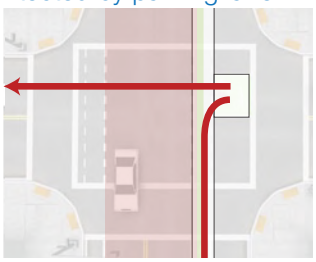
Guidance

- The queue box shall be placed in a protected area. Typically this is within an on-street parking lane or cycle track buffer area.
- 6' minimum depth of bicycle storage area
- Bicycle stencil and turn arrow pavement markings shall be used to indicate proper bicycle direction and positioning.
- A "No Turn on Red" (MUTCD R10-11) sign shall be installed on the cross street to prevent vehicles from entering the turn box.

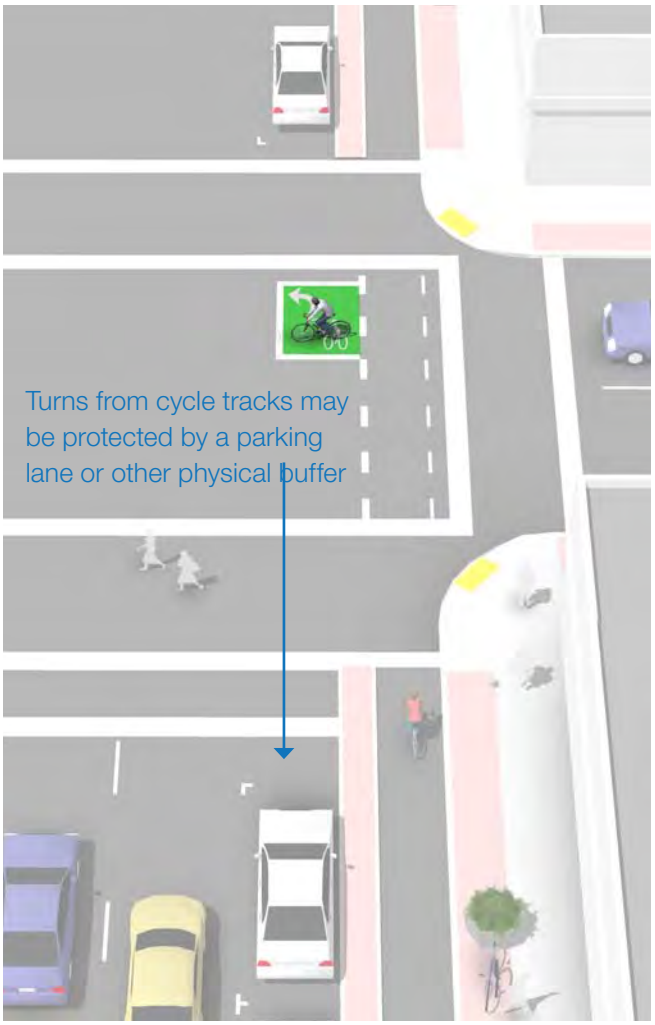
Cycle track turn box protected by physical buffer:



Bike lane turn box protected by parking lane:



Turns from a bicycle lane may be protected by an adjacent parking lane or crosswalk setback space



Discussion

While two stage turns may increase bicyclist comfort in many locations, this configuration will typically result in higher average signal delay for bicyclists versus a vehicular style left turn maneuver.

Additional References and Guidelines

NACTO. *Urban Bikeway Design Guide.* 2012.

Materials and Maintenance

Paint can wear more quickly in high traffic areas or in winter climates.

Bike Lane at Diverging Ramp Lanes

Description

Some arterials may contain high speed freeway-style designs such as merge lanes and exit ramps, which can create difficulties for bicyclists. The entrance and exit lanes typically have intrinsic visibility problems because of low approach angles and feature high speed differentials between bicyclists and motor vehicles.

Strategies to improve safety focus on increasing sight distances, creating formal crossings, and minimizing crossing distances.

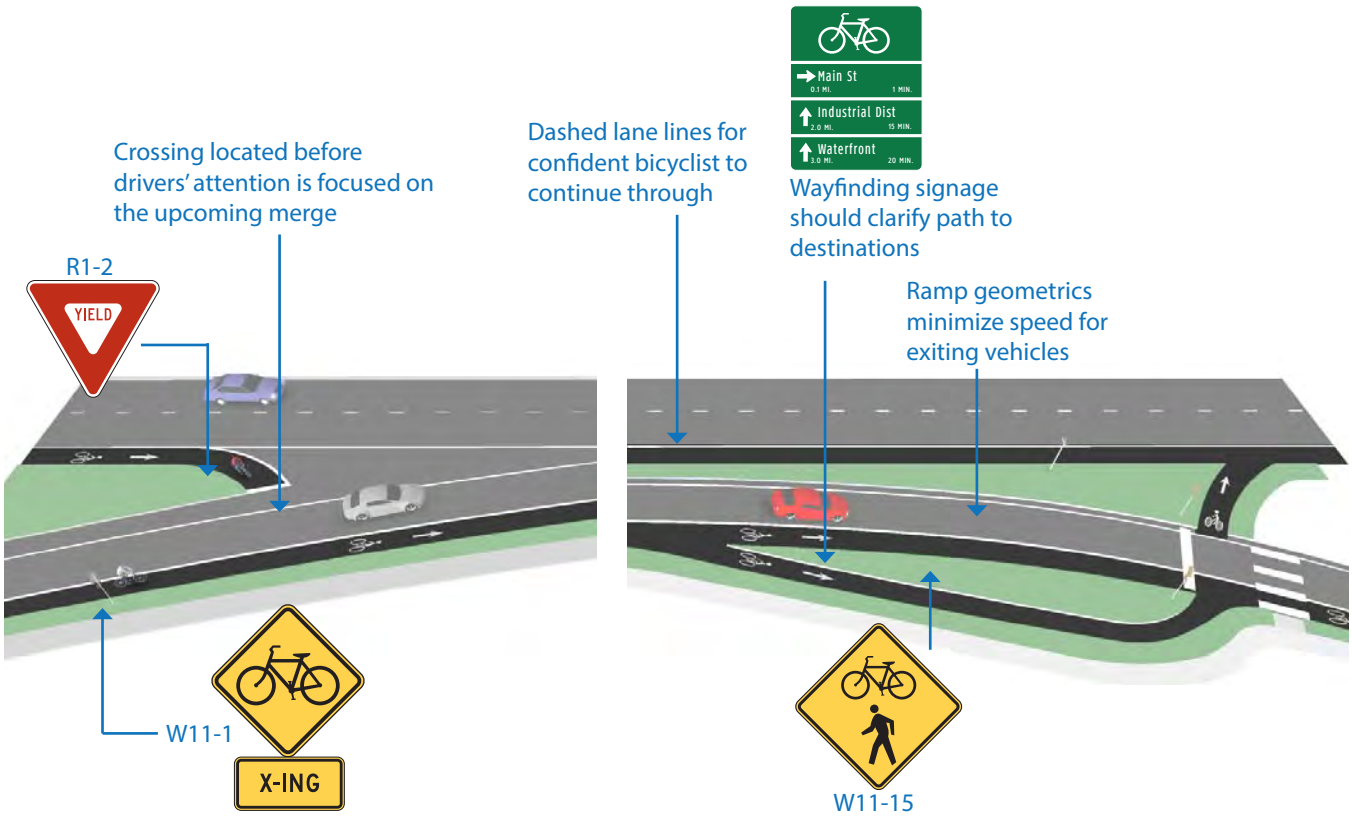
Guidance

Entrance Ramps:

Angle the bike lane to increase the approach angle with entering traffic. Position crossing before drivers' attention is focused on the upcoming merge.

Exit Ramps:

Use a jug handle turn to bring bicyclists to increase the approach angle with exiting traffic, and add yield striping and signage to the bicycle approach.



Discussion

While the jug-handle approach is the preferred configuration at exit ramps, provide the option for through bicyclists to perform a vehicular merge and proceed straight through under safe conditions.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
Caltrans *CA-MUTCD.* 2012
Caltrans. *Complete Intersections.* 2010.

Materials and Maintenance

Locate crossing markings out of wheel tread when possible to minimize wear and maintenance costs.

Freeway Interchange Design

Description

Freeway Interchanges can be significant obstacles to bicycling if they are poorly designed. Travel through some interchange designs may be particularly challenging for youth bicyclists.

Key design features at conflict areas through interchanges should be included to improve the experience for bicyclists.

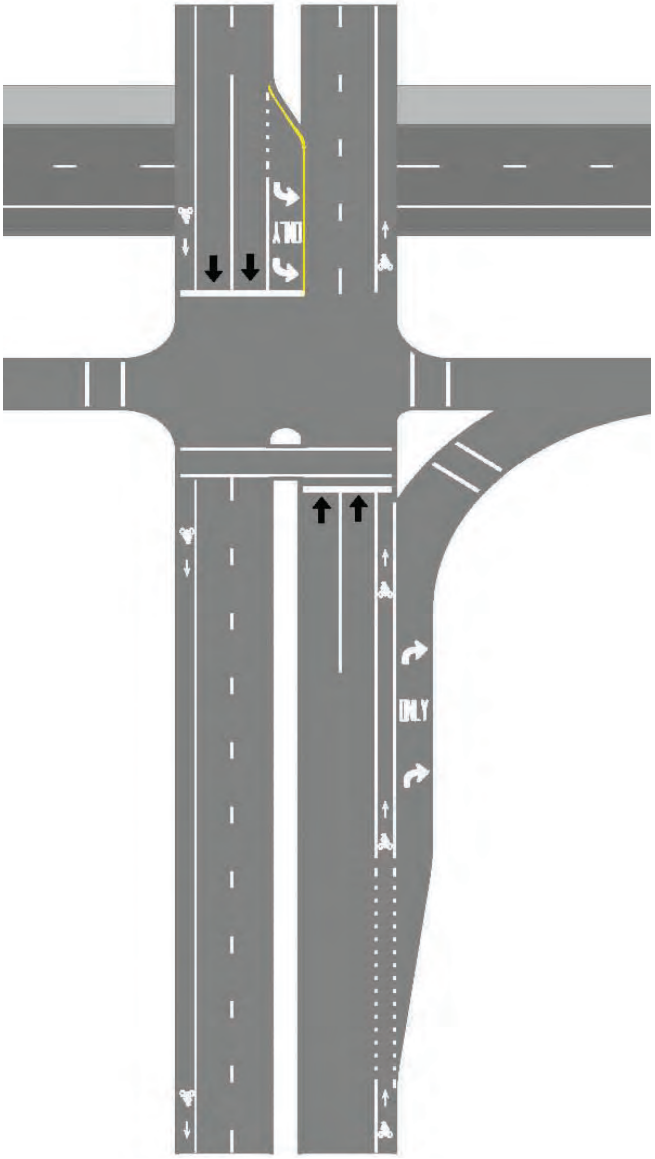
Guidance

Entrance Ramps:

- A right-turn lane should be configured with a taper as an "add-lane" for motorists turning right onto the freeway entrance ramp.
- A bike lane should be provided along the left side of the right turn lane. Dotted through bike lane striping provides clear priority for bicyclists at right turn 'add lane' on-ramps.

Exit Ramps:

- Motorists existing the freeway and turning onto the crossroad should be controlled by a stop sign, signal, or yield sign, rather than allowing a free-flowing movement.



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

Discussion

The on-ramps should be configured as a right-turn-only "add lane" to assert through bicyclist priority. Designs that are functional for bicycle passage typically encourage slowing or require motor vehicle traffic to slow or stop. Designs that encourage high-speed traffic movements are difficult for bicyclists to negotiate.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
Caltrans *CA-MUTCD.* 2012
Caltrans. *Complete Intersections.* 2010.

Materials and Maintenance

Locate crossing markings out of wheel tracks when possible to minimize wear and maintenance costs.

Bicyclists at Single Lane Roundabouts

Description

Roundabouts are circular intersections designed with yield control for all entering traffic, channelized approaches and geometry to induce desirable speeds. They are used as an alternative to intersection signalization.

Other roundabout-like intersection designs include:

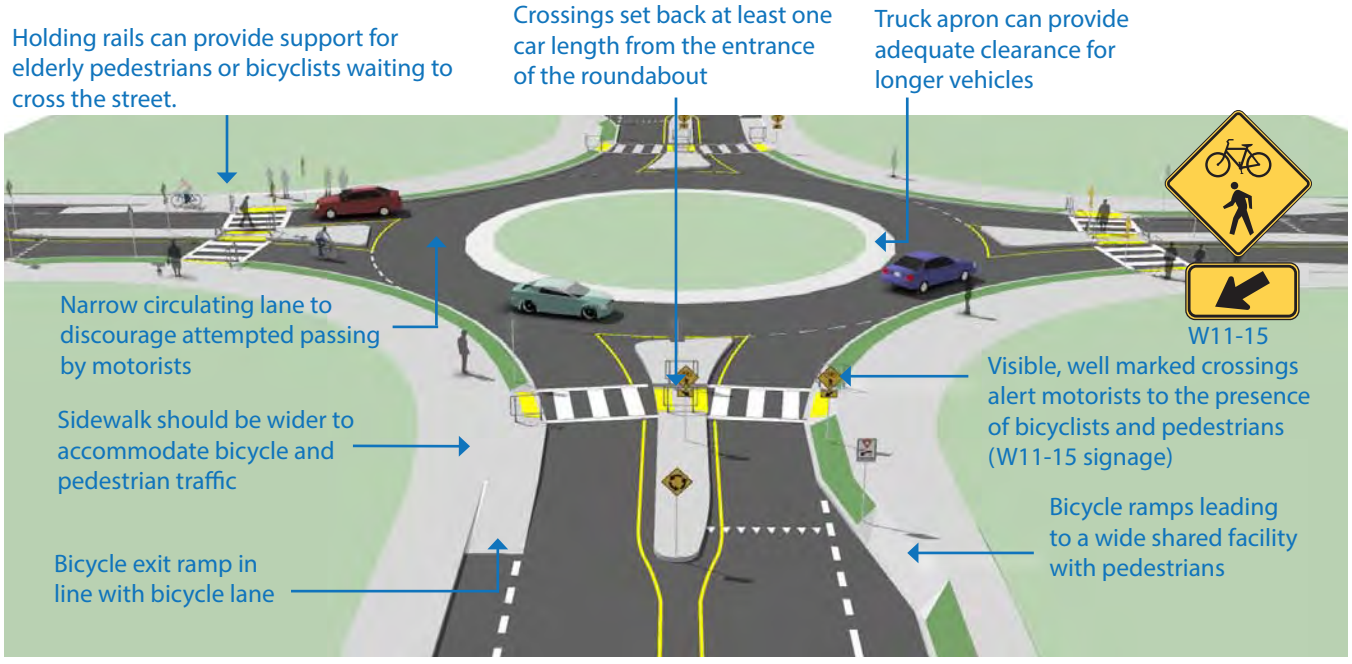
Traffic Circles (also known as rotaries) are old style circular intersections where traffic signals or stop signs are used to control one or more entry.

Mini Roundabouts (also called neighborhood traffic circles) are small-sized circular intersections of local streets. They may be uncontrolled or stop controlled, and do not channelize entry.

Guidance

It is important to indicate to motorists, bicyclists and pedestrians the right-of-way rules and correct way for them to circulate in the roundabout.

- 25 mph maximum circulating design speed. Design approaches/exits to the lowest speeds possible.
- Encourage bicyclists navigating the roundabout like motor vehicles to "take the lane."
- Maximize yielding rate of motorists to pedestrians and bicyclists at crosswalks.
- Provide separated facilities for bicyclists who prefer not to navigate the roundabout on the roadway.



Discussion

On bicycle routes a roundabout is preferable to stop control as bicyclists do not like to lose their momentum due to the physical effort required. At intersections of shared-use paths, pedestrian and bicycle only roundabouts are an excellent form of non-motorized user traffic control.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
TRB. *NCHRP 672 Roundabouts: An Informational Guide.* 2010
TRB. *NCHRP Report 572 Roundabouts in the United States.* 2007.
Hourdos, John et al. *Investigation of Pedestrian/Bicyclist Risk in Minnesota Roundabout Crossings.* 2012.
TRB. *NCHRP 674 Crossing Solutions at Roundabouts and Channelized Turn Lanes for Pedestrians with Vision Disabilities.* 2011.
Shaw and Moler. *Bicyclist- and Pedestrian-Only Roundabouts.* 2009. FHWA.
Brown, Rick. *The Case of Roundabouts.* 2012.

Materials and Maintenance

Signage and striping require routine maintenance.

Channelized Turn Lane

Description

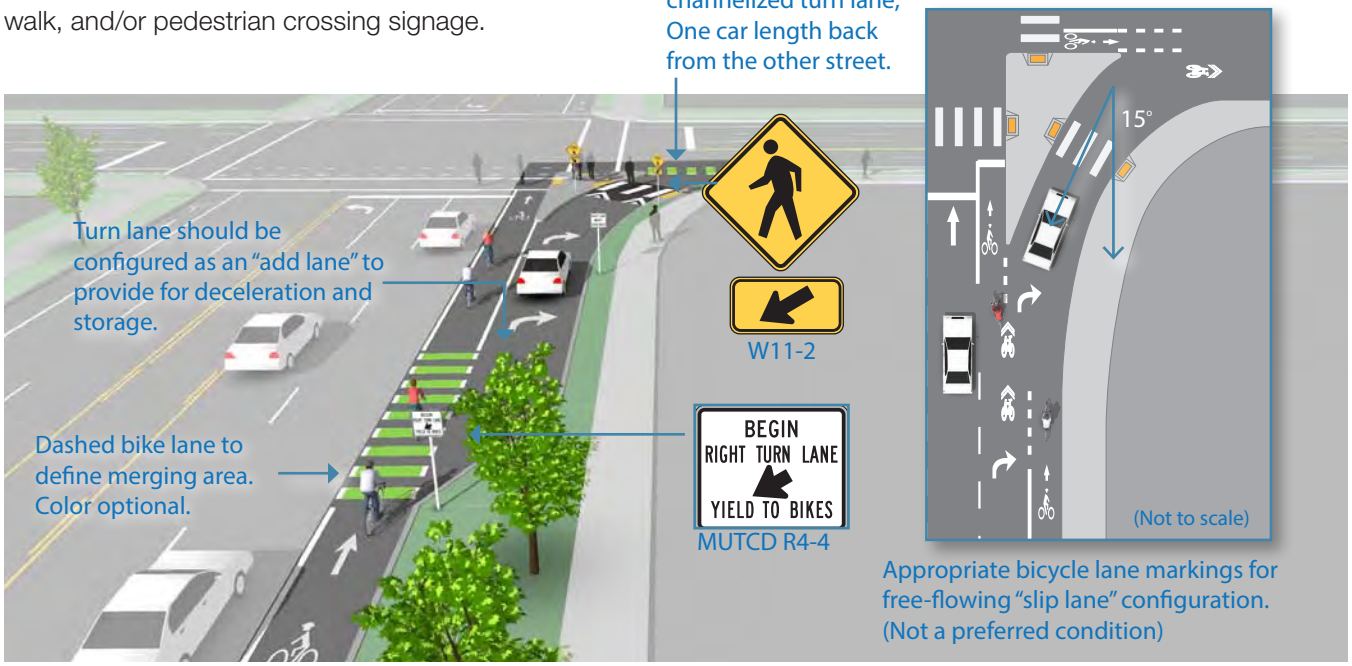
In some intersections of arterials streets, design vehicle requirements or intersection angles may result in wide turning radii at corners. Configuring the intersection as a channelized (or free-right) turn lane with a raised refuge island can improve conditions for pedestrians trying to cross the street.

Similar to a median refuge island, the raised refuge island can reduce crossing distances, allow staged crossing of the roadway, and improve visibility of pedestrians crossing the roadway.

