RESOLUTION NO. 14-02

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF SAN CLEMENTE, CALIFORNIA, APPROVING THE DRAFT BICYCLE AND PEDESTRIAN MASTER PLAN, APPLICATION NO. GPA 13-043

WHEREAS, On June 1, 2010, the City Council approved Contract C10-32, by and between the City of San Clemente and KTU+A, providing for the development of a Bicycle and Pedestrian Master Plan "Master Plan"; and

WHEREAS, the purposes of the Master Plan were to identify the bicyclist and pedestrian transportation needs in San Clemente, provide recommendations to improve the overall walking and biking environments, and to integrate San Clemente's bikeway network with the Southern Orange County area's regional bikeway system; and

WHEREAS, Council directed that the Bicycle and Pedestrian Master Plan be developed currently with a new general plan to allow the general plan process to better assess the Community's bicyclist and pedestrian needs and to develop relevant policies and implementation actions to address those needs; and

WHEREAS, To encourage public input and participation in the planning process, the project scope of work utilized several public outreach methods, including involvement of the bicycle advocacy group PEDal in the selection of the consultant and review of the draft Plan, an on-line survey, Focus Area Workshops, General Plan Advisory Committee (GPAC) review and advertised public meetings before the Planning Commission and City Council; and

WHEREAS, citizens, property and business owners, interested groups and agencies were notified of general plan meetings and topics through legal advertisements in a local newspaper of general circulation, through newspaper articles and workshop invitations, and through City website notices regarding public meetings of the General Plan Advisory Committee, the Planning Commission and the City Council; and

WHEREAS, at a public meeting on January 17, 2012, the City Council directed that the Master Plan be fully integrated with the General Plan to ensure consistency between the documents and to comply with the California Complete Streets Act, AB 1358, which took effect January 2011; and

WHEREAS, based on GPAC's review and recommendations, public input, Planning Commission review and direction, and planning consultant and staff recommendations received during numerous public meetings held between June 2010 and June 2013, the Planning Commission endorsed a revised Bicycle and Pedestrian Master Plan and fully incorporated Chapter Two of the Master Plan, "Policy Framework," into the draft General Plan Multi-Modal and Complete Streets Element; and

WHEREAS, at a duly noticed public hearing on August 7, 2013, the Planning Commission conducted a public hearing on the Draft Bicycle and Pedestrian Master Plan in City Council Chambers, 100 Avenida Presidio, San Clemente, California. At

said hearing, the Planning Commission recommended that the City Council approve the 2013 Bicycle and Pedestrian Master Plan, City Council Hearing Draft Centennial General Plan, Environmental Impact Report, Climate Action Plan and related planning documents; and

NOW, THEREFORE, the City Council of the City of San Clemente hereby resolves as follows:

Section 1. **Findings.** Based upon its deliberations, the City Council makes the following findings:

1. The proposed 2013 Draft Bicycle and Pedestrian Master Plan ("BPMP"), **Exhibit A**, will promote the public health, safety and welfare by providing technical background, policies, candidate projects and design standards to help meet bicyclist and pedestrian transportation needs and to coordinate such projects with General Plan implementation and Capital Improvement Programs.

2. The 2013 Bicycle and Pedestrian Master Plan promotes public health, safety and welfare by addressing the community's non-motorized transportation needs and goals, and that Chapter Two of the BPMP, "Policy Framework", has been fully incorporated into the Final Draft General Plan Multi-Modal and Complete Streets Element.

3. The 2013 Bicycle and Pedestrian Master Plan incorporates GPAC and Planning Commission recommendations, public input, including bicycle advocacy group recommendations, consultant and staff recommendations and reflects the Council's review, direction and independent judgment regarding non-motorized transportation needs, existing and proposed circulation and transportation services and facilities, land use factors, economic development, design and other factors related to bicycle and pedestrian movement and infrastructure.

Section 2. **Environmental Determination.**

1. The City Council has reviewed and considered an Environmental Impact Report which evaluated potential impacts of the Draft BPMP and based on its deliberations, the City Council determined the DEIR adequately addresses the 2013 Bicycle and Pedestrian Master Plan's potential environmental impacts and certified the EIR as complying with requirements of the California Environmental Quality Act (CEQA) and CEQA Guidelines.