To improve safety and comfort for pedestrians, measures to slow traffic at the pedestrian crossing are recommended such as provision of a raised crosswalk, signalized pedestrian walk phase, high visibility crosswalk, and/or pedestrian crossing signage.

Guidance

- The preferred angle of intersection between the channelized turn lane and the roadway being joined is no more than 15 degrees to allow for simultaneous visibility of pedestrians and potential roadway gaps.
- Design with a maximum 30-35 foot turning radius.
- Signing: Pedestrian crossing sign assembly (W11-2) or Yield (R1-2) to encourage yielding. Yield to Bikes (R4-4) or similar if bike lanes are present.
- Raised Crossings in the channelized turn lane may slow driver speed through the turning area.



Discussion

This design requires trucks to turn into multiple receiving lanes, and may not be appropriate on the approach to streets with one through lane. Channelized turn lanes can be very challenging for blind pedestrians. NCHRP 674 identified the use of sound strips (a full lane rumble strip-like device) in conjunction with flashing beacons to increase yielding compliance.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
TRB. *NCHRP 674 Crossing Solutions at Roundabouts and Channelized Turn Lanes for Pedestrians with Vision Disabilities.* 2011.
ITE. *Designing Walkable Urban Thoroughfares.* 2010.

Materials and Maintenance

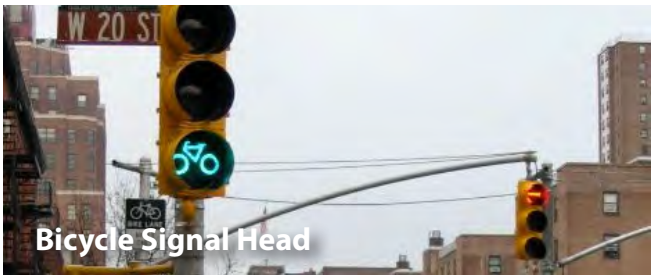
Signage and striping require routine maintenance.

5.6 Signalization

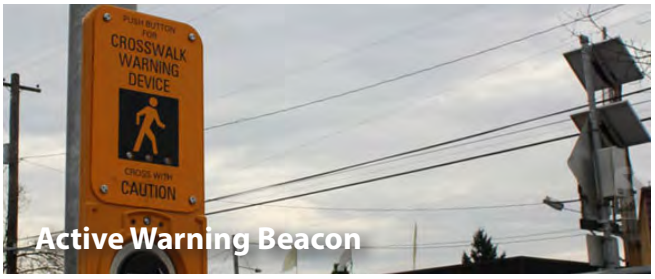
Determining which type of signal or beacon to use for a particular intersection depends on a variety of factors. These include speed limits, Average Daily Traffic (ADT), anticipated bicycle crossing traffic, and the configuration of planned or existing bicycle facilities. Signals may be necessary as part of the construction of a protected bicycle facility such as a cycle track with potential turning conflicts, or to decrease vehicle or pedestrian conflicts at major crossings. An intersection with bicycle signals may reduce stress and delays for a crossing bicyclist, and discourage illegal and unsafe crossing maneuvers.

This Section Includes:


Bicycle Detection and Actuation



Bicycle Signal Head



Active Warning Beacon


Hybrid Beacon (HAWK)

Bicycle Detection and Actuation

Description

Push Button Actuation

User-activated button mounted on a pole facing the street.

Loop Detectors

Bicycle-activated loop detectors are installed within the roadway to allow the presence of a bicycle to trigger a change in the traffic signal. This allows the bicyclist to stay within the lane of travel without having to maneuver to the side of the road to trigger a push button.

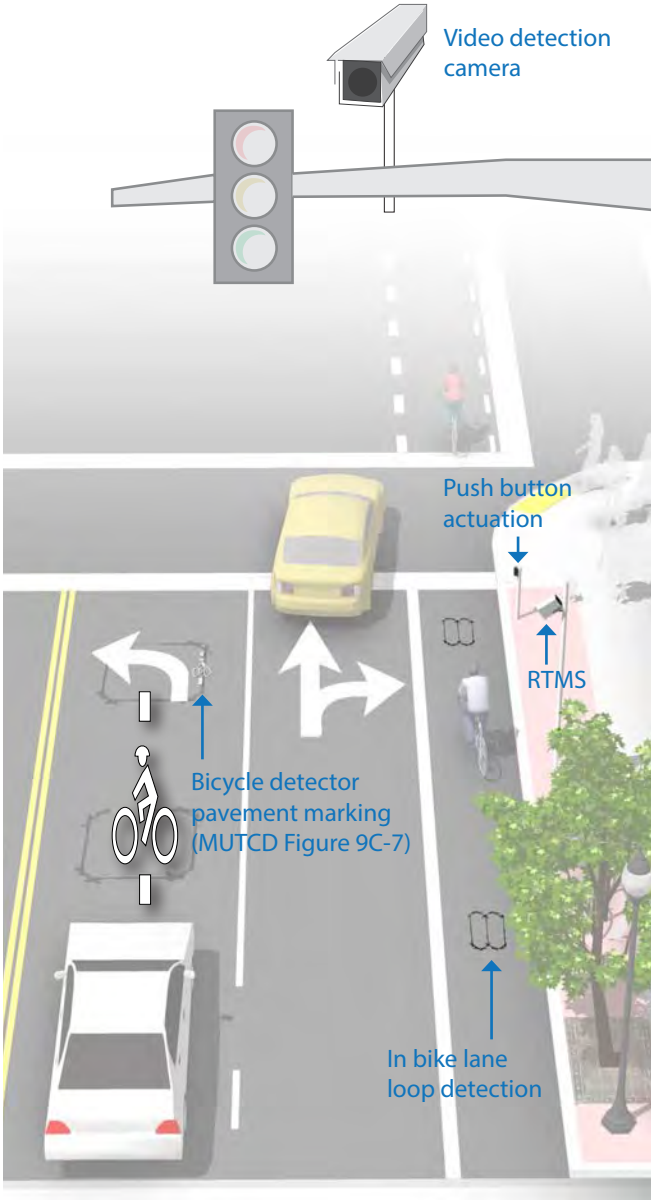
Loops that are sensitive enough to detect bicycles should be supplemented with pavement markings to instruct bicyclists how to trip them.

Video Detection Cameras

Video detection systems use digital image processing to detect a change in the image at a location. These systems can be calibrated to detect bicycles. Video camera system costs range from $20,000 to $25,000 per intersection.

Remote Traffic Microwave Sensor Detection (RTMS)

RTMS is a system which uses frequency modulated continuous wave radio signals to detect objects in the roadway. This method marks the detected object with a time code to determine its distance from the sensor. The RTMS system is unaffected by temperature and lighting, which can affect standard video detection.



Discussion

Proper bicycle detection should meet two primary criteria: 1) accurately detects bicyclists and 2) provides clear guidance to bicyclists on how to actuate detection (e.g., what button to push, where to stand).
The requirement for bicycle detection at all new and modified approaches to traffic signals is formalized in Policy Directive 09-06 and is included in the CA MUTCD 2012.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
NACTO. *Urban Bikeway Design Guide.* 2012.
Caltrans *CA-MUTCD.* 2012
Caltrans. *Policy Directive 09-06.* 2009.
Caltrans. *Complete Intersections.* 2010.

Materials and Maintenance

Signal detection and actuation for bicyclists should be maintained with other traffic signal detection and roadway pavement markings.

Bicycle Signal Head

Description

A bicycle signal is an electrically powered traffic control device that should only be used in combination with an existing conventional or hybrid signal. Bicycle signals are typically used to improve identified safety or operational problems involving bicycle facilities. Bicycle signal heads may be installed at signalized intersections to indicate bicycle signal phases and other bicycle-specific timing strategies. Bicycle signals can be actuated with bicycle sensitive loop detectors, video detection, or push buttons.

Bicycle signal heads use standard three-lens signal heads in green, yellow, and red. Bicycle signals are typically used to provide guidance for bicyclists at intersections where they may have different needs from other road users (e.g., bicycle-only movements, or leading bicycle intervals).

Guidance

California MUTCD Bicycle Signal Warrant is based off bicyclist volumes, collision history, or geometric warrants:

- Those with high volume of bicyclists at peak hours
- Those with high numbers of bicycle/motor vehicle crashes, especially those caused by turning vehicle movements
- Where a multi-use path intersects a roadway
- At locations to facilitate a bicycle movement that is not permitted for a motor vehicle

Discussion

See CA MUTCD Section 4C.102 for detailed warrant requirements.

For improved visibility, smaller (4 inch lens) near-sided bicycle signals should be considered to supplement far-side signals.

Additional References and Guidelines

NACTO. *Urban Bikeway Design Guide.* 2012.
The National Committee on Uniform Traffic Control Devices has formed a Task Force that is considering adding guidance to the MUTCD on the use of bicycle signals.

Materials and Maintenance

Bicycle signal heads require the same maintenance as standard traffic signal heads, such as replacing bulbs and responding to power outages.

Active Warning Beacon

Description

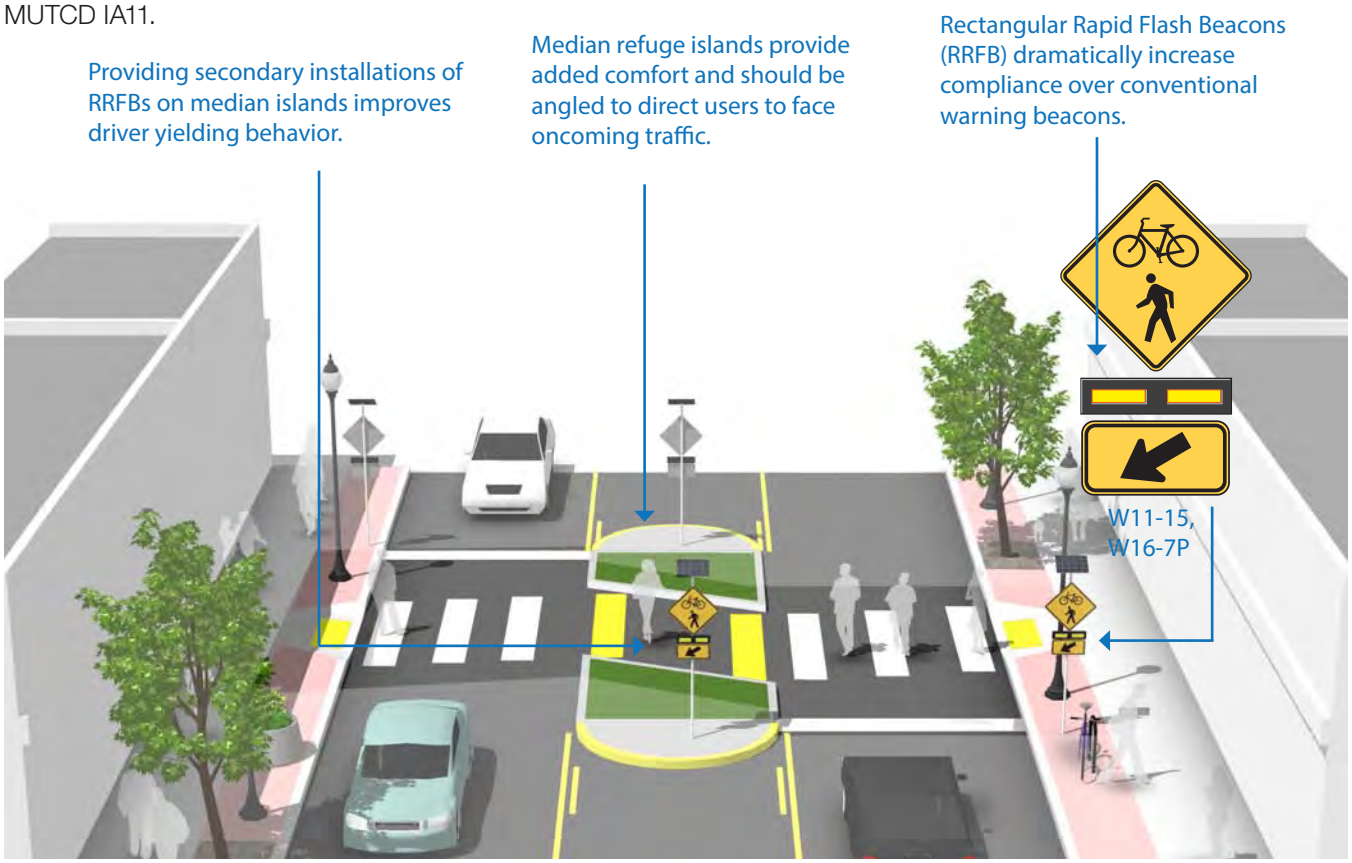
Active warning beacons are user actuated illuminated devices designed to increase motor vehicle yielding compliance at crossings of multi lane or high volume roadways.

Types of active warning beacons include conventional circular yellow flashing beacons, in-roadway warning lights, or Rectangular Rapid Flash Beacons (RRFB).

RRFBs have blanket approval in California per FHWA MUTCD IA11.

Guidance

- Warning beacons shall not be used at crosswalks controlled by YIELD signs, STOP signs or traffic signals.
- Warning beacons shall initiate operation based on pedestrian or bicyclist actuation and shall cease operation at a predetermined time after actuation or, with passive detection, after the pedestrian or bicyclist clears the crosswalk.



Discussion

Rectangular rapid flash beacons have the highest compliance of all the warning beacon enhancement options. A study of the effectiveness of going from a no-beacon arrangement to a two-beacon RRFB installation increased yielding from 18 percent to 81 percent. A four-beacon arrangement raised compliance to 88 percent.

Additional References and Guidelines

NACTO. *Urban Bikeway Design Guide.* 2012.
Caltrans *CA-MUTCD.* 2012
FHWA. *Interim Approval (IA-11).* 2008.
Caltrans. *Complete Intersections.* 2010.

Materials and Maintenance

Depending on power supply, maintenance can be minimal. If solar power is used, RRFBs can run for years without issue.

Pedestrian Hybrid Beacon

Description

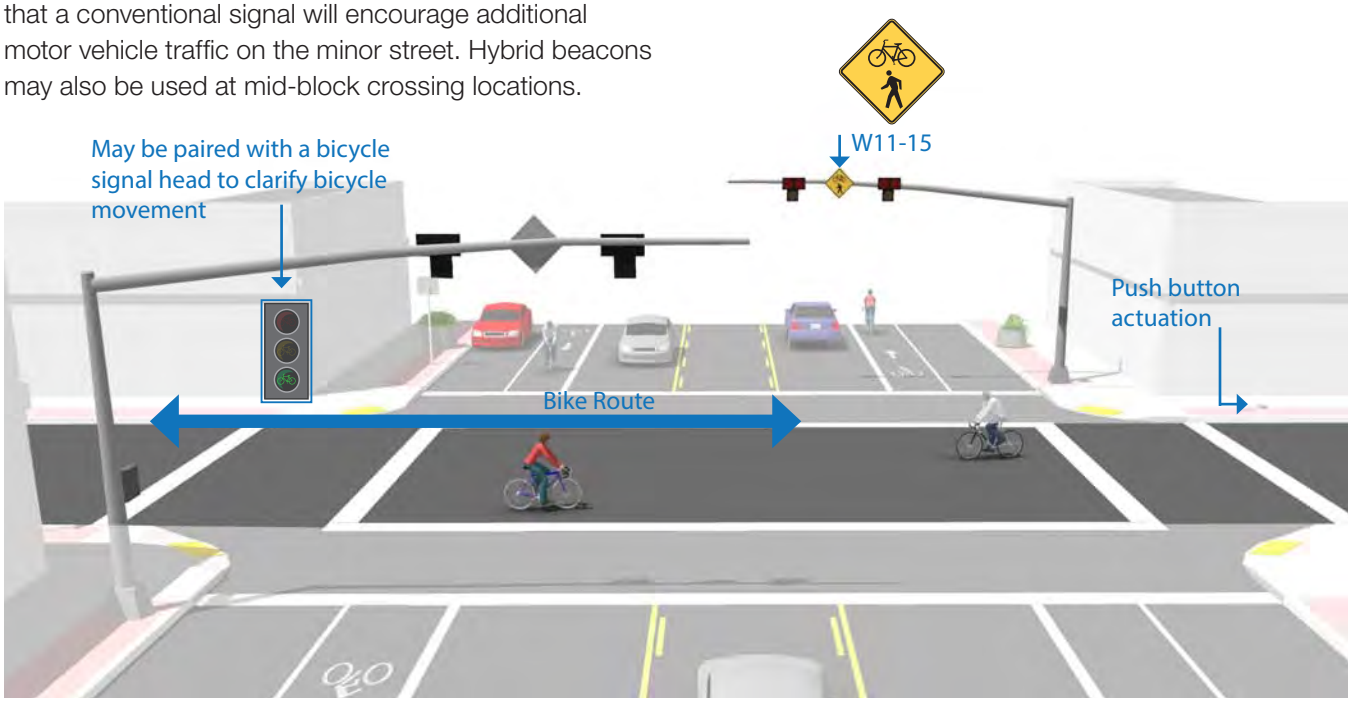
A pedestrian hybrid beacon, previously known as a High-intensity Activated Crosswalk (HAWK), consists of a signal-head with two red lenses over a single yellow lens on the major street, and pedestrian and/or **bicycle signal heads** for the minor street. There are no signal indications for motor vehicles on the minor street approaches. At a cost of about $85,000 per installation, a beacon is less than a third of the cost of a typical traffic signal.

Pedestrian hybrid beacons are used to improve non-motorized crossings of major streets in locations where side-street volumes do not support installation of a conventional traffic signal or where there are concerns that a conventional signal will encourage additional motor vehicle traffic on the minor street. Hybrid beacons may also be used at mid-block crossing locations.

Guidance

Pedestrian hybrid beacons may be installed without meeting traffic signal control warrants if roadway speed and volumes are excessive for comfortable user crossing.

- If installed within a signal system, signal engineers should evaluate the need for the pedestrian hybrid beacon to be coordinated with other signals.
- Parking and other sight obstructions should be prohibited for at least 100 feet in advance of and at least 20 feet beyond the marked crosswalk to provide adequate sight distance.



Discussion

The hybrid beacon can significantly improve the operation of a bicycle route, particularly along **bicycle boulevard** corridors. Each crossing, regardless of traffic speed or volume, requires additional review by a registered transportation engineer to identify sight lines, potential impacts on traffic, signal timing, capacity and safety.

Additional References and Guidelines

Caltrans *CA-MUTCD.* 2012
NACTO. *Urban Bikeway Design Guide.* 2012.
FHWA. *Safety Effectiveness of the HAWK Pedestrian Crossing Treatment.* 2010.

Materials and Maintenance

Signing and striping need to be maintained to help users understand any unfamiliar traffic control.

5.7 Bikeway Signing

The ability to navigate through a city is informed by landmarks, natural features and other visual cues. Signs throughout the city should indicate to bicyclists:

- Direction of travel
- Location of destinations
- Travel time/distance to those destinations

These signs will increase users' comfort and accessibility to the bicycle systems.

Signage can serve both wayfinding and safety purposes including:

- Helping to familiarize users with the bicycle network
- Helping users identify the best routes to destinations
- Helping to address misperceptions about time and distance
- Helping overcome a "barrier to entry" for people who are not frequent bicyclists (e.g., "interested but concerned" bicyclists)

A community-wide bicycle wayfinding signage plan would identify:

- Sign locations
- Sign type – what information should be included and design features
- Destinations to be highlighted on each sign – key destinations for bicyclists
- May include approximate distance and travel time to each destination

Bicycle wayfinding signs also visually cue motorists that they are driving along a bicycle route and should use caution. Signs are typically placed at key locations leading to and along bicycle routes, including the intersection of multiple routes. Too many road signs tend to clutter the right-of-way, and it is recommended that these signs be posted at a level most visible to bicyclists rather than per vehicle signage standards.