Section 3. **Bicycle and Pedestrian Master Plan Approved.**

1. The City Council hereby approves the 2013 Bicycle and Pedestrian Master Plan, as shown in **Exhibit A.**

Section 4. **Master Plan Amendments.** The City Council authorizes the City Manager or his designee to make minor amendments administratively, without a public hearing, to the Bicycle and Pedestrian Master Plan for the following reasons: 1) to reflect multi-modal improvements made in the community (i.e. updating tables, figures, and candidate projects); and 2) to remain consistent with state and/or local law.

Section 5. **Publication and Availability**. The Community Development Director shall cause the newly adopted Bicycle and Pedestrian Master Plan to be published electronically and made publicly available on the City's website as soon as practicable, with a target date of March 31, 2014.

Section 6. **Effective Date**. The newly adopted Bicycle and Pedestrian Master Plan shall be effective on the thirtieth day after passage of this resolution.

Section 7. **Zoning and Specific Plans Consistency**. The City Council intends, within a reasonable time after adopting the Centennial General Plan, to update the Zoning Ordinance and official Zone Map, and affected specific plans to ensure consistency with the Bicycle and Pedestrian Master Plan.

Section 8. **City Clerk Certification**. The City Clerk shall certify to the passage and adoption of this resolution and enter it into the book of original resolutions.

PASSED AND ADOPTED this 4th day of February, 2014.

ATTEST:

City Clerk of the City of
San Clemente, California

Mayor of the City of San
Clemente, California

STATE OF CALIFORNIA)
COUNTY OF ORANGE) §
CITY OF SAN CLEMENTE)

I, JOANNE BAADE, City Clerk of the City of San Clemente, California, do hereby certify that Resolution No. 14-02 was adopted at a regular meeting of the City Council of the City of San Clemente held on the 4th day of February, 2014, by the following vote:

AYES: BAKER, DONCHAK, EVERT, HAMM, MAYOR BROWN

NOES: NONE

ABSENT: NONE

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the official seal of the City of San Clemente, California, this 11TH day of MARCH, 2014.

CITY CLERK of the City of
San Clemente, California

Approved as to form:

/s/ Jeff Goldfarb
City Attorney

2013

City of San Clemente

Acknowledgements:

This Bicycle and Pedestrian Master Plan was prepared for the City of San Clemente under the direction of project manager Cliff Jones, Associate Planner, and the General Plan project manager, Jeff Hook, Principal Planner.

Special thanks to Brenda Miller of PEDal for her technical assistance and to the contributors to the Los Angeles County Model Design Manual for Living Streets.

Prime consultant was KTU+A Planning + Landscape Architecture of San Diego, California. Project manager was John Eric Holloway, ASLA, LEED Green Associate, LCI. Project planners and GIS analysts were Joe Punsalan, GISP, LCI, and Catrine Machi, AICP, LCI. Traffic engineering support was provided by Fehr & Peers Transportation Consultants.

This document is intended to fulfill project scope requirements for bicycle and pedestrian facility planning and to obtain City of San Clemente compliance with California Streets and Highways Code, Section 891.2 requirements for bicycle transportation plans.

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Executive Summary

Plan Scope

This is the City of San Clemente's first *Bicycle and Pedestrian Master Plan*. It establishes San Clemente's bikeway system to be considered for implementation and identifies the need to integrate with the existing southern Orange County area regional bikeway system. It also provides broad recommendations to improve the overall walking environment.

This Plan's candidate recommendations are based on public input, coordination with City departments and community groups, as well as best practices employed by agencies around the country, and are in accordance with the American Association of State Highway and Transportation Officials (AASHTO) *Guide for the Development of Bicycle Facilities* and the *Manual of Uniform Traffic Control Devices* (MUTCD), among others. Substantial sections of the Los Angeles County *Model Design Manual for Living Streets* have also been incorporated.