This Section Includes:

Wayfinding Sign Type


Wayfinding Sign Placement

Wayfinding Sign Types

Description

A bicycle wayfinding system consists of comprehensive signing and/or pavement markings to guide bicyclists to their destinations along preferred bicycle routes. There are three general types of wayfinding signs:

Confirmation Signs

- Indicate to bicyclists that they are on a designated bikeway. Make motorists aware of the bicycle route.
- May include destinations and distance/time. Do not include arrows.

Turn Signs

- Indicate where a bikeway turns from one street onto another street. Can be used with pavement markings.
- Include destinations and arrows.

Decisions Signs

- Mark the junction of two or more bikeways.
- Inform bicyclists of the designated bike route to access key destinations.
- Destinations and arrows are required, distances are optional but recommended.
- The inclusion of bicycle travel time is non-standard, but is recommended.

Discussion

There is no standard color for bicycle wayfinding signage. Section 1A.12 of the MUTCD establishes the general meaning for signage colors. Green is the color used for directional guidance and is the most common color of bicycle wayfinding signage in the US, including those in the MUTCD.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
Caltrans *CA-MUTCD.* 2012
NACTO. *Urban Bikeway Design Guide.* 2012.

Materials and Maintenance

Maintenance needs for bicycle wayfinding signs are similar to other signs and will need periodic replacement due to wear.

Wayfinding Sign Placement

Guidance

Signs are typically placed at decision points along bicycle routes – typically at the intersection of two or more bikeways and at other key locations leading to and along bicycle routes.

Decisions Signs

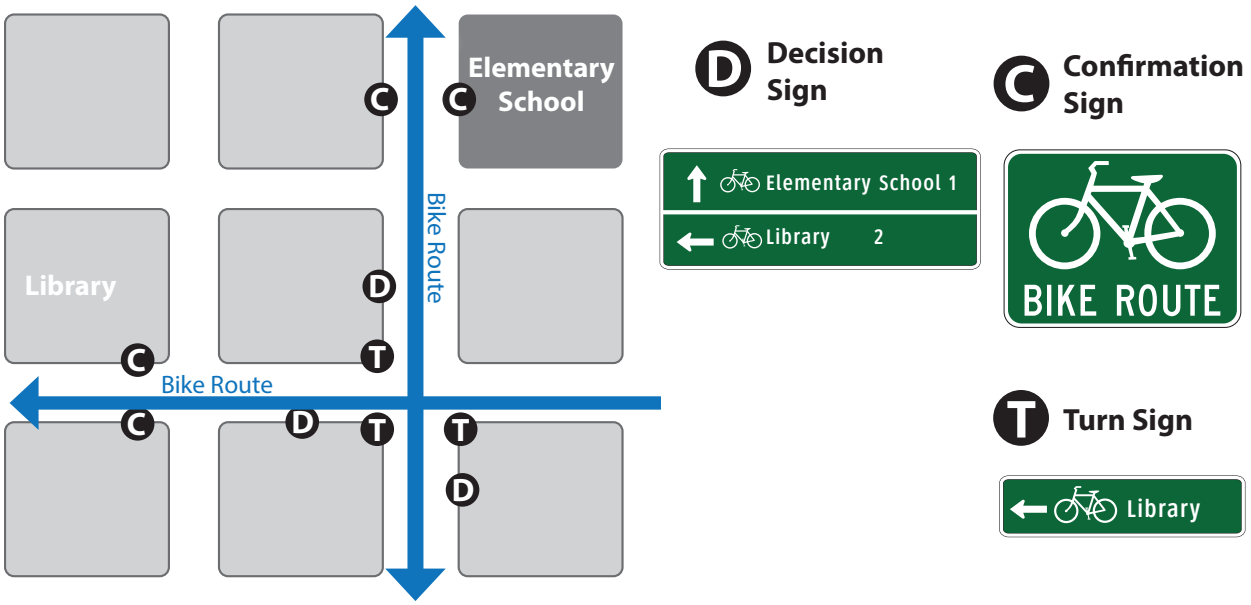
- Near-side of intersections in advance of a junction with another bicycle route.
- Along a route to indicate a nearby destination.

Confirmation Signs

- Every ¼ to ½ mile on off-street facilities and every 2 to 3 blocks along on-street bicycle facilities, unless another type of sign is used (e.g., within 150 feet of a turn or decision sign). Should be placed soon after turns to confirm destination(s). Pavement markings can also act as confirmation that a bicyclist is on a preferred route.

Turn Signs

- Near-side of intersections where bike routes turn (e.g., where the street ceases to be a bicycle route or does not go through). Pavement markings can also indicate the need to turn to the bicyclist.



Discussion

It can be useful to classify a list of destinations for inclusion on the signs based on their relative importance to users throughout the area. A particular destination's ranking in the hierarchy can be used to determine the physical distance from which the locations are signed.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
Caltrans *CA-MUTCD.* 2012
NACTO. *Urban Bikeway Design Guide.* 2012.

Materials and Maintenance

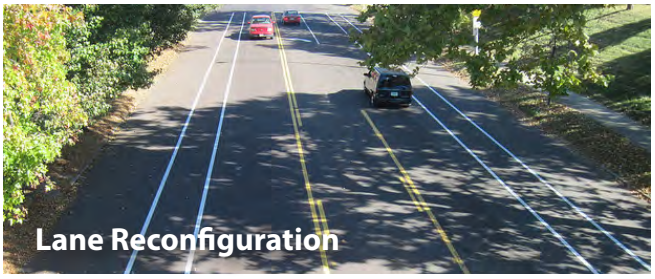
Maintenance needs for bicycle wayfinding signs are similar to other signs and will need periodic replacement due to wear.

5.8 Retrofitting Existing Streets to add Bikeways

Most major streets are characterized by conditions (e.g., high vehicle speeds and/or volumes) for which dedicated bike lanes are the most appropriate facility to accommodate safe and comfortable riding. Although opportunities to add bike lanes through roadway widening may exist in some locations, many major streets have physical and other constraints that would require street retrofit measures within existing curb-to-curb widths. As a result, much of the guidance provided in this section focuses on effectively reallocating existing street width through striping modifications to accommodate dedicated bike lanes.

Although largely intended for major streets, these measures may be appropriate for any roadway where bike lanes would be the best accommodation for bicyclists.

This Section Includes:



Lane Narrowing

Description

Lane narrowing utilizes roadway space that exceeds minimum standards to provide the needed space for bike lanes. Many roadways have existing travel lanes that are wider than those prescribed in local and national roadway design standards, or which are not marked. Most standards allow for the use of 11 foot and sometimes 10 foot wide travel lanes to create space for bike lanes.

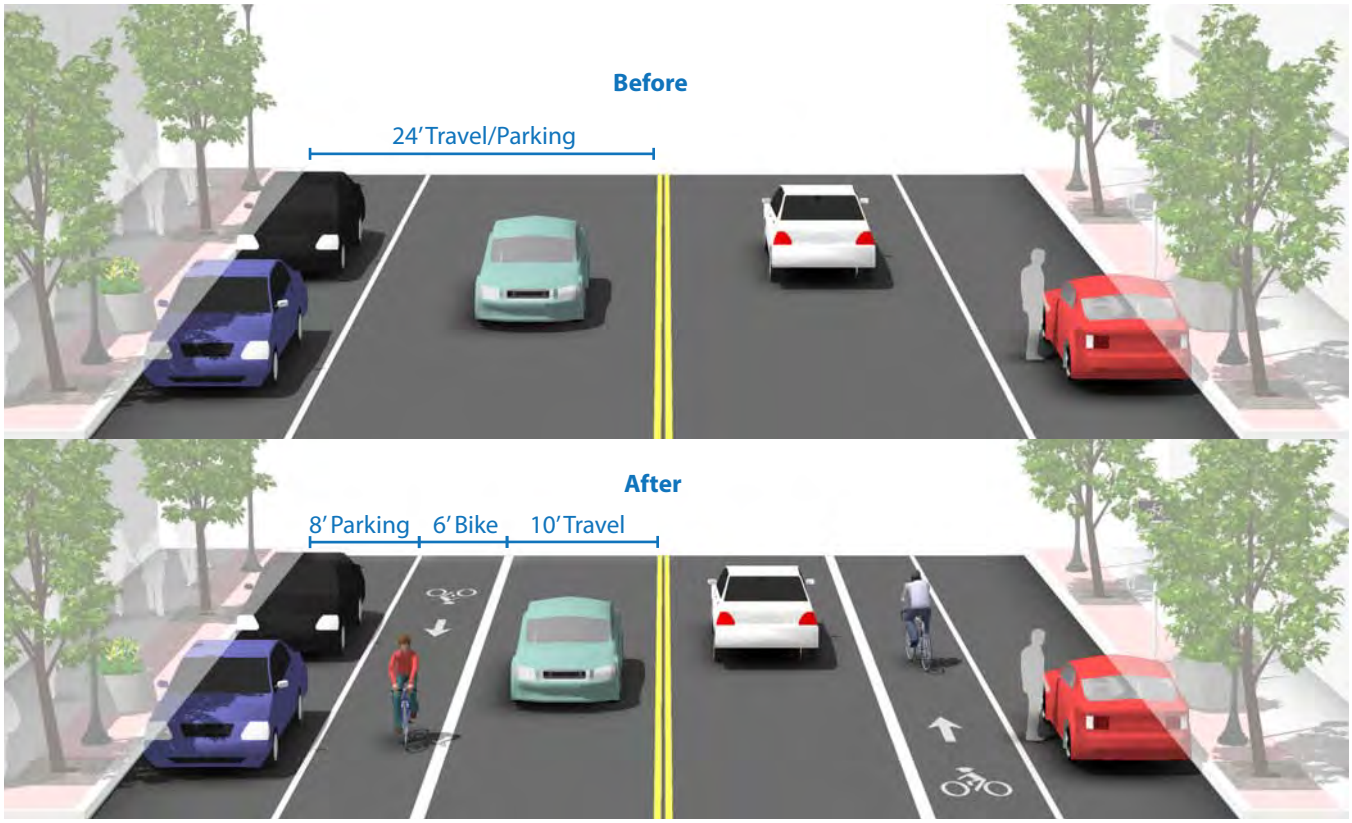
Guidance

Vehicle lane width:

- Before: 10-15 feet
- After: 10-11 feet

Bicycle lane width:

- Guidance on **Bicycle Lanes** applies to this treatment



Discussion

Special consideration should be given to the amount of heavy vehicle traffic and horizontal curvature before the decision is made to narrow travel lanes. Center turn lanes can also be narrowed in some situations to free up pavement space for bike lanes.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
AASHTO. *A Policy on Geometric Design of Highways and Streets.* 2011.
Caltrans. *California HDM.* 2012.
Caltrans. *Main Streets.* 2005.

Materials and Maintenance

Repair rough or uneven pavement surface. Use bicycle compatible drainage grates. Raise or lower existing grates and utility covers so they are flush.

Lane Reconfiguration

Description

The removal of a single travel lane will generally provide sufficient space for bike lanes on both sides of a street. Streets with excess vehicle capacity provide opportunities for bike lane retrofit projects.

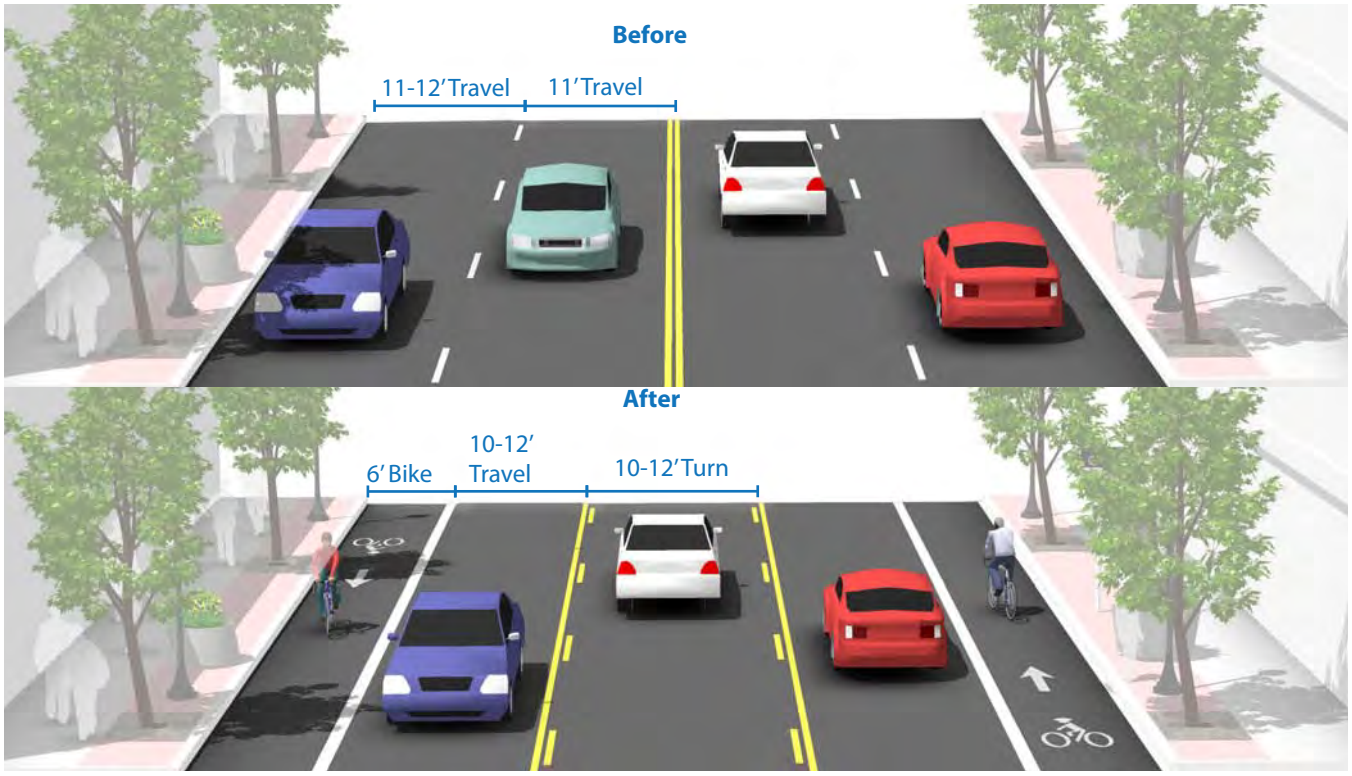
Guidance

Vehicle lane width:

- Width depends on project. No narrowing may be needed if a lane is removed.

Bicycle lane width:

- Guidance on **Bicycle Lanes** applies to this treatment.



Discussion

Depending on a street's existing configuration, traffic operations, user needs and safety concerns, various lane reduction configurations may apply. For instance, a four-lane street (with two travel lanes in each direction) could be modified to provide one travel lane in each direction, a center turn lane, and bike lanes.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
FHWA. *Evaluation of Lane Reduction "Road Diet" Measures on Crashes.* 2010.
Caltrans. *Main Streets.* 2005.

Materials and Maintenance

Repair rough or uneven pavement surface. Use bicycle compatible drainage grates. Raise or lower existing grates and utility covers so they are flush.

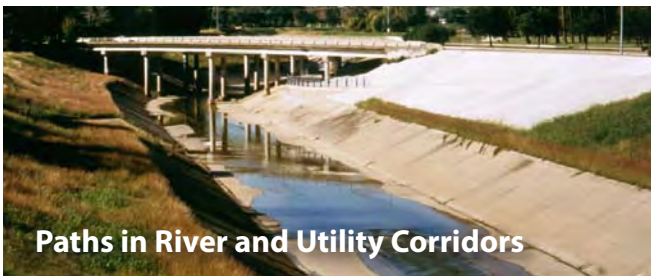
5.9 Shared-use Paths

A shared-use path allows for two-way, off-street bicycle use and also may be used by pedestrians, skaters, wheelchair users, joggers and other non-motorized users. These facilities are frequently found in parks, along rivers, beaches, and in greenbelts or utility corridors where there are few conflicts with motorized vehicles. Path facilities can also include amenities such as lighting, signage, and fencing (where appropriate).

Key features of greenways include:

- Frequent access points from the local road network.
- Directional signs to direct users to and from the path.
- A limited number of at-grade crossings with streets or driveways.
- Terminating the path where it is easily accessible to and from the street system.
- Separate treads for pedestrians and bicyclists when heavy use is expected.

This Section Includes:



General Design Practices

Description

Shared-use paths can provide a desirable facility, particularly for recreation, and users of all skill levels preferring separation from traffic. Bicycle paths should generally provide directional travel opportunities not provided by existing roadways.

Guidance

Width

- 8 feet is the minimum allowed for a two-way bicycle path and is only recommended for low traffic situations.
- 10 feet is recommended in most situations and will be adequate for moderate to heavy use.
- 12 feet is recommended for heavy use situations with high concentrations of multiple users. A separate track (5' minimum) can be provided for pedestrian use.

Lateral Clearance

- A 2 foot or greater shoulder on both sides of the path should be provided. An additional foot of lateral clearance (total of 3') is required by the MUTCD for the installation of signage or other furnishings.
- If bollards are used at intersections and access points, they should be colored brightly and/or supplemented with reflective materials to be visible at night.

Overhead Clearance

- Clearance to overhead obstructions should be 8 feet minimum, with 10 feet recommended.

Striping

- When striping is required, use a 4 inch dashed yellow centerline stripe with 4 inch solid white edge lines.
- Solid centerlines can be provided on tight or blind corners, and on the approaches to roadway crossings.

Discussion

The AASHTO Guide for the Development of Bicycle Facilities generally recommends against the development of **shared-use paths along roadways**.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
Caltrans *CA-MUTCD.* 2012
Flink, C. *Greenways.* 1993.
Caltrans. *California HDM.* 2012.

Materials and Maintenance

Asphalt is the most common surface for bicycle paths. The use of concrete for paths has proven to be more durable over the long term.

Paths in River and Utility Corridors

Description

Utility and waterway corridors often offer excellent shared-use path development and bikeway gap closure opportunities. Utility corridors typically include powerline and sewer corridors, while waterway corridors include canals, drainage ditches, rivers, and beaches. These corridors offer excellent transportation and recreation opportunities for bicyclists of all ages and skills.

Guidance

Shared-use paths in utility corridors should meet or exceed **general design practices**. If additional width allows, wider paths, and landscaping are desirable.

Access Points

Any access point to the path should be well-defined with appropriate signage designating the pathway as a bicycle facility and prohibiting motor vehicles.

Path Closure

Public access to the path may be prohibited during the following events:

- Canal/flood control channel or other utility maintenance activities
- Inclement weather or the prediction of storm conditions

Discussion

Similar to railroads, public access to flood control channels or canals is undesirable by all parties. Appropriate fencing may be required to keep path users within the designated travel way. Creative design of fencing is encouraged to make the path facility feel welcoming to the user.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
Caltrans *CA-MUTCD.* 2012
Flink, C. *Greenways.* 1993.

Materials and Maintenance

If concrete is used, saw cut concrete joints rather than troweled improve the experience of path users.

Paths in Abandoned Rail Corridors

Description

Commonly referred to as Rails-to-Trails or Rail-Trails, these projects convert vacated rail corridors into off-street paths. Rail corridors offer several advantages, including relatively direct routes between major destinations and generally flat terrain.

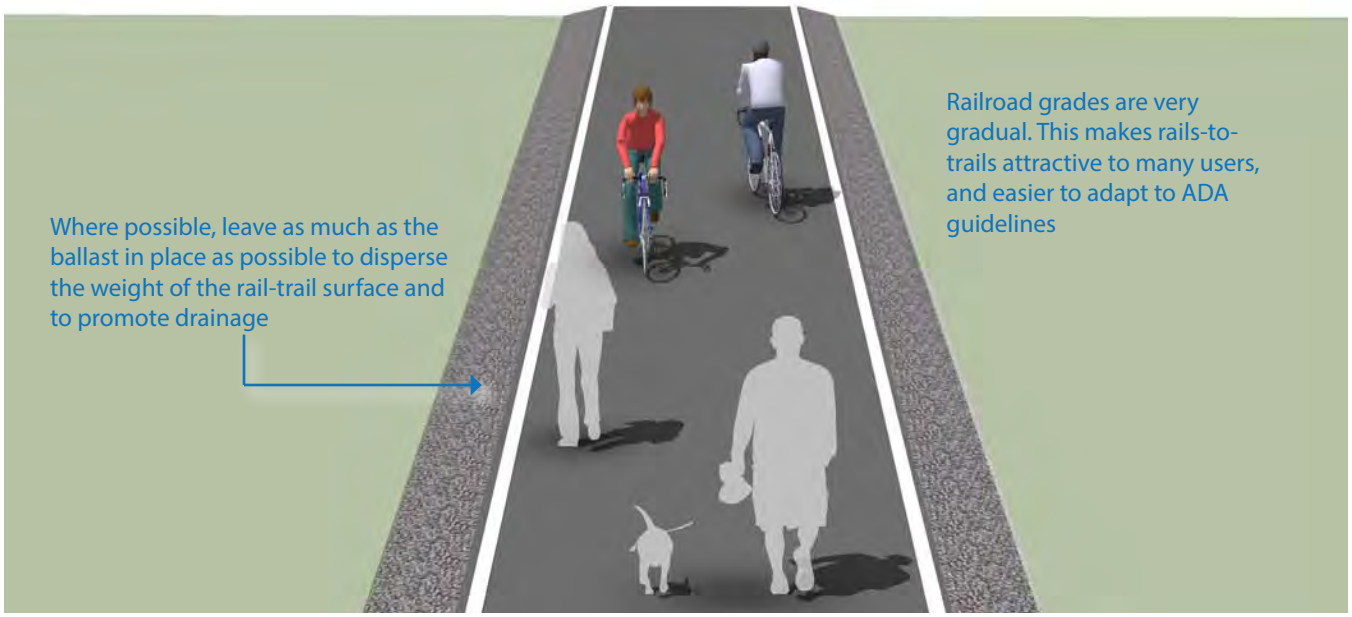
In some cases, rail owners may rail-bank their corridors as an alternative to a complete abandonment of the line, thus preserving the rail corridor for possible future use.

Guidance

Shared-use paths in abandoned rail corridors should meet or exceed **general design practices**. If additional width allows, wider paths and landscaping are desirable.

In full conversions of abandoned rail corridors, the subbase, superstructure, drainage, bridges, and crossings are already established. Design becomes a matter of working with the existing infrastructure to meet the needs of a rail-trail.

If converting a rail bed adjacent to an active rail line, see **Paths in Active Rail Corridors**.



Discussion

It is often impractical and costly to add material to existing railroad bed fill slopes. This results in trails that meet minimum path widths, but often lack preferred shoulder and lateral clearance widths.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
Caltrans *CA-MUTCD.* 2012
Flink, C. *Greenways.* 1993.

Materials and Maintenance

If concrete is used, saw cut concrete joints rather than troweled improve the experience of path users.

Paths in Active Rail Corridors

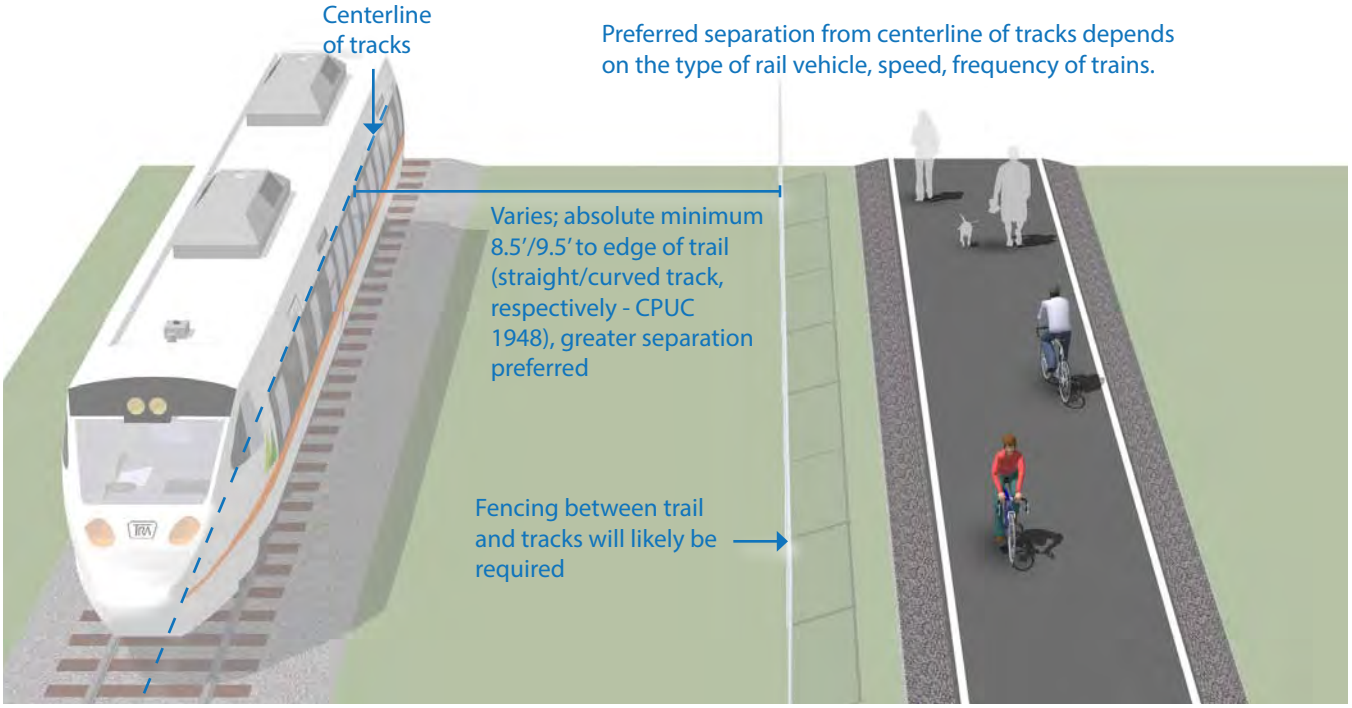
Description

Rails-with-Trails projects typically consist of paths adjacent to active railroads. It should be noted that some constraints could impact the feasibility of rail-with-trail projects. In some cases, space needs to be preserved for future planned freight, transit or commuter rail service. In other cases, limited right-of-way width, inadequate setbacks, concerns about safety/trespassing, and numerous mid-block crossings may affect a project's feasibility.

Guidance

Paths in utility corridors should meet or exceed **general design standards**. If additional width allows, wider paths, and landscaping are desirable.

If required, fencing should be a minimum of 5 feet in height with higher fencing than usual next to sensitive areas such as switching yards. Setbacks from the active rail line will vary depending on the speed and frequency of trains, and available right-of-way.



Discussion

Railroads typically require fencing with all rail-with-trail projects. Concerns with trespassing and security can vary with the amount of train traffic on the adjacent rail line and the setting of the bicycle path, i.e. whether the section of track is in an urban or rural setting.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
Caltrans *CA-MUTCD.* 2012
FHWA. *Rails-with-Trails: Lessons Learned.* 2002.
California Public Utilities Commission. General Orders.

Materials and Maintenance

If concrete is used, saw cut concrete joints rather than troweled improve the experience of path users.

Local Neighborhood Accessways

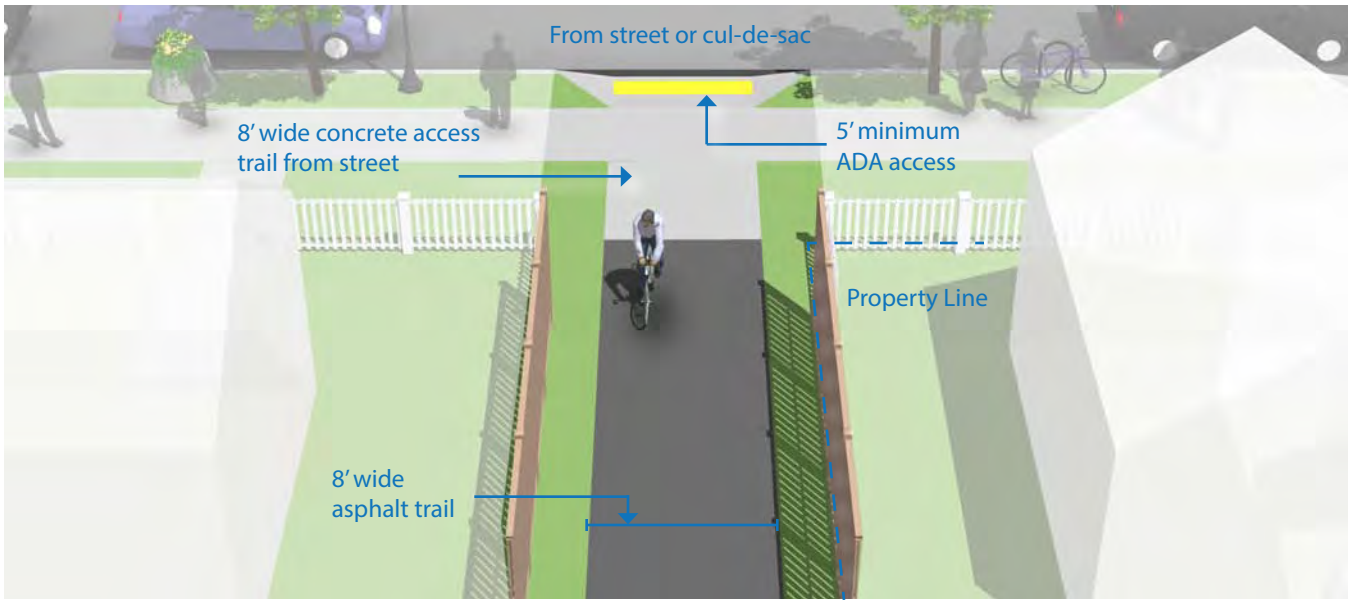
Description

Neighborhood accessways provide residential areas with direct bicycle and pedestrian access to parks, trails, greenspaces, and other recreational areas. They most often serve as small trail connections to and from the larger trail network, typically having their own rights-of-way and easements.

Additionally, these smaller trails can be used to provide bicycle and pedestrian connections between dead-end streets, cul-de-sacs, and access to nearby destinations not provided by the street network.

Guidance

- Neighborhood accessways should remain open to the public.
- Trail pavement shall be at least 8' wide to accommodate emergency and maintenance vehicles, meet ADA requirements and be considered suitable for multi-use.
- Trail widths should be designed to be less than 8' wide only when necessary to protect large mature native trees over 18" in caliper, wetlands or other ecologically sensitive areas.
- Access trails should slightly meander whenever possible.



Discussion

Neighborhood accessways should be designed into new subdivisions at every opportunity and should be required by City/County subdivision regulations.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
Caltrans *CA-MUTCD.* 2012

Materials and Maintenance

If concrete is used, saw cut concrete joints rather than troweled improve the experience of path users.

5.10 Path/Roadway Crossings

At-grade roadway crossings can create potential conflicts between path users and motorists, however, well-designed crossings can mitigate many operational issues and provide a higher degree of safety and comfort for path users. This is evidenced by the thousands of successful facilities around the United States with at-grade crossings. In most cases, at-grade path crossings can be properly designed to provide a reasonable degree of safety and can meet existing traffic and safety standards. Path facilities that cater to bicyclists can require additional considerations due to the higher travel speed of bicyclists versus pedestrians.

In addition to guidance presented in this section, see previous entries for **Active Warning Beacons** and **Pedestrian Hybrid Beacons** for other methods for enhancing trail crossings.

This Section Includes:

Marked/Unsignalized Crossings

Description

A marked/unsignalized crossing typically consists of a marked crossing area, signage and other markings to slow or stop traffic. The approach to designing crossings at mid-block locations depends on an evaluation of vehicular traffic, line of sight, pathway traffic, use patterns, vehicle speed, road type, road width, and other safety issues such as proximity to major attractions.

When space is available, using a median refuge island can improve user safety by providing pedestrians and bicyclists space to perform the safe crossing of one side of the street at a time.

Guidance

Maximum traffic volumes

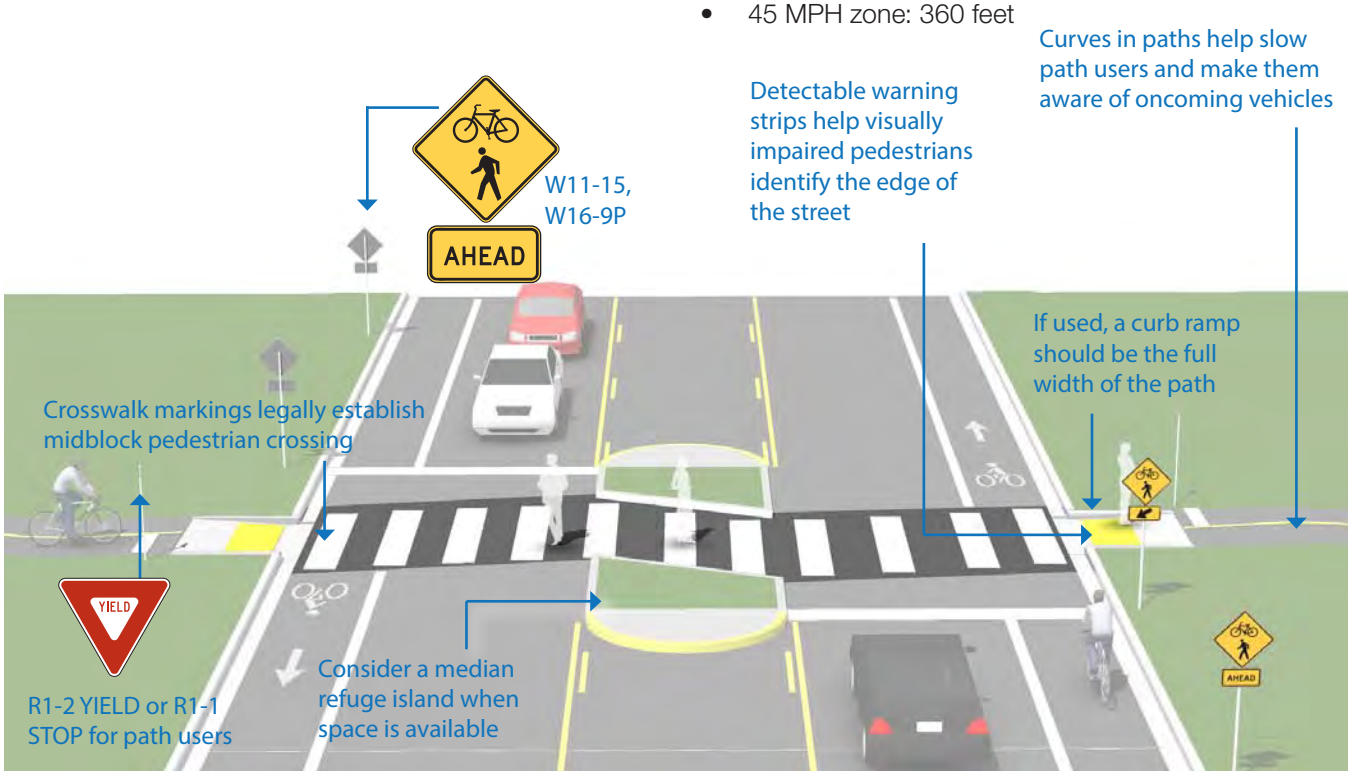
- ≤9,000-12,000 Average Daily Traffic (ADT) volume
- Up to 15,000 ADT on two-lane roads, preferably with a median
- Up to 12,000 ADT on four-lane roads with median

Maximum travel speed

- 35 MPH

Minimum line of sight

- 25 MPH zone: 155 feet
- 35 MPH zone: 250 feet
- 45 MPH zone: 360 feet



Discussion

Unsignalized crossings of multi-lane arterials over 15,000 ADT may be possible with features such as sufficient crossing gaps (more than 60 per hour), median refuges, and/or active warning devices like rectangular rapid flash beacons.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
Caltrans *CA-MUTCD.* 2012
Caltrans. *California HDM.* 2012.

Materials and Maintenance

Locate markings out of wheel tread when possible to minimize wear and maintenance costs.

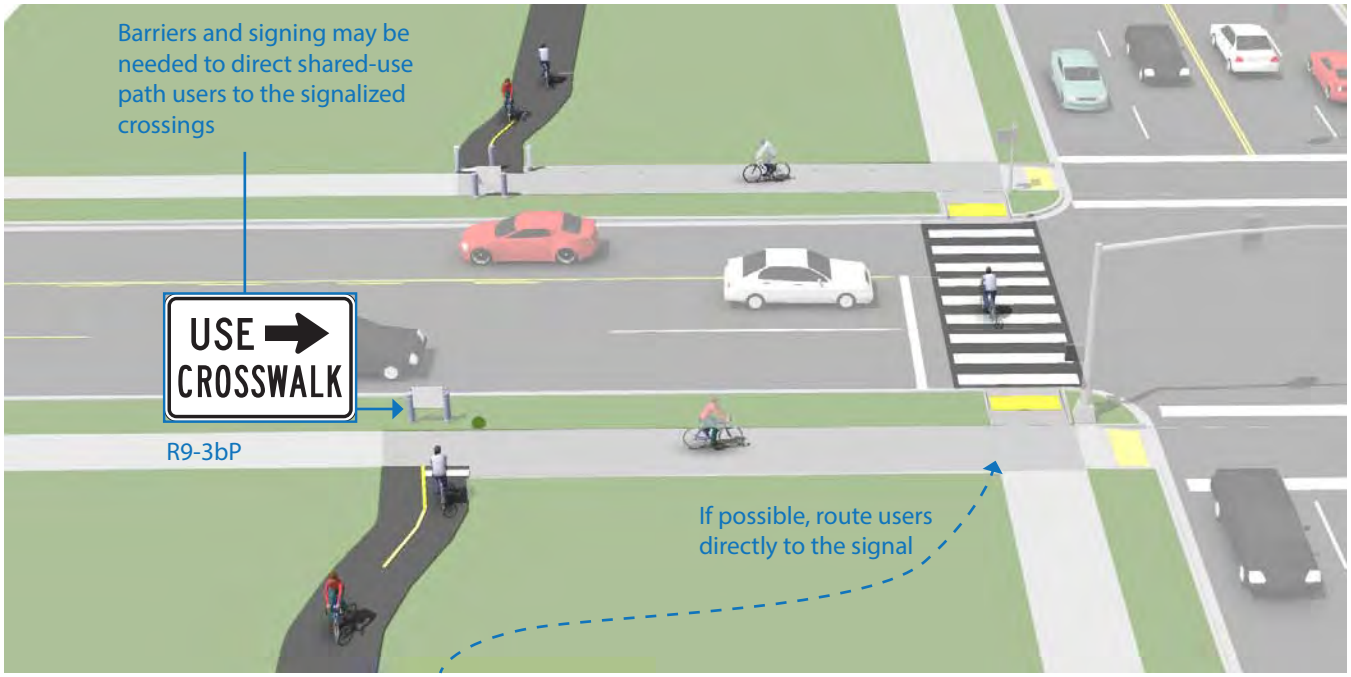
Signalized Crossings

Description

Path crossings within approximately 400 feet of an existing signalized intersection with pedestrian crosswalks are typically diverted to the signalized intersection to avoid traffic operation problems when located so close to an existing signal. For this restriction to be effective, barriers and signing may be needed to direct path users to the signalized crossing. If no pedestrian crossing exists at the signal, modifications should be made.

Guidance

Path crossings should not be provided within approximately 400 feet of an existing signalized intersection. If possible, route path directly to the signal.