General Plan Relationship

This Plan is a comprehensive document that implements goals and policies of San Clemente's *General Plan*. It incorporates text, maps and graphics highlighting project research, best practices and outreach. While the *General Plan* needs to address cyclists, pedestrians and multi-modal transportation, it can only do so in a general way. This *Bicycle and Pedestrian Master Plan* needs to be consistent with and support the *General Plan*. Its details can be readily referenced by City leaders, staff, citizens and advocates.

Plan Compliance

Streets and Highways Code Section 891.2

This plan satisfies the requirements of the California *Bicycle Transportation Act* (BTA, 1994), which mandates that California Department of Transportation (Caltrans) approval of this Plan certifies the City of San Clemente's eligibility for state-distributed bicycle facility funding.

Master Plan of Arterial Highways (MPAH)

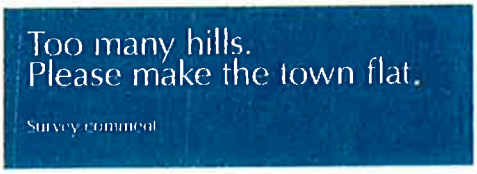
One of the primary local sources of funds for road projects is Orange County Transportation Authority (OCTA) Measure M grants. To be eligible, local agencies must adopt a *General Plan* Circulation Element that does not preclude implementation of the MPAH. An MPAH roadway unilaterally removed from or downgraded on the local agency's Circulation Element, and/or does not meet the capacity criteria, will result in the local agency becoming ineligible to participate in the Orange County Combined Transportation Funding Programs (CTFP). Therefore, any bicycle or pedestrian project impacts on MPAH roadway carrying capacity should be carefully evaluated.

Significant Findings and Recommendations

Like many initial planning efforts, the majority of the proposed facilities tend to fill gaps in the existing system. The intent was to complete facilities so that cyclists and walkers can expect more consistent, and therefore safer and convenient conditions. However, this Plan also recommends additional programmatic improvements, particularly programs and policies related to education, encouragement, enforcement, evaluation and planning. In conjunction with the City's existing cycling and walking infrastructure, these programs and policies are intended to persuade more people to ride or walk to get around San Clemente, instead of automatically reaching for their car keys.

Terrain and Development Patterns

The newer major roadways within San Clemente reflect up-to-date street standards and incorporate Class 2 bicycle lanes. However, these bicycle lanes commonly share roadways with high motor vehicle traffic volumes and posted speed limits. This means that although cyclists have wider, more visible facilities, they share the roadways with large numbers of faster moving motor vehicles.



San Clemente's overall development patterns were driven by its hilly topography. Major arterials and connecting streets were laid out in relation to this terrain, which limited the number of feasible connections. This means that cyclists and walkers often have to use streets with grades significant enough to discourage casual use and less hilly alternate routes are not always available.

Connectivity Issues

Interstate 5

Freeways create connectivity problems for cyclists and walkers, especially where they must cross at interchanges without bicycle facilities or appropriate pedestrian facilities. While most interchanges have sidewalks, few have Class 2 bicycle lanes and some are not even designated as Class 3 routes. The roadway within the freeway right-of-way is often a gap in otherwise consistent bikeway facilities. Bicycle lane striping and signage remind drivers to be aware of cyclists. Without these important visual cues, cyclists feel less secure making the passage under or over a freeway.

While this Plan strives to take advantage of available freeway crossings away from interchanges, their distance from each other requires the consideration of all other crossing points, including those at interchanges because these locations are where many vehicular turning and lane-changing movements occur. "Enhanced" painted bicycle lanes at such locations have been shown to promote safety by increasing driver awareness of the presence of cyclists and walkers through improved visibility and this technique recently won state approval.

Existing Informal Pathways

Formalize well-used pathways that have served as important circulation routes for a significant amount of time. Most of these occur along the Interstate 5 frontage. Some of these could serve a Safe Routes to School function.

Low Volume Streets

Make some low volume streets one-way to allow space for sidewalks. Not all streets need this treatment, but entire neighborhoods may benefit from it, especially if busier streets are maintained as two-way to function more as arterials.

Beach Route

Extend the beach route north and south to adjacent communities and the state park and make it more accessible to all non-motorized users.