Discussion

In the US, the minimum distance a marked crossing can be from an existing signalized intersection varies from approximately 250 to 660 feet. Engineering judgement and the context of the location should be taken into account when choosing the appropriate allowable setback.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
AASHTO. *Guide for the Planning, Design, and Operation of Pedestrian Facilities.* 2004.

Materials and Maintenance

If a sidewalk is used for crossing access, it should be kept clear of snow and debris and the surface should be level for wheeled users.

Overcrossings

Description

Bicycle/pedestrian overcrossings provide critical non-motorized system links by joining areas separated by barriers such as deep canyons, waterways or major transportation corridors. In most cases, these structures are built in response to user demand for safe crossings where they previously did not exist.

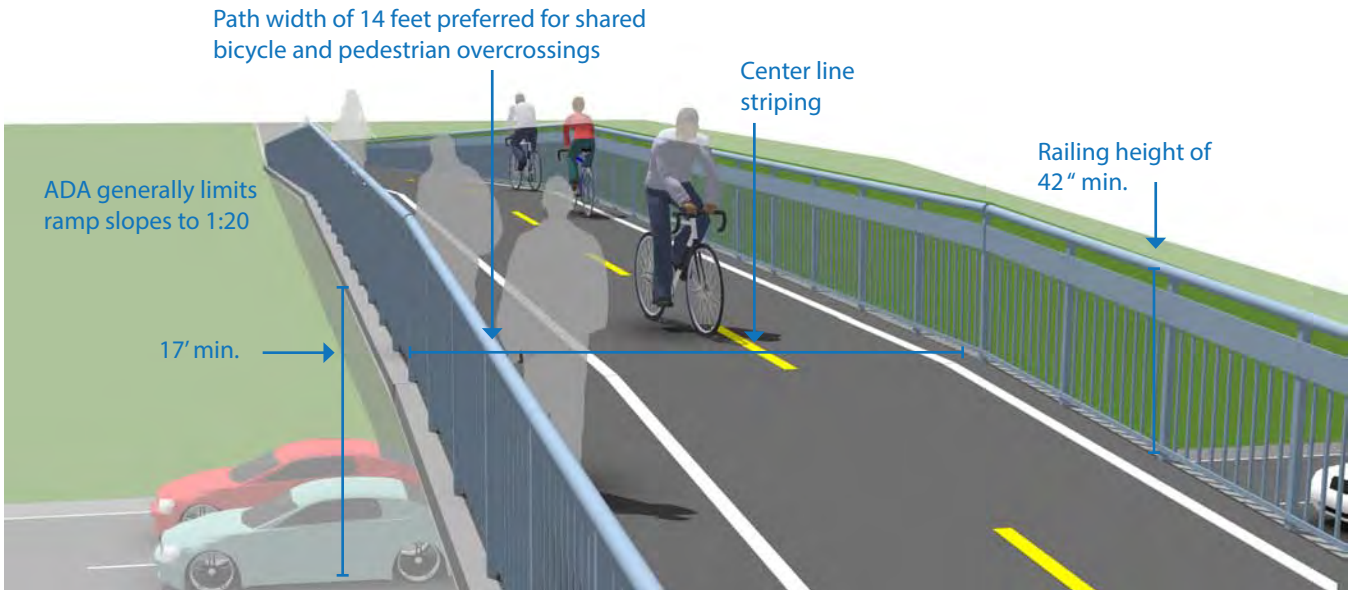
Grade-separated crossings may be needed where existing bicycle/pedestrian crossings do not exist, where ADT exceeds 25,000 vehicles, and where 85th percentile speeds exceed 45 miles per hour.

Guidance

- 8 foot minimum width, 14 feet preferred. If overcrossing has any scenic vistas additional width should be provided to allow for stopping. A separate 5 foot pedestrian area may be provided for facilities with high bicycle and pedestrian use.
- 10 foot headroom on overcrossing; clearance below will vary depending on feature being crossed.

  Roadway: 17 feet
  Freeway: 18.5 feet
  Heavy Rail Line: 23 feet

- The overcrossing should have a centerline stripe even if the rest of the path does not have one.



Discussion

Overcrossings for bicycles and pedestrians typically fall under the Americans with Disabilities Act (ADA), which strictly limits ramp slopes to 5% (1:20) with landings at 400 foot intervals, or 8.33% (1:12) with landings every 30 feet.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
AASHTO. *Guide for the Planning, Design, and Operation of Pedestrian Facilities.* 2004.

Materials and Maintenance

Potential issues with vandalism. Overcrossings can be more difficult to clear of snow than undercrossings.

5.11 Bicycle Support Facilities

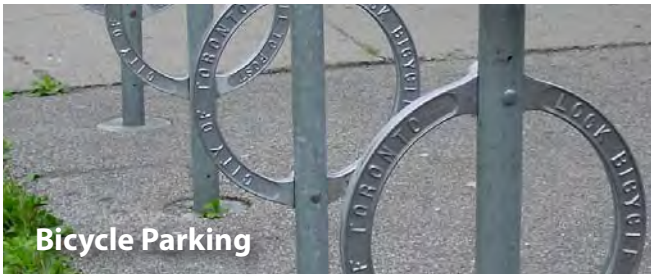
Bicycle Parking

Bicyclists expect a safe, convenient place to secure their bicycle when they reach their destination. This may be short-term parking of 2 hours or less, or long-term parking for employees, students, residents, and commuters.

Access to Transit

Safe and easy access to bicycle parking facilities is necessary to encourage commuters to access transit via bicycle. Providing bicycle access to transit and space for bicycles on buses and rail vehicles can increase the feasibility of transit in lower-density areas, where transit stops are beyond walking distance of many residences. People are often willing to walk only a quarter- to half-mile to a bus stop, while they might bike as much as two or more miles to reach a transit station.

This Section Includes:


Bicycle Parking


On-Street Bicycle Corral


Bicycle Lockers


Secure Parking Areas (SPA)


Bicycle Access to Transit

Bicycle Parking

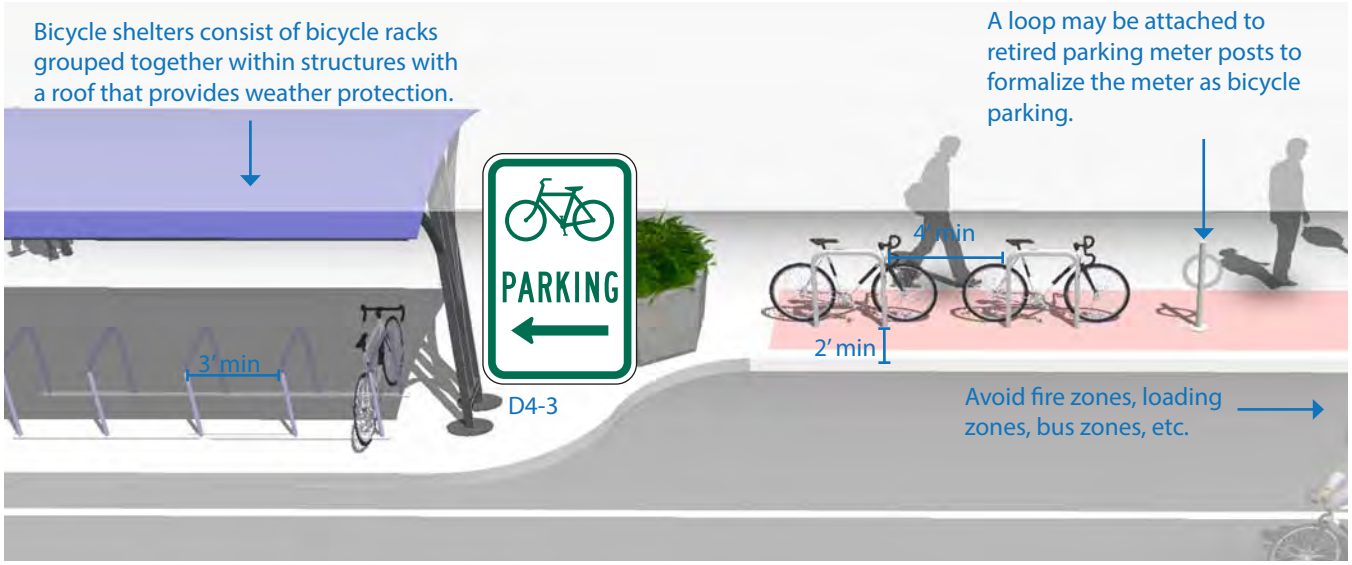
Description

Short-term bicycle parking is meant to accommodate visitors, customers, and others expected to depart within two hours. It should have an approved standard rack, appropriate location and placement, and weather protection. The Association for Pedestrian and Bicycle Professionals (APBP) recommends selecting a bicycle rack that:

- Supports the bicycle in at least two places, preventing it from falling over.
- Allows locking of the frame and one or both wheels with a U-lock.
- Is securely anchored to ground.
- Resists cutting, rusting and bending or deformation.

Guidance

- 2' minimum from the curb face to avoid 'dooring.'
- Close to destinations; 50' maximum distance from main building entrance.
- Minimum clear distance of 6' should be provided between the bicycle rack and the property line.
- Should be highly visible from adjacent bicycle routes and pedestrian traffic.
- Locate racks in areas that cyclists are most likely to travel.



Discussion

Where the placement of racks on sidewalks is not possible (due to narrow sidewalk width, sidewalk obstructions, street trees, etc.), bicycle parking can be provided in the street where on-street vehicle parking is allowed in the form of **on-street bicycle corrals**.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
APBP. *Bicycle Parking Guide 2nd Edition.* 2010.

Materials and Maintenance

Use of proper anchors will prevent vandalism and theft. Educate snow removal crews to avoid burying racks during winter months.

On-Street Bicycle Corral

Description

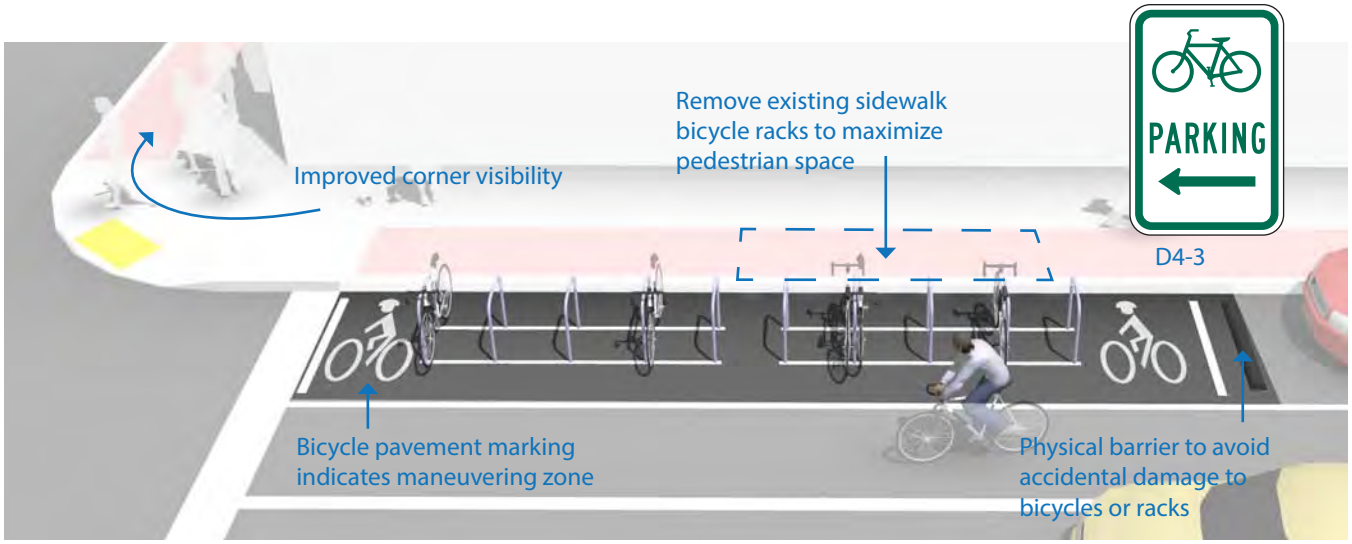
Bicycle corrals (also known as on-street bicycle parking) consist of bicycle racks grouped together in a common area within the street traditionally used for automobile parking. Bicycle corrals are reserved exclusively for bicycle parking and provide a relatively inexpensive solution to providing high-volume bicycle parking. Bicycle corrals can be implemented by converting one or two on-street motor vehicle parking spaces into on-street bicycle parking. Each motor vehicle parking space can be replaced with approximately 6-10 bicycle parking spaces.

Bicycle corrals move bicycles off the sidewalks, leaving more space for pedestrians, sidewalk café tables, etc. Because bicycle parking does not block sightlines (as large motor vehicles would do), it may be possible to locate bicycle parking in 'no-parking' zones near intersections and crosswalks.

Guidance

See guidelines for sidewalk **Bicycle Rack** placement and clear zones.

- Bicyclists should have an entrance width from the roadway of 5' – 6'.
- Can be used with parallel or angled parking.
- Parking stalls adjacent to curb extensions are good candidates for bicycle corrals since the concrete extension serves as delimitation on one side.



Discussion

In many communities, the installation of bicycle corrals is driven by requests from adjacent businesses, and is not a city-driven initiative. In other areas, the city provides the facility and business associations take responsibility for the maintenance of the facility.

Additional References and Guidelines

APBP. *Bicycle Parking Guide 2nd Edition.* 2010.

Materials and Maintenance

Physical barriers may obstruct drainage and collect debris. Establish a maintenance agreement with neighboring businesses.

Bicycle Lockers

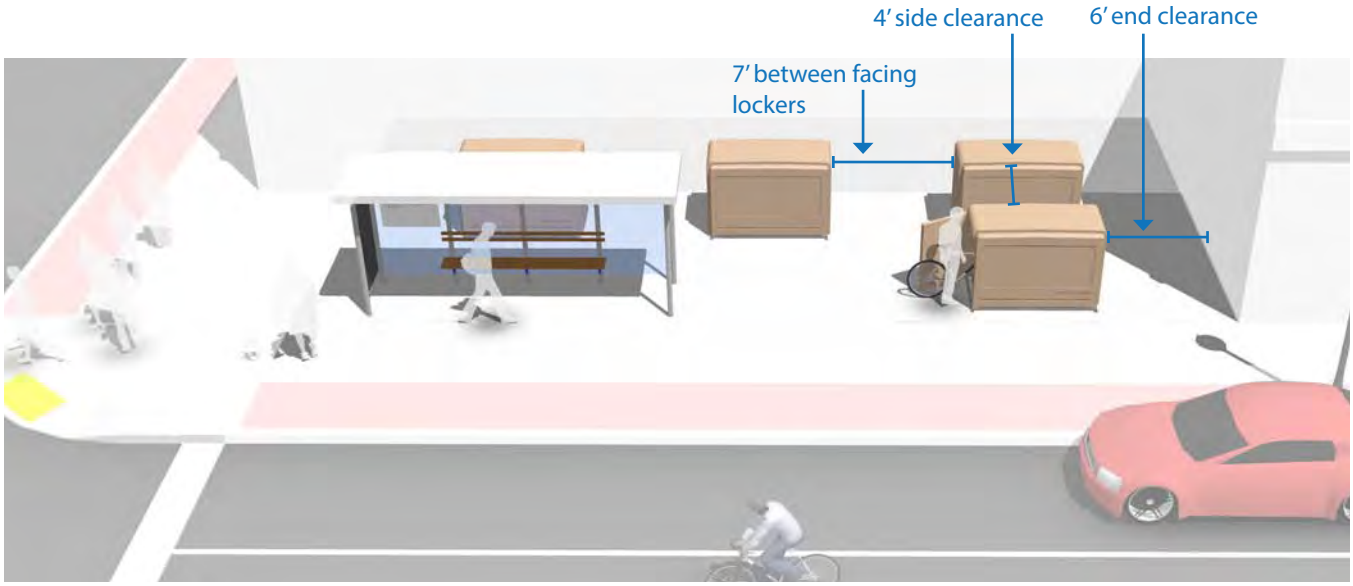
Description

Bicycle lockers are intended to provide long-term bicycle storage for employees, students, residents, commuters, and others expected to park more than two hours. Long-term facilities protect the entire bicycle, its components and accessories against theft and against inclement weather, including snow and wind-driven rain.

Bicycle lockers provide space to store a few accessories or rain gear in addition to containing the bicycle. Some lockers allow access to two users - a partition separating the two bicycles can help users feel their bike is secure. Lockers can also be stacked, reducing the footprint of the area, although that makes them more difficult to use.

Guidance

- Minimum dimensions: width (opening) 2.5'; height 4'; depth 6'.
- 4 foot side clearance and 6 foot end clearance.
- 7 foot minimum distance between facing lockers.
- Locker designs that allow visibility and inspection of contents are recommended for increased security.
- Access is controlled by a key or access code.



Discussion

Long-term parking facilities are more expensive to provide than short-term facilities, but are also significantly more secure. Although many bicycle commuters would be willing to pay a nominal fee to guarantee the safety of their bicycle, long-term bicycle parking should be free wherever automobile parking is free.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
APBP. *Bicycle Parking Guide 2nd Edition.* 2010.

Materials and Maintenance

Regularly inspect the functioning of moving parts and enclosures. Change keys and access codes periodically to prevent access to unapproved users.

Secure Parking Areas (SPA)

Description

A Secure Parking Area for bicycles, also known as a BikeSPA or Bike & Ride (when located at transit stations), is a semi-enclosed space that offers a higher level of security than ordinary bike racks. Accessible via key-card, combination locks, or keys, BikeSPAs provide high-capacity parking for 10 to 100 or more bicycles. Increased security measures create an additional transportation option for those whose biggest concern is theft and vulnerability.

Guidance

Key features may include:

- Closed-circuit television monitoring.
- Double high racks & cargo bike spaces.
- Bike repair station with bench.
- Bike tube and maintenance item vending machine.
- Bike lock "hitching post" – allows people to leave bike locks.
- Secure access for users.

Discussion

Long-term parking facilities are more expensive to provide than short-term facilities, but are also significantly more secure. Although many bicycle commuters would be willing to pay a nominal fee to guarantee the safety of their bicycle, long-term bicycle parking should be free wherever automobile parking is free.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
APBP. *Bicycle Parking Guide 2nd Edition.* 2010.

Materials and Maintenance

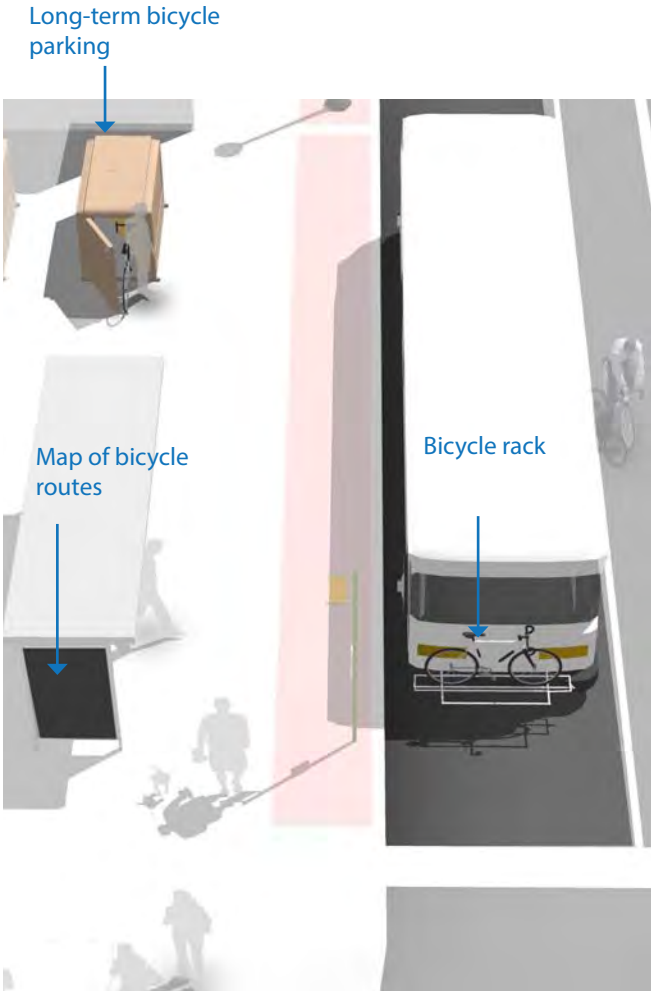
Regularly inspect the functioning of moving parts and enclosures. Change keys and access codes periodically to prevent access to unapproved users.

Bicycle Access to Transit

Description

Safe and easy access to transit stations and secure bicycle parking facilities is necessary to encourage commuters to access transit via bicycle. Bicycling to transit reduces the need to provide expensive and space consuming car parking spaces.

Many people who ride to a transit stop will want to bring their bicycle with them on the transit portion of their trip, so buses and other transit vehicles should be equipped accordingly.



Guidance

Access

- Provide direct and convenient access to transit stations and stops from the bicycle and pedestrian networks.
- Provide maps at major stops and stations showing nearby bicycle routes.
- Provide wayfinding signage and pavement markings from the bicycle network to transit stations.

Bicycle Parking

- The route from bicycle parking locations to station/stop platforms should be well-lit and visible.
- Signing should note the location of bicycle parking, rules for use, and instructions as needed.
- Provide safe and secure long-term parking such as **bicycle lockers** at transit hubs. Parking should be easy to use and well maintained.

Discussion

Providing bicycle routes to transit helps combine the long-distance coverage of bus and rail travel with the door-to-door service of bicycle riding. Transit use can overcome large obstacles to bicycling, including distance, hills, riding on busy streets, night riding, inclement weather, and breakdowns.

Additional References and Guidelines

APBP. *Bicycle Parking Guide 2nd Edition.* 2010.
FHWA. *University Course on Bicycle and Pedestrian Transportation. Lesson 18: Bicycle and Pedestrian Connections to Transit*. 2006.

Materials and Maintenance

Regularly inspect the functioning of long-term parking moving parts and enclosures.

5.12 Bikeway Maintenance

Regular bicycle facility maintenance includes sweeping, maintaining a smooth roadway, ensuring that the gutter-to-pavement transition remains relatively flat, and installing bicycle-friendly drainage grates. Pavement overlays are a good opportunity to improve bicycle facilities. The following recommendations provide a menu of options to consider to enhance a maintenance regimen.

Recommended Walkway and Bikeway Maintenance Activities

Maintenance Activity	Frequency
Inspections	Seasonal – at beginning and end of Summer
Pavement sweeping/blowing	As needed, with higher frequency in the early Spring and Fall
Pavement sealing	5 - 15 years
Pothole repair	1 week – 1 month after report
Culvert and drainage grate inspection	Before Winter and after major storms
Pavement markings replacement	As needed
Signage replacement	As needed
Shoulder plant trimming (weeds, trees, brambles)	Twice a year; middle of growing season and early Fall
Tree and shrub plantings, trimming	1 – 3 years
Major damage response (washouts, fallen trees, flooding)	As soon as possible

This Section Includes:

Sweeping

Description

Bicyclists often avoid shoulders and bike lanes filled with gravel, broken glass and other debris; they will ride in the roadway to avoid these hazards, potentially causing conflicts with motorists. Debris from the roadway should not be swept onto sidewalks (pedestrians need a clean walking surface), nor should debris be swept from the sidewalk onto the roadway. A regularly scheduled inspection and maintenance program helps ensure that roadway debris is regularly picked up or swept.

Guidance

- Establish a seasonal sweeping schedule that prioritizes roadways with major bicycle routes.
- Sweep walkways and bikeways whenever there is an accumulation of debris on the facility.
- In curbed sections, sweepers should pick up debris; on open shoulders, debris can be swept onto gravel shoulders.
- Pave gravel driveway approaches to minimize loose gravel on paved roadway shoulders.
- Perform additional sweeping in the Spring to remove debris from the Winter.
- Perform additional sweeping in the Fall in areas where leaves accumulate .

Gutter to Pavement Transition

Description

On streets with concrete curbs and gutters, 1 to 2 feet of the curbside area is typically devoted to the gutter pan, where water collects and drains into catch basins. On many streets, the bikeway is situated near the transition between the gutter pan and the pavement edge. This transition can be susceptible to erosion, creating potholes and a rough surface for travel.

Guidance

- Ensure that gutter-to-pavement transitions have no more than a ¼" vertical transition.
- Examine pavement transitions during every roadway project for new construction, maintenance activities, and construction project activities that occur in streets.
- Inspect the pavement 2 to 4 months after trenching construction activities are completed to ensure that excessive settlement has not occurred.
- Provide at least 3 feet of pavement outside of the gutter seam.

Roadway Surface

Description

Bicycles are much more sensitive to subtle changes in roadway surface than are motor vehicles. Various materials are used to pave roadways, and some are smoother than others. Compaction is also an important issue after trenches and other construction holes are filled. Uneven settlement after trenching can affect the roadway surface nearest the curb where bicycles travel. Sometimes compaction is not achieved to a satisfactory level, and an uneven pavement surface can result due to settling over the course of days or weeks. When resurfacing streets, use the smallest chip size and ensure that the surface is as smooth as possible to improve safety and comfort for bicyclists.

Guidance

- Maintain a smooth pothole-free surface.
- Ensure that on new roadway construction, the finished surface on bikeways does not vary more than ¼".
- Maintain pavement so ridge buildup does not occur at the gutter-to-pavement transition or adjacent to railway crossings.
- Inspect the pavement 2 to 4 months after trenching construction activities are completed to ensure that excessive settlement has not occurred.
- If chip sealing is to be performed, use the smallest possible chip on bike lanes and shoulders. Sweep loose chips regularly following application.
- During chip seal maintenance projects, if the pavement condition of the bike lane is satisfactory, it may be appropriate to chip seal the travel lanes only. However, use caution when doing this so as not to create an unacceptable ridge between the bike lane and travel lane.

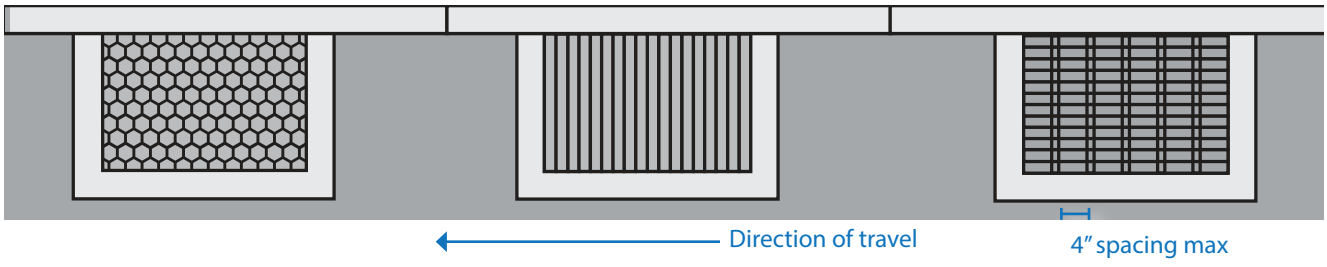
Drainage Grates

Guidance

- Require all new drainage grates be bicycle-friendly, including grates that have horizontal slats on them so that bicycle tires and assistive devices do not fall through the vertical slats.
- Create a program to inventory all existing drainage grates, and replace hazardous grates as necessary – temporary modifications such as installing rebar horizontally across the grate should not be an acceptable alternative to replacement.

Description

Drainage grates are typically located in the gutter area near the curb of a roadway. Drainage grates typically have slots through which water drains into the municipal storm sewer system. Many older grates were designed with linear parallel bars spread wide enough for a tire to become caught so that if a bicyclist were to ride on them, the front tire could become caught in the slot. This would cause the bicyclist to tumble over the handlebars and sustain potentially serious injuries.



6 Funding Sources

Federal, state and local government agencies invest billions of dollars every year in the nation's transportation system. Only a fraction of that funding is used in planning and implementation of bicycle infrastructure and policy development to improve conditions for cyclists. Even though appropriate funds are limited, they are available, but desirable projects sometimes go unfunded because communities may be unaware of a fund's existence, or may apply for the wrong type of grants. Also, there typically is strong competition between municipalities for the available bikeway funding.

Whenever federal funds are used for bicycle projects, a certain level of state and/or local matching funding is generally required. State funds are often available to local governments on similar terms. Almost every implemented bicycle program and facility in the United States has had more than one funding source, and it often takes a good deal of coordination to pull the various sources together.

According to the Federal Highway Administration's (FHWA) publication, An Analysis of Current Funding Mechanisms for Bicycle and Pedestrian Programs at the Federal, State and Local Levels, where successful local bike facility programs exist, there is usually a full time bicycle coordinator with extensive understanding of funding sources. Cities such as Seattle, Washington, Portland, Oregon and Tucson, Arizona, are prime examples. Bicycle coordinators are often in a position to develop a competitive project and detailed proposal that can be used to improve conditions for cyclists within their jurisdictions.

The Orange County Transportation Authority Board of Directors (Board) approved the use of ten percent of annual federal Congestion Mitigation and Air Quality (CMAQ) Program funds (roughly $4.5 million annually) for bicycle and pedestrian projects on October 7, 2011. In February 2012, the Board approved release of the first annual Bicycle Corridor Improvement Program (BCIP) Call for Projects. In addition, the Board has approved the use of one percent of annual Federal Transit Administration Section 5307 (FTA 5307) funds (roughly $500,000 annually) to be included in the BCIP Call for Projects.

To support agency efforts to find outside funding sources to implement improvements along the proposed corridors, a summary by source type has been provided with details regarding eligibility, use, and requirements associated with funding sources.

6.1 Federal Sources

6.1.1 Moving Ahead for Progress in the Twenty-First Century (MAP-21) and the California Active Transportation Program (ATP)

On July 6, 2012 President Obama signed into law P.L. 112-141, the Moving Ahead for Progress in the 21st Century Act (MAP-21). MAP-21 funds surface transportation programs at over $105 billion for fiscal years (FY) 2013 and 2014. More information: http://www.fhwa.dot.gov/map21

MAP-21 includes the following funding programs that may support bicycle projects in Orange County.

Congestion Mitigation and Air Quality Improvement Program (CMAQ)

The CMAQ program provides funding for projects and programs in air quality nonattainment and maintenance areas for ozone, carbon monoxide, and particulate matter which reduce transportation related emissions. These federal dollars can be used to build bicycle and pedestrian facilities that reduce travel by automobile.

To be funded under this program, projects and programs must be included in the Federal Transportation Improvement Program (FTIP). CMAQ funding is administered through OCTA on the local level. As noted above, this funding will be programmed through the OCTA BCIP Call for Projects. More information is available at: http://www.fhwa.dot.gov/map21/guidance/guidecmaq.cfm

Federal Transit Administration Section 5307 (FTA 5307)

FTA 5307 provides funding for public transportation capital, planning, and job access and reverse commute projects. FTA apportions funds by formula to designated recipients, which then suballocate funds to state and local governmental authorities, including public transportation providers. Recipients must expend at least 1% of their 5307 apportionment on Associated Transportation Improvements. As noted above, this funding will be programmed through the OCTA BCIP Call for Projects. More information is available at: http://www.fta.dot.gov/documents/MAP-21_Fact_Sheet_-_Urbanized_Area_Formula_Grants.pdf

Transportation Alternatives Program (TAP)
MAP-21 consolidates prior sources for non-motorized improvements such as Transportation Enhancements, Safe Routes to School, and Recreational Trails into the Transportation Alternatives Program (TAP). In California, TAP funds will be distributed through the State's Active Transportation Program. More information is available at: http://www.fhwa.dot.gov/map21/guidance/guidetap.cfm

Active Transportation Program (ATP)
In September 2013, the State of California created a new Active Transportation Program (ATP) that consolidates most of California's existing state and federal sources of funding for trails, bicycling and walking into one fund, which will be administered by the California Transportation Commission (CTC). This consolidated program was created to raise the profile of active transportation projects in the state and to streamline the process for financing bicycling and walking infrastructure by reducing administrative costs. The federal TAP program will be rolled into the California ATP. State funding sources incorporated into the new ATP are the Bicycle Transportation Account, the Environmental Enhancement and Mitigation Program (partially), and California's state-funded Safe Routes to School (SR2S) program.

The goals of the ATP are to:

- Increase the proportion of trips accomplished by biking and walking.
- Increase safety and mobility for nonmotorized users.
- Advance the Active Transportation efforts of regional agencies to achieve greenhouse gas reduction goals as established pursuant to SB 375 (Chapter 728, Statutes of 2008) and SB 391 (Chapter 585, Statutes of 2009).
- Enhance public health, including the reduction of childhood obesity through the use of programs including, but not limited to, projects eligible to Safe Routes to School Program funding.
- Ensure that disadvantaged communities fully share in the benefits of the program.
- Provide a broad spectrum of projects to benefit many types of active transportation users.

The 2014 allocation to the ATP is $128.5 million.

Forty percent of ATP funds will be made available to metropolitan planning organizations (MPOs) in urbanized areas with a population greater than 200,000; 10 percent for smaller urban and rural regions; and 50 percent on a statewide basis, with all awards to be made competitively. To ensure that the ATP will prioritize improvements in disadvantaged communities where funds can have the greatest impact and where traffic safety problems are often most severe, no less than 25 percent of ATP funding must benefit disadvantaged communities and dollars will be available to assist with planning and community engagement, particularly critical in those communities with limited resources.

The CTC has been charged with developing guidelines and project selection criteria for the ATP in consultation with the public and with designated representatives of Caltrans, Strategic Growth Council, Department of Housing and Community Development, Natural Resources Agency, Air Resources Board, Department of Public Health, Office of Traffic Safety, MPOs, and Regional Transportation Agencies. The resulting working group will determine project selection criteria and scoring for a wide array of different project types, provide guidance that is focused but flexible to regional agencies, and decide how to define "disadvantaged community" for those projects that are eligible for the equity set-aside. MPOs will do similar work to set guidelines for the portion of funds that each MPO controls.

Highway Safety Improvement Program (HSIP)
MAP-21 doubles the amount of funding available through the Highway Safety Improvement Program (HSIP). Funds are distributed through a call for projects administered by California Department of Transportation (Caltrans). More information is available at: http://www.fhwa.dot.gov/map21/guidance/guidehsip.cfm

Pilot Transit-Oriented Development Planning
MAP-21 establishes a new pilot program to promote planning for Transit-Oriented Development. The bill makes $10 million available for the planning of projects that seek to "facilitate multimodal connectivity and accessibility," and "increase access to transit hubs for pedestrian and bicycle traffic." Funds are administered through the FTA. More information is available at: http://www.fta.dot.gov/documents/MAP-21_Fact_Sheet_-_Transit-Oriented_Development_Planning_Pilot.pdf

6.1.2 Other Federal Funding Opportunities

Partnership for Sustainable Communities
Founded in 2009, the Partnership for Sustainable Communities is a joint project of the Environmental Protection Agency (EPA), the U.S. Department of Housing and Urban Development (HUD), and the U.S. Department of Transportation (USDOT). The Partnership is based on five Livability Principles, one of which explicitly addresses the need for bicycle and pedestrian infrastructure. The Partnership does not provide a regular annual grant program. Nevertheless, it has already led to some new grant opportunities (including the TIGER grants). Local agencies should track Partnership communications and be prepared to respond proactively to announcements of new grant programs. More information is available at: http://www.epa.gov/smartgrowth/partnership/

Department of the Interior – Land and Water Conservation Fund (LWCF)
The U.S. Recreation and Heritage Conservation Service and the State Department of Park and Recreation administer this funding source. Trails are the most commonly approved project. More information is available at: http://www.nps.gov/lwcf/manual/lwcf.pdf

Rivers, Trails, and Conservation Assistance Program (RTCA)
The RTCA is the community assistance arm of the National Park Service. RTCA provides technical assistance to communities in order to preserve open space and develop trails. The assistance is not for infrastructure, but for building plans, engaging public participation and identifying other sources of funding. More information is available at: http://www.nps.gov/pwro/rtca/who-we-are.htm

Community Development Block Grants (CDBG)
The U.S Department of Housing and Urban Development (HUD) provides CDBG funding. Trails and greenway projects that enhance accessibility are the best fit for this funding source. CDBG funds could also be used to write ADA Transition Plans. More information is available at: http://www.hud.gov/cdbg

Community Transformation Grants (CTG)
The Center for Disease Control administers CTG. Active transportation infrastructure and programs that promote healthy lifestyles are a good fit for this program. More information is available at: http://www.cdc.gov/communitytransformation

6.2 State, Regional & Local Sources

Climate Ready Grant Program
Climate Ready grants are provided by the California State Coastal Conservancy and are available for projects located along the coast and coastal watersheds. More information is available at: http://scc.ca.gov/2013/06/21/announcing-climate-ready-grant-opportunities/

SCAG Sustainability Program
Southern California Association of Governments (SCAG) provides assistance to member agencies for integrated land use and transportation planning.

More information is available at: http://sustain.scag.ca.gov/Pages/Grants%20and%20Local%20Assistance/GrantsLocalAssistance.aspx

Mobile Source Air Pollution Reduction Review Committee (MSRC) Clean Transportation Funding
The MSRC provides “Clean Transportation Funding” funding opportunities to cities and counties in the South Coast Air Quality Management District. Under the 2013 Program $11.0 million is available to fund seven categories including a category specific to bicycle infrastructure and related programs. The MSRC Program may be refined in the future to include a category to match funds for First/Last Mile projects. More information is available at: http://www.cleantransportationfunding.org/

Other Local Sources
Local sales taxes, fees and permits may be implemented as new funding sources for bicycle projects. However, any of these potential sources would require a local election.

Volunteer programs may be developed to substantially reduce the cost of implementing some routes, particularly multi use paths. For example, a local college design class may use such a multi-use route as a student project, working with a local landscape architectural or engineering firm. Work parties could be formed to help clear the right-of-way for the route.

A local construction company may donate or discount services beyond what the volunteers can do. A

challenge grant program with local businesses may be a good source of local funding, in which the businesses can "adopt" a route or segment of one to help construct and maintain it.

6.3 Private Sources

Private funding sources can be acquired by applying through the advocacy groups such as the League of American Bicyclists and the Bikes Belong Coalition. Most of the private funding comes from foundations wanting to enhance and improve bicycle facilities and advocacy. Grant applications will typically be through the advocacy groups as they leverage funding from federal, state and private sources. Below are several examples of private funding opportunities available.

People for Bikes Grant Program

PeopleForBikes includes both an industry coalition of bicycle suppliers and retailers, as well as a charitable foundation, has awarded $1.2 million and leveraged an additional $470 million since its inception in 1999. Since its inception in 1999 as Bikes Belong, they have invested $2.1 million in community bicycling projects and have leveraged an additional $650 million in federal, state, and private funding. The grant program funds corridor improvements, bike paths, rail trails, mountain bike trails, end-of-trip facilities (bike parking), and BMX parks that build momentum for bicycling in communities across the country. It is funded by members of the bicycle industry and their employees. More information is available at: http://www.peopleforbikes.org/pages/community-grants

Community Action for a Renewed Environment (CARE)

CARE is a competitive grant program that offers an innovative way for a community to organize and take action to reduce toxic pollution in its local environment. Through CARE, a community creates a partnership that implements solutions to reduce releases of toxic pollutants and minimize people's exposure to them. By providing financial and technical assistance, EPA helps CARE communities get on the path to a renewed environment. Transportation and "smart-growth" types of projects are eligible. Grants range between $90,000 and $275,000. More information is available at: http://www.epa.gov/care/

Kaiser Permanente Healthy Eating Active Living (HEAL) Program

Kaiser Permanente developed the Healthy Eating Active Living (HEAL) initiative in Southern California to address the increasing obesity epidemic. The HEAL program is multi-faceted, with a large focus on active transportation. For instance, past recipients have been awarded funds to develop bicycle master plans, implement Safe Routes to School plans, and complete design plans for bicycle friendly streets. More information is available at: http://share.kaiserpermanente.org/article/healthy-eating-active-living-heal-grants-partnerships/

6.4 Strategies for Funding Bicycle Facilities

New Construction

Future road widening and construction projects can include street bicycle facilities. To ensure that roadway construction projects provide bike lanes where needed, it is important that the review process includes input to ensure consistency with the proposed system.

In addition, California's 2008 Complete Streets Act and Caltrans' Deputy Directive 64 require that the needs of all roadway users be considered during "all phases of state highway projects, from planning to construction to maintenance and repair." More information is available at: http://www.dot.ca.gov/hq/tpp/Offices/ocp/complete_streets.html

Fiber Optic Installation

Cable TV and telephone companies sometimes need new cable routes within public rights of way. Recently, this has most commonly occurred during expansion of fiber optic networks. Since these projects require a significant amount of advance planning and disruption of curb lanes, it may be possible to request reimbursement for affected bicycle facilities to mitigate construction impacts. In cases where cable routes cross undeveloped areas, it may be possible to provide for new bikeway facilities following completion of the cable trenching, such as sharing the use of maintenance roads.

Developer Impact Fees

As a condition for development approval, municipalities can require developers to provide certain infrastructure improvements, which can include bikeway projects. These projects have commonly provided Class 2

facilities for portions of on street, previously planned routes. They can also be used to provide bicycle parking or shower and locker facilities. The type of facility that should be required to be built by developers should reflect the greatest need for the particular project and its local area. Legal challenges to these types of fees have resulted in the requirement to illustrate a clear nexus between the particular project and the mandated improvement and cost. Much of the roadway infrastructure in Orange County was constructed as part of new community development.

Corporate Donations

Corporate donations are often received in the form of liquid investments (i.e., cash, stock, bonds) and in the form of land. Employers recognize that creating places to bike and walk is one way to build community and attract a quality work force. Bicycling and outdoor recreation businesses often support local projects and programs. Municipalities typically create funds to facilitate and simplify a transaction from a corporation's donation to the given municipality. Donations are mainly received when a widely supported capital improvement program is implemented. Such donations can improve capital budgets and/or projects.

Tables 6-1 through 6-4 list additional funding sources that have previously been made available to bicycle projects. Table 6-5 provides a summary of the funding sources along with eligible project types.

Table 6-1: Federal Funding Sources

Grant Source	Remarks
Local Highway Bridge Program	Funds to replace or rehabilitate public highway bridges over waterways, other topographical barriers, other highways, or railroads.
Paul S. Sarbanes Transit in Parks and Public Lands Program	Funds transportation modes that reduce congestion in parks and public lands.
Bus and Bus Facilities Program: State of Good Repair	Can be used for projects to provide access for bicycles to public transportation facilities, to provide shelters and parking facilities for bicycles in or around public transportation facilities, or to install equipment for transporting bicycles on public transportation vehicles.
Bus Livability Initiative	Can be used for bicycle and pedestrian support facilities, such as bicycle parking, bike racks on buses, pedestrian amenities, and educational materials

Table 6-2: State Funding Sources

Grant Source	Remarks
Office of Traffic Safety Program (OTS)	Funds safety improvements to existing facilities, safety promotions including bicycle helmet giveaways and studies to improve Traffic safety.
Community Based Transportation Planning Grants	Eligible projects that exemplify livable community concepts including enhancing bicycle and pedestrian access.
Mobile Source Air Pollution Reduction (MSRC) AB 2766 Vehicle Registration Funds	Competitive program for projects that benefit air quality.
Habitat Conservation Fund (HCF)	Provides funds to local entities to protect threatened species, to address wildlife corridors, to create trails, and to provide for nature interpretation programs which bring urban residents into park and wildlife areas.
California River Parkways	Create or expand trails for walking, bicycling and / or equestrian activities that are compatible with other conservation objectives.
State Gas Tax (local share)	Major Projects, >$300,000
Public Access Program	Funds the protection and development of public access areas in support of wildlife- oriented uses, including helping to fund construction of ADA trails.
State Coastal Conservancy	Projects must be in accordance with Division 21 in the coastal zone and meet the goals and objectives of the Conservancy's strategic plan. More information can be found at http://scc.ca.gov/applying-for- grants-and-assistance/forms.
Habitat Conservation Fund (HCF)	Funds to cities, counties, and districts to acquire or develop wildlife corridors and trails.
Environmental Justice: Context-Sensitive Planning	Funds projects that foster sustainable economies, encourage transit-oriented and mixed use development, and expand transportation choices, including walking and biking. Projects can be design and education, as well as planning.

Table 6-3: Regional & Local Funding Sources

Grant Source	Remarks
Measure M2 Turnback	For streets and roadway improvements, including bicycle and pedestrian facilities.
Parking Meter Districts	Parking Meter Districts can use parking meter revenues for streetscape improvements such as pedestrian facilities, landscaping, and lighting.
Transient Occupancy Tax (TOT)	Created to cover expenses and improvements related to tourism and to encourage more tourists to visit. This fund may be appropriate in areas where heavy tourism exists such as along the waterfront, major parks and historic neighborhoods.

Table 6-4: Private Funding Sources

Grant Source	Remarks
Community Action for a Renewed Environment (CARE)	Grant program to help community organize and take action to reduce toxic pollution in its local environment.
Surdna Foundation	The Surdna Foundation makes grants to nonprofit organizations in the areas of environment, community revitalization, effective citizenry, the arts, and the nonprofit sector. Government entities cannot apply, only non-profits. http://www.surdna.org/grants/
Health Foundations	Focus pedestrian improvements for an obesity prevention strategy. Examples include California Wellness Foundation, Kaiser, and the California Endowment.
Rails-to-Trails Conservancy	Provides technical assistance for converting abandoned rail corridors to use as multi-use trails.

Table 6-5: Bikeway Funding Opportunities by Project Type

Bicycle and Pedestrian Funding Opportunities		Planning	Design, ROW, Construction	Amenities	Safety / Education
Federal Sources	Partnership for Sustainable Communities	X	X		
	Land and Water Conservation Fund (LWCF)	X	X	X	X
	Rivers, Trails, and Conservation Assistance Program (RTCA)	X	X	X	X
	Community Development Block Grants	X	X	X	
	Community Transformation Grants	X			X
	Local Highway Bridge Program	X	X	X	X
	Paul S. Sarbanes Transit in Parks and Public Lands Program	X	X		
	Bus and Bus Facilities Program: State of Good Repair		X	X	
	Bus Livability Initiative		X	X	X
State Sources	Climate Ready Grant Program	X	X		X
	Office of Traffic Safety Program (OTS)	X	X		X
	Community Based Transportation Planning Grants	X	X		
	MSRC/AB 2766 Vehicle Registration Funds	X	X	X	X
	Environmental Justice: Context-Sensitive Planning	X	X	X	X
	Habitat Conservation Fund (HCF)	X	X	X	X
	California River Parkways	X	X		
	State Gas Tax (local share)		X		
	Public Access Program		X		
	State Coastal Conservancy	X	X	X	X
	Land and Water Conservation Fund	X	X	X	
Local Sources	Measure M2 Turnback	X	X	X	X
	Bicycle Corridor Improvement Program (BCIP)		X	X	
	Transient Occupancy Tax (TOT)	X	X	X	X
Private Sources	PeopleForBikes Community Grant Program		X	X	X
	Community Action for a Renewed Environment (CARE)	X			X
	Surdna Foundation	X	X	X	X
	Kaiser Permanente HEAL Initiative	X	X	X	X
	Health Foundations	X	X	X	X
	Rails-to-Trails Conservancy	X	X	X	X
	Donations	X	X	X	X
	In-kind Services	X	X	X	X
Other Sources	Parking Meter Districts			X	
	Developer Fees or Exactions	X	X	X	X

Appendices

A. Development Tools

OCTA BPI

OCTA maintains a robust GIS database to evaluate bicycle demand. The Bicycle Priority Index (BPI) provides evaluates how bicycle usage and demand is linked to areas within the county with high population and employment density, key land uses such as local schools and destinations, as well as location of key transit centers.

Level of Traffic Stress Analysis

A bicycle network is likely to attract a larger portion of the population if its fundamental attribute is low stress connectivity. In other words, a network should provide direct routes between origins and destinations that do not include links that exceed one's tolerance for traffic stress. The foundation for the Traffic Stress Analysis is based on The Mineta Transportation Institute's Low-Stress Bicycle and Network Connectivity model. Traffic Stress Analysis is an objective, data-driven and points-based evaluation model which identifies high traffic stress links, bicycle network gaps, and gaps between "low stress" links.

The premise for this analysis is that points increase as stress-inducing factors, such as high traffic speeds and volume, increase. Street segments with bicycle facilities are intended to reduce stress levels but, given roadway conditions, may comprise higher stress categories.

A Traffic Stress Analysis results in four possible street type outcomes:

Stress Category	Stress Indicator
LTS 1	All local roads and off street bikeways
LTS 2	Less than 8,000 vehicles per day or collector streets
LTS 3	Less than 30,000 vehicles per day with bike lanes or bike routes
LTS 4	All other streets

In suburban and urban contexts, it is common to see low stress "islands" bounded by higher stress links. Higher stress links represent natural barriers to cyclists who may be uncomfortable navigating across or along streets with high or moderate stress indicators especially if the transportation system lacks bicycle facilities. Therefore, movement from low stress links across higher stress links warrants special attention to minimize the stress experienced by cyclists.

In the context of OCTA's Bikeway Strategy and corridor prioritization, the numeric values which reflect stress levels are aggregated to the corridor level to produce an average Traffic Stress value.

This analysis is useful in prioritizing projects to increase the potential volumes of would-be cyclists that may currently feel comfortable on lower stress streets. The priority corridors developed by OCTA and the project team provide excellent connections between key trip origins and destinations. However, they are currently located on several higher stress links (i.e., LTS 3 and LTS 4 links). The goal of this analysis and the overall project is to accommodate a wider range of cyclists by reducing stress levels through enhanced bicycle facilities, traffic calming mechanisms, or optional parallel off-street paths that provide route directness and connectivity to major destinations and attractions.

B. Facilitation Efforts

Preparation of this report was a collaborative effort, with facilitation by OCTA of input from public stakeholders, agency staff, and elected officials. Preparation of the Strategy included the following efforts.

Project Development Team (PDT) Summary

A project development team (PDT) was convened with planning and engineering representatives from each member agency within Districts 1 and 2, as well as OCTA, OCCOG, and project consultant team staff. The PDT met on multiple occasions to discuss project goals and objectives, opportunities and constraints, preliminary corridor alignments, and draft ranking criteria. Meetings were held at OCTA (December 2012), Huntington Beach City Hall (January 2013), Westminster City Hall (April 2013), and Newport Beach City Hall (June 2013). Attendance at the PDT meetings ranged between 25-30 attendees. The PDT membership included the following representatives:

City of Buena Park – Leah Phu, Dennis Barnes, and Nabil Henein

City of Costa Mesa – Raja Sethuraman and Pritam Deshmukh

City of Cypress – Nick Mangkalakiri and Kori Nevarez

City of Fountain Valley – Stacy Delong

City of Garden Grove – Greg Brown

City of Huntington Beach – Rick Ramos, Bob Stachelski, and Darren Sam

City of La Palma – Larry Baldwin

City of Newport Beach – Fern Nueno and Brad Sommers

City of Santa Ana – Melanie McCann, Suzi Furjanic, and Zed Kekula

City of Seal Beach – Jerry Olivera and Cesar Rangel

City of Stanton – Kelly Hart and Quang Le

City of Westminster – Adolfo Ozaeta and Art Bashmakian

County of Orange – Lance Natsuhara, Jeff Dickman, Ruby Maldonado, Jose Elias, and Tuan Richardson

Caltrans – Romeo Estrella

OCCOG – Dave Simpson

OCTA – Wes Parsel, Charlie Larwood, Alice Rogan, Marlon Perry, Carolyn Mamaradlo, Gary Hewitt, Jim Sterling

Focus Group Meetings

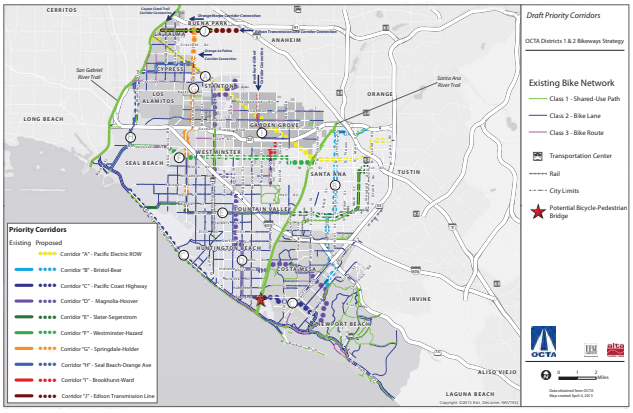
Focus group meetings were convened with PDT representatives to create smaller working groups comprised of groups of cities. During the focus meeting, large format boards were printed for brainstorming potential bikeways corridors. The printed materials included identification of utility corridors, water and rail corridors, the transportation network, existing and proposed bikeways, major destinations, and other key features for consideration and collaborative brainstorming. Focus meeting #1 occurred on February 21st at the City of Costa Mesa with representatives from Costa Mesa and Newport Beach. Focus meeting #2 occurred on March 7th at the City of Fountain Valley with representatives from Fountain Valley, Garden Grove, Huntington Beach, Santa Ana, Seal Beach, Stanton, and Westminster. Focus meeting #3 occurred on March 14th the City of Cypress with representatives from Buena Park, County of Orange, Cypress, and La Palma. Prior to the Focus meeting #3, the project team met with staff from Los Alamitos at the Los Alamitos City Hall to solicit bikeways corridors input.

C. Outreach

Media

A project webpage was created at www.octa.net/D1-2bike. The webpage includes a project overview and a map illustrating the existing bikeways network in the project area. The webpage was updated regularly with project materials including meeting materials, meeting dates, and contact information. Additionally, outreach events scheduled within the community were posted to the webpage to provide notification to the community. The project website includes a marketing contact from OCTA on the right frame with phone and email contact information provided.

The Districts 1 & 2 Bikeways Collaborative has been promoted and covered by various outlets throughout the process. The winter 2013 edition of OCTA's "Bikeways Newsletter" described the December 2012 kickoff to the effort and mentioned the 4th District's similar planning process. The local nonprofit news source *Voice of OC* published an article about bicycle



OCTA Districts 1 & 2 Bikeways Collaborative Survey

The Orange County Transportation Authority (OCTA) is conducting a survey to better understand bicycle transportation. To participate, you can:

- Complete survey and mail back by June 5th
- Complete survey online at **www.OCTA.net/BikePlanningSurvey**

Participants providing an email address will receive future updates on OCTA's bike efforts.

1. Why do you ride your bicycle? (check all that apply)
   ❑Work/School ❑Shopping/Entertainment/Social
   ❑Exercise/Recreation ❑Other: _____
2. Please **choose three** of the draft priority regional bikeway corridors that you would most likely use. (Use 1, 2, and 3 to indicate priority)

	A. Pacific Electric ROW		F. Westminster – Hazard
	B. Bristol – Bear		G. Springdale – Holder
	C. Pacific Coast Highway		H. Seal Beach – Orange Ave
	D. Magnolia – Hoover		I. Brookhurst – Ward
	E. Slater – Segerstrom		J. Edison Transmission Line

3. Where do you prefer riding your bike?
   ❑On the street – with either a striped bike lane, a signed bike route, or on a bicycle boulevard
   ❑Off-street – on a paved bicycle path
4. What types of streets would you feel comfortable riding on? (check all that apply)
   ❑ Multi-lane arterial streets with a speed limit over 35 MPH and no bike lane
   ❑ Multi-lane arterial streets with a speed limit over 35 MPH and with bike lane
   ❑ Local streets with a speed limit below 35 MPH
   ❑ Residential streets
5. How often do you ride your bicycle?
   ❑ 4+ days a week.
   ❑ 2-3 days a week
   ❑ Once a week
   ❑ Less than once a week
6. Email address (Optional): _____
7. Other comments: _____

Graphic 4: Survey provided at outreach events and online asking for public input on bicycling and preliminary corridors ranking.

safety on May 30, 2013, and credited the current regional bikeways strategy effort for seeking to make the county's roadways safer for bicycling. OCTA's blog and newsletter – *Orange County On the Move* - advertised the Bikeways Workshop in its April edition, then provided a recap in the May edition. In addition, the independent *bikeNewportBeach.org* blog provided a positive summary of the first Bikeways Workshop on May 16, 2013. The second Bikeways Workshop in September of 2013 was promoted in *Orange County On the Move* on July 26, 2013, and in Supervisor Janet Nguyen's *First District Journal* on August 15th. The second Workshop was then recapped by *bikeNewportBeach.org*, *Orange County On the Move*, and Supervisor Shawn Nelson's *4th District Update* shortly after the September 11th event.

Survey

A survey that asked respondents to identify corridors they would be most likely to utilize, their bicycling preferences, and frequency was distributed online, during outreach events, and at the first public workshop. The survey was provided in English and Spanish, and included a graphic showing the preliminary regional corridors. A total of 103 surveys were completed including six in Spanish.

A separate survey was distributed at the second Bikeways Workshop in September 2013 to gauge attendees' level of cycling comfort and to ask to describe their typical bicycle trip purpose(s). The survey also solicited feedback on the proposed corridors and ranking results as presented in the second draft of the Bikeways Strategy.

When respondents were asked why you ride your bicycle:

- 35 answered Work/School
- 90 answered Exercise/Recreation
- 90 answered Shopping/Entertainment/Social
- 9 answered Other including vacation, park, fun, family time, and bike to work week

When respondents were asked to identify three of the corridors they would be most likely to use, the following results were received:

- Corridor A: 29
- Corridor B: 37
- Corridor C: 57
- Corridor D: 23
- Corridor E: 23
- Corridor F: 17
- Corridor G: 12
- Corridor H: 25
- Corridor I: 9
- Corridor J: 5

When respondents were asked where you prefer riding your bike, the following results were received:

- On the street – with either a striped bike lane, a signed bike route, or on a bicycle boulevard: 64
- Off-street – on a paved bicycle path: 40
- Other: 1 (mountain biking)

When respondents were asked what types of streets they would feel comfortable riding on, the following results were received:

- Multi-lane arterial streets with a speed limit over 35 MPH and no bike lane: 22
- Multi-lane arterial streets with a speed limit over 35 MPH and with a bike lane: 66
- Local streets with a speed limit below 35 MPH: 68
- Residential streets: 61

When respondents were frequency of riding their bicycle, the following results were received:

- 4+ days a week: 12
- 2-3 days a week: 20
- Once a week: 34
- Less than once a week: 33

Additional comments were provided with some email addresses. Comments provided varied in topic including destinations where bicycle connectivity is desired, to bicycle safety, to discussion about the project in general.

Outreach Event #2: Buena Park Hall & Police Department Open House

Outreach Event #3: Newport Beach Back Bay Trail

Small Format Outreach Events

Nine small-format outreach events were held throughout the project area to reach an audience diverse in geography, as well as skill-level (from the "strong & fearless" to the "interested but concerned"). These included organized events such as the Huntington Beach Bicycle Master Plan meeting, Buena Park City Hall and Police Department Open House, the Santa Ana Health & Fitness Fair, the Fountain Valley Kiwanis Club meeting, the Latino Health Access Wellness Corridor Walk/Ride, the Westminster Dia de la Familia event, and the OC Wheelmen Annual Picnic, and a standalone booth at Mile Square Park in Fountain Valley and the Newport Beach Back Bay Trail.

Outreach Event #1: Huntington Beach Bicycle Master Plan Meeting

Public outreach was conducted in Huntington Beach on Thursday, April 11 at the City-organized Bicycle Master Plan Workshop at the Huntington Beach Public Library. A table was set up at the event from 6:00 p.m. to 8:30 p.m. Project team staff spoke with event attendees about the bikeways collaborative project and asked for input and completion of the survey. Surveys were completed by four visitors to the booth identifying their primary reasons for bicycling, how often, where they would like to see facilities, and what types. Those who stopped by the booth were also provided with materials such as bike maps, fact sheets, and visors. The event was primarily attended by residents of Huntington Beach interested in the Draft Bicycle Master Plan presentation by the project team.

Outreach Event #2: Buena Park City Hall & Police Department Open House

Public outreach was conducted in Buena Park on Saturday, May 4 at the City-organized Open House event at City Hall. A table with canopy was set up at the

Outreach Event #5: Santa Ana Health & Fitness Fair

event from 11:00 a.m. to 2:00 p.m. Project team staff spoke with event attendees about the bikeways collaborative project and asked for input and completion of the survey. Surveys were completed by seven visitors to the booth. Those who stopped by the booth were also provided with materials such as bike maps, fact sheets, visors, and cell phone cases. The event was well attended by members of the community, and all available visors, cell phone cases, and bike maps were given out to the community.

Outreach Event #3: Newport Beach Back Bay Trail
Public outreach was conducted in Newport Beach on Saturday, May 11 on the Back Bay Trail. A table with canopy was set up just off the paved path at the junction of San Joaquin Hills Road and Back Bay Road from 10:00 a.m. to 1:00 p.m. Project team staff spoke with bicyclists and pedestrians along the trail about the bikeways collaborative project and asked for input and completion of the survey. Surveys were completed by 21 visitors to the booth. Those who stopped by the booth were also provided with materials such as bike maps, fact sheets, visors, snacks, and cell phone cases.

Outreach Event #4: Mile Square Park
Public outreach was conducted in Fountain Valley on Saturday, May 25 at Mile Square Park. A table with canopy was set up from 11:00 a.m. to 2:00 p.m. near a natural junction in pathways in the park and south of the bicycle rentals. Project team staff spoke with passing bicyclists and pedestrians about the bikeways collaborative project and solicited input and completion of the survey. Seven visitors to the booth completed the surveys. Those who stopped by the booth were also provided with materials such as bike maps, fact sheets, visors, and cell phone cases.

Outreach Event #5: Santa Ana Health & Fitness Fair
Public outreach was conducted in Santa Ana on Saturday, June 1 at Rosita Park. The booth discussing the bikeways collaborative project was set up as part of the City-organized 7th Annual Health and Fitness Fair. Project team staff was present at the event from 8:00 a.m. and 1:00 p.m. to discuss the project. A total of nineteen (19) surveys were completed by visitors to the booth including six (6) using the Spanish form. Those who stopped by the booth were also provided with materials such as bike maps, fact sheets, visors, snacks, and cell phone cases. The event included a large group of children and families, and all available visors and cell phone cases were given to booth visitors.

Outreach Event #6: Fountain Valley Kiwanis Meeting
Public outreach was conducted at the regular meeting of the Fountain Valley Kiwanis non-profit service

organization on Thursday, June 13 in the City of Fountain Valley. At the request of the organization President, OCTA and the consultant team spoke about regional bikeway planning by OCTA, the Districts 1 and 2 Bikeways Collaborative, and the forthcoming OCTA bikeshare in Fullerton (Bikelink). Approximately 10 members of the Kiwanis club attended the meeting and provided input and asked questions about bikeway use within Fountain Valley and surrounding areas. The members were pleased to hear about connectivity through Fountain Valley and to major destinations such as Mile Square Park and the Santa Ana River Trail.

Outreach Event #7: Latino Health Access Wellness Corridor Walk/Ride

Public outreach was conducted at the monthly Wellness Corridor promotional walk and ride located in downtown Santa Ana. The August 17 Wellness Corridor walk and bicycle ride was organized by Latino Health Access (LHA). A table was set up from 7:00 p.m. to 9:00 p.m. at the LHA offices at 450 West 4th Street in Santa Ana. Project team staff spoke with participants in the walk and rides about the public review draft strategy and promoted the upcoming Bikeways Workshop #2 meeting with flyers in both English and Spanish. LHA staff helped translate to the Spanish-speaking participants. Materials such as bike maps, fact sheets, and cell phone cases were distributed to the event participants.

Outreach Event #7: Santa Ana Latino Health Access Wellness Corridor Walk/Ride

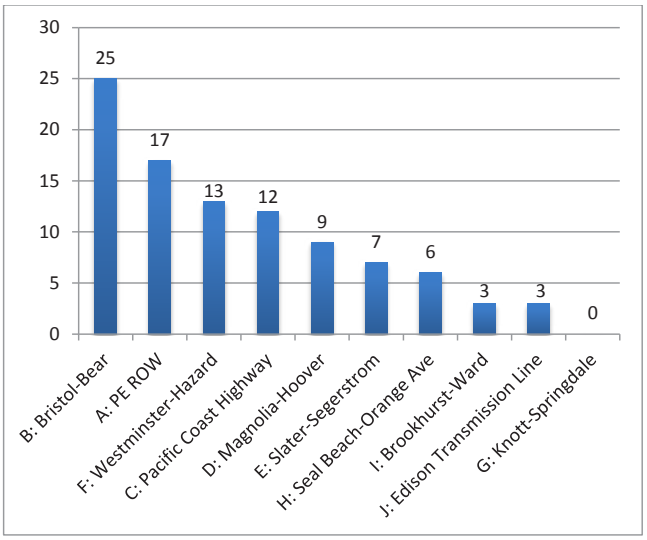
Outreach Event #8: OC Wheelmen Picnic

Public outreach was conducted at the annual picnic organized for members of the OC Wheelmen bicycling club. The August 18 event occurred in the City of Huntington Beach at Huntington Central Park at 6622 Lakeview Drive. A table was set up from 11:00 a.m. to 1:00 p.m. at the park and project team staff spoke with event attendees about the public review draft strategy and promoted the upcoming Bikeways Workshop #2 meeting with flyers in both English and Spanish. Materials such as bike maps, fact sheets, and cell phone cases were distributed to the event participants.

Outreach Event #9: Westminster Dia de la Familia event

Outreach Event #9: Westminster Dia de la Familia

Public outreach was conducted at the annual Dia de la Familia event facilitated by the City of Westminster at Sigler Park at 7200 Plaza Street on September 8. A table was set up from 1:00 p.m. to 5:00 p.m. at the park and project team staff spoke with event attendees about the public review draft strategy and promoted the upcoming Bikeways Workshop #2 meeting with flyers in both English and Spanish. Materials such as bike maps, fact sheets, and cell phone cases were distributed to the event participants.



Graphic 5: Sticker Vote Count of Priority Corridors by Workshop Attendees

Bikeways Workshop

Two workshops provided the opportunity for public input on the project. The first workshop included a presentation on the potential corridors and their ranking and public input was requested on corridor concepts and ranking evaluation criteria. Attendees included public stakeholders from the bicycle advocacy, health, safety, and social justice sectors, as well as elected officials and community residents. Presentations and large-format boards were provided describing the planning process and project components. The second workshop was attended by a similar number of people with boards showing the proposed corridors. A presentation discussed the eleven corridors and key changes since the first workshop, and focused on concepts for near-term implementation. Attendees at the workshop were provided the opportunity to comment to the group and were asked to provide comments on the boards directly and through a comment sheet. Promotion of the second workshop included direct emails to stakeholders that had provided contact information to "stay connected" to the project at outreach events, the website, or through the survey.

Bikeways Workshop 1: Garden Grove Community Center

The Bikeways Workshop was conducted in Garden Grove on Thursday, May 16 at the Community Center near Garden Grove City Hall to provide detailed information to members of the public and solicit input. Large format boards were provided illustrating the overview of the draft corridors, a board for each corridor, and a board for ranking criteria. A presentation was given discussing regional context and background, with an overview of each corridor. Six OCTA Board of Directors attended the event and spoke during the presentation. Additional City Council and technical staff represented many of the project cities. Over 50 stakeholders provided comments during the presentation and on the draft corridors. Input from the stakeholders in attendance helped prioritize corridors as well as identify non-engineering ideas for improving bicycling within Districts 1 & 2. Workshop materials posted to the OCTA website include the presentation given in PDF format, a project Factsheet, the Draft Regional Corridors Map, and the draft evaluation criteria.

Bikeways Workshop 2: Costa Mesa Neighborhood Community Center

The second Bikeways Workshop was conducted in Costa Mesa on Wednesday, September 11, at the Neighborhood Community Center to provide a quick summary of the Public Review Draft Strategy and to discuss near-term implementation concepts. Large format boards were provided illustrating the proposed bikeway corridors. A presentation was given discussing the proposed corridors with changes identified since the May workshop. Near-term recommendations where highlighted on the boards around the room, and the presentation discussed near-term concepts. Five OCTA Board of Directors attended the event and participated in the presentation. Approximately 50 stakeholders attended the workshop including community members, elected officials, and agency staff from many of the project cities. Attendees were asked to review the near-term concepts proposed for each corridor and provide comments to determine if additional "low-hanging fruit" opportunities should be identified within the report. Workshop materials promoting the event were provided in English, Spanish, and Vietnamese.

D. Corridor Ranking

Corridor Cost Estimates – Detailed Summary

Cost estimates were prepared for each corridor to determine planning-level estimates and use in the economic efficiency criteria. The costs utilized in the ranking analysis include right-of-way, anticipated bridges and construction costs, but do not include environmental clearance, design, utility impacts or maintenance costs.

Table D-1 summarizes the mid-point cost estimates for each corridor, whereas, a range of high and low costs have been presented in the Executive Summary and in Section 3 (Regional Bikeway Corridors).

*Note: The costs shown on the next page include right-of-way, anticipated bridges and construction costs, but do not include environmental clearance, design, utility impacts or maintenance costs.

Corridor Ranking Criteria Definitions and Scoring

Raw measures are in different units. In order to combine different scales, each raw measure is normalized. For example, the number of collisions per mile for a given corridor is transformed into a normalized score between 0 and 100 using the formula given below. To maintain consistency (100 is best), the maximum and minimum terms have been reversed if the scoring is done on a measure where lower values are more desirable.

$$\textit{normalized value} = 100 \times \frac{\textit{actual value}}{\textit{maximum value in range}}$$

Below is a discussion of the criteria and weighting utilized in the ranking analysis.

1. **Trip Demand:** based on the Bicycle Priority Index (BPI), a measure of population and employment density, land use, local schools and transit that influences usage. Proposed weight: 1.0

   - OCTA Bicycle Priority Index GIS output - score per acre. Higher numbers represent a higher estimated potential demand and therefore a higher priority for treatment.

2. **Level of Traffic Stress (LTS):** addresses perceived safety related to traffic volume and existing bikeway type. In addition to serving as a proxy for safety, the existing bikeway factor is a measure of existing network supply. Refer to the appendix for more information on the LTS analysis. Proposed weight: 1.0

   - Stress increases with traffic volume and lack of existing bikeways. LTS scores can range from 1 (low stress) to 4 (high stress). High stress routes are prioritized for treatment. All corridors have medium or higher stress due to regional characteristics such as the crossing of major arterials on all routes.

3. **Reported Collisions:** address safety through five years of reported data, normalized by crashes per mile. Unlike automobile crashes, the lower volume of bike crashes and lack of robust, long term exposure data (i.e. number of bicyclists using each corridor) means that this dataset is not as statistically sound. However, it is still commonly reported and easily understood. Proposed weight: 0.5

   - For each corridor, a 100' buffer was defined and all reported collisions for the five year period up to and including 2012 counted. If no facility exists, the buffer was expanded to 2000' to incorporate adjacent roadways. The total reported collisions were divided by corridor length in miles. Corridors with higher collisions per mile are prioritized for treatment.

4. **Public support:** incorporate public priorities through a Public Demand Index. Weighting may be reduced depending on the extent of public interest. Proposed weight: 0.5

   - Combination of survey Q2 and workshop "votes"

5. **Constraints:** tally physical constraints such as right-of-way, on-street parking, and other "chokepoints". Fewer constraints results in a higher score as the corridor will be easier to implement. Proposed weight: 0.5

   - Subjective assessment of parking impacts, the number of unsignalized street crossings, the need for new bridges/structures and the need for roadway widening. The latter two constraints are considered more substantial constraints. Points are assigned 1, 2, 3, or 4. 1 is no constraints, 4 is high number of constraints. Lower scoring corridors are considered easier to implement and

Table D-1: Cost Estimate Summary by Corridor

Corridor	Bikeway Class	Mileage	Cost	Cost Assumptions
A: Pacific Electric ROW	Class I (new)	11.1	$21,819,000	Upgrade/New bridges at Santa Ana River trail ($7M), Yosemite Dr. ($2.5M), Embassy Circle ($1M), Coyote Creek ($5M), Roadway Widening along Fairview and Road Reconfiguration on Civic Center between Minter to Flower ($399,432)
	Class II (widen/new)	4.5	$641,000	
	30% Contingency		$6,738,000	
	Total	**15.6**	**$29,198,000**	
B: Bristol Bear	Class I (upgrade/new)	3.2	$1,514,000	Widening along Bear Street and Santa Ana Ave ($12.7M), Bristol Street Widening not included in costs
	Class II (widen/upgrade/new)	9.14	$13,038,000	
	Class III (new)	0.62	$4,000	
	30% Contingency		$4,367,000	
	Total	**12.3**	**$18,923,000**	
C: PCH	Class II (upgrade/new)	21.3	$1,158,000	
	30% Contingency		$347,000	
	Total	**21.3**	**$1,505,000**	
D: Magnolia Hoover	Class I (upgrade/new)	9.6	$3,986,000	
	Class II (upgrade/new)	5.4	$21,000	
	30% Contingency		$1,202,000	
	Total	**15.0**	**$5,209,000**	
E: Slater Segerstrom	Class I (upgrade)	0.82	$521,000	Widening along Segerstrom Ave ($13.2M)
	Class II (widen/upgrade/new)	12.7	$13,366,000	
	30% Contingency		$4,166,000	
	Total	**13.5**	**$18,053,000**	
F: Hazard	Class I (new)	2.2	$4,307,000	New bridge at Lampson Ave over flood channel ($3M), Widening at Goldenwest Street ($426,360), Upgrade Existing Class II ($1,159), 19 Class II intersection signs ($14,820)
	Class II (widen/upgrade/new)	9.2	$862,000	
	30% Contingency		$1,551,000	
	Total	**11.4**	**$6,720,000**	
G: Knott Springdale	Class I (upgrade)	0.5	$521,000	
	Class II (upgrade/new)	7.6	$305,000	
	30% Contingency		$248,000	
	Total	**8.1**	**$1,074,000**	
H: Seal Beach-Orange Ave	Class I (upgrade)	0.32	$500	Upgrade along Orange Avenue ($2.05M)
	Class II (widen/upgrade/new)	9.7	$2,307,000	
	30% Contingency		$692,000	
	Total	**10.0**	**$2,999,500**	
I: Brookhurst-Ward	Class I (upgrade/new)	3.9	$2,267,000	
	Class II (upgrade/new)	7.9	$120,000	
	30% Contingency		$716,000	
	Total	**11.8**	**$3,103,000**	
J: Edison Transmission Line	Class I (new)	2.8	$1,894,000	4 HAWK Intersection ($89,600 each)
	30% Contingency		$568,000	
	Total	**2.8**	**$2,462,000**	
K: Indianapolis-Fairview	Class I (upgrade/new)	4.3	$1,026,000	
	Class II (upgrade/new)	6.9	$243,000	
	30% Contingency		$381,000	
	Total	**11.1**	**$1,650,000**	

therefore prioritized for treatment. The weight has been reduced because all corridors have constraints, and the cost estimates address this already.

6. **Completes the corridor:** proportion of the corridor that is already built to at least minimum Caltrans standard for the bikeway type that is proposed – this helps to prioritize corridors which are already partially built. This factor is also part of the LTS Index (criterion 2). Proposed weight: 0.5

   - Assessed by a ratio of proposed length to total length. A high ratio (near 100%) means that the corridor has no existing bikeways to build on. Corridors with existing facilities are a higher priority for treatment.

7. **Completes the network:** regional corridors which link to other regional and local bikeways help complete the network – measured by number of intersections with other existing and proposed bikeways. Existing bikeways would be weighted more heavily. Proximity to the bikeway network is also included in the BPI (criterion 1). Proposed weight: 0.5

   - Although partly captured in the BPI method, the number of links/crossings with existing or proposed bikeways (from CBSP and this project) is recalculated here as the BPI does not include the proposed corridors. Connections to class 3 were not considered. Note that this is largely a function of length, therefore the number of connections has been divided by miles.

8. **Economic efficiency:** measure the financial benefits associated with corridor, normalized by the number of anticipated users (in turn a product of the facility type and length), and divided by the rough order construction cost estimates. Proposed weight: 1.0

   - Using NCHRP Report 552 methods, 1/4, 1/2 and 1 mi buffers were drawn around each corridor to obtain American Community Survey (ACS) population and journey to work mode share data. An extrapolation of all bicycle trips was made and estimates of potential ridership developed based on Class 1 path or Class 2 bicycle lane attractiveness functions defined in the NCHRP research calculated. Using the existing and estimated ridership, annual mobility, health, recreation, and reduced auto use cost saving benefits were calculated. The assumptions in the NCHRP method were modified to more conservative values (for example, rather than assuming that a new corridor facility would result in usage by new riders 365 days per year, usage was estimated for only 12 days per year). All benefit figures have been calculated using the original dollar values rather than updated to 2012 values, which results in more conservative benefit-cost ratios. These simplifications and conservative assumptions are considered appropriate given the high level comparative nature of the assessment. The economic evaluation assumed a 30-year analysis period, 0.57% annual population growth rate and a 5% discount rate. The net present value of benefits was divided by cost.

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F. Sample Letter of Support

The following is an example of a letter of support that would be prepared by an individual city and submitted as part of a grant funding application.

Date
Funding Agency
Address
City, State Zip

Subject: Letter of Support for Funding Grant Application for (insert Project Name)

To Whom It May Concern:

The City of (insert name) is submitting this letter in support of the funding grant application submitted by (insert lead agency) for the (insert project name). This proposed bikeway project represents an important piece of the regional bikeway network in northwestern Orange County, and we recognize the benefits that the project will provide not only to (insert city name), but all cities within this section of the county.

This proposed project was identified as a focus corridor as part of the Districts 1 and 2 Bikeways Collaborative, a joint effort involving our city, the project applicant, the Orange County Transportation Authority (OCTA), and other neighboring local agencies. Our city was an active participant in the Districts 1 and 2 Bikeways Collaborative. This collaborative effort focused on regional bikeway planning and identification of bikeway projects and improvements that would provide benefits throughout Orange County's Supervisorial Districts 1 and 2. The collaborative was one of many projects undertaken by OCTA to improve regional bikeways planning throughout Orange County.

Improving bikeway facilities within Districts 1 and 2 is a key priority for our city. Bikeway facilities help to provide our residents and commuters with alternatives to automobile travel, and providing safe and convenient bikeways helps to encourage people to travel by bicycle. We enthusiastically support the consideration of the (insert project name) for funding through this program.

Sincerely,

City Contact
Title

DISTRICTS 1 AND 2 BIKEWAYS STRATEGY
OCTA - Orange County Transportation Authority

Prepared by