Lack of Bicycle Parking

Field review, survey comments and other community input clearly shows that there is a need for additional bicycle parking, especially in the downtown area. This can be seen as a blessing in disguise because the City can inaugurate an overall bicycle parking program that complements its aesthetics while employing the latest best practices. The City could seek air quality improvement or congestion mitigation program grants to fund bicycle parking programs.

"When using bicycles for transportation, the biggest oversight is nowhere to secure and park the bicycle at stores, etc."

"There are almost no bicycle racks in San Clemente, which can be very frustrating."

"More places to lock up my bike, especially in the downtown area, would be great."

Survey comments

Education

According to survey responses for this and other studies, many cyclists feel that drivers are generally not aware of and do not respect cyclists' rights to use the roadways. Drivers counter that they frequently see cyclists disobeying basic traffic rules, especially riding the wrong way and ignoring stop signs and traffic signals.

Education can alleviate much of this misunderstanding, especially if learning takes place early. Education programs directed at both drivers and cyclists can help create an environment more conducive to riding and walking.

"I'm lucky to be seen by even one driver. In fact, I would say that on a daily ride I have to make at least one heroic move just to not get hit. The roads just are not user friendly."

"There are way too many bicyclists blowing the stop signs or red lights and getting hostile at drivers who nearly hit them due to their own stupidity."

Survey comments

Lack of Employment Site Amenities

One of the most common reasons survey respondents cite for not commuting by bicycle is the lack of lockers, showers or changing facilities at their work place. Past national polls have found that up to 20 percent of adults say they would sometimes bicycle to work if safe routes and workplace parking and changing facilities were provided. This relatively simple addition could encourage a higher percentage of commuters to consider getting to and from work other than by driving, helping to alleviate roadway congestion and on-site parking demand.

As new bicycle facilities attract more cyclists, per-capita car-related collision rates decline, and increased numbers have been shown to increase safety. It is also well documented that the provision of sidewalks and other pedestrian amenities encourage more people to walk instead of drive. The Safe Routes to School Program offers ways to encourage more children to ride and walk. The program's goal is to reduce childhood injury, obesity, respiratory illness and the risk of cardiovascular disease later in life. Both the City and school administrators will also benefit from fewer vehicles congesting pick-up and drop-off points and nearby streets.

Candidate Projects

The proposed system includes a total of approximately 40 miles of new bikeways, in addition to the 26 miles in place in 2012. Table ES-1 shows the number of existing and proposed miles for each bikeway classification.

Table ES-1: Candidate Bicycle Facilities

Facility Types	Existing	Proposed	Totals
Class 1 Paths	3.8	6.7	**10.5**
Class 2 Lanes	20.4	14.7	**35.1**
Class 3 Routes	2.2	13.4	**15.6**
Totals	**26.4**	**34.8**	**61.2**

Implementation

Plan implementation is necessarily multi-faceted. Besides adoption of goals and policies, it often includes implementation of programs and the pursuit of project funding, whether through the City's capital improvements project process or grant funding. The Plan addresses goals, policies, programs and projects that may not be feasible to implement right away, but are included to stir ideas and inspire long-term actions.

Following adoption of the Plan, the next tasks are getting the programs into the City's or appropriate school's budget, grant writing to fund projects and programs, amending City Engineering Standards and Design Guidelines for consistency, including projects in the City's ongoing capital improvements programs, and implementing goals and policies in the everyday processes of City management, whether in site plan review, traffic enforcement or street engineering decisions.

Recommendations include education and outreach programs that can be implemented by the City, schools, volunteers and Orange County Sheriff's Office. Implementation ultimately rests on the community and City's desire to make the Plan a reality.

1 Introduction

1.1 Context

A growing number of communities are discovering the value of their streets as important public spaces for many aspects of daily life. People want streets that are safe to cross or walk along, offer places to meet people, link healthy neighborhoods and support a vibrant retail mix. More people are enjoying the value of farmers' markets, street festival and gathering places. More people want to be able to walk and ride bicycles in their neighborhoods. People from a wide variety of backgrounds are forming partnerships with schools, health agencies, neighborhood associations, environmental organizations and other groups in asking their city councils to create streets and neighborhoods that fit this vision.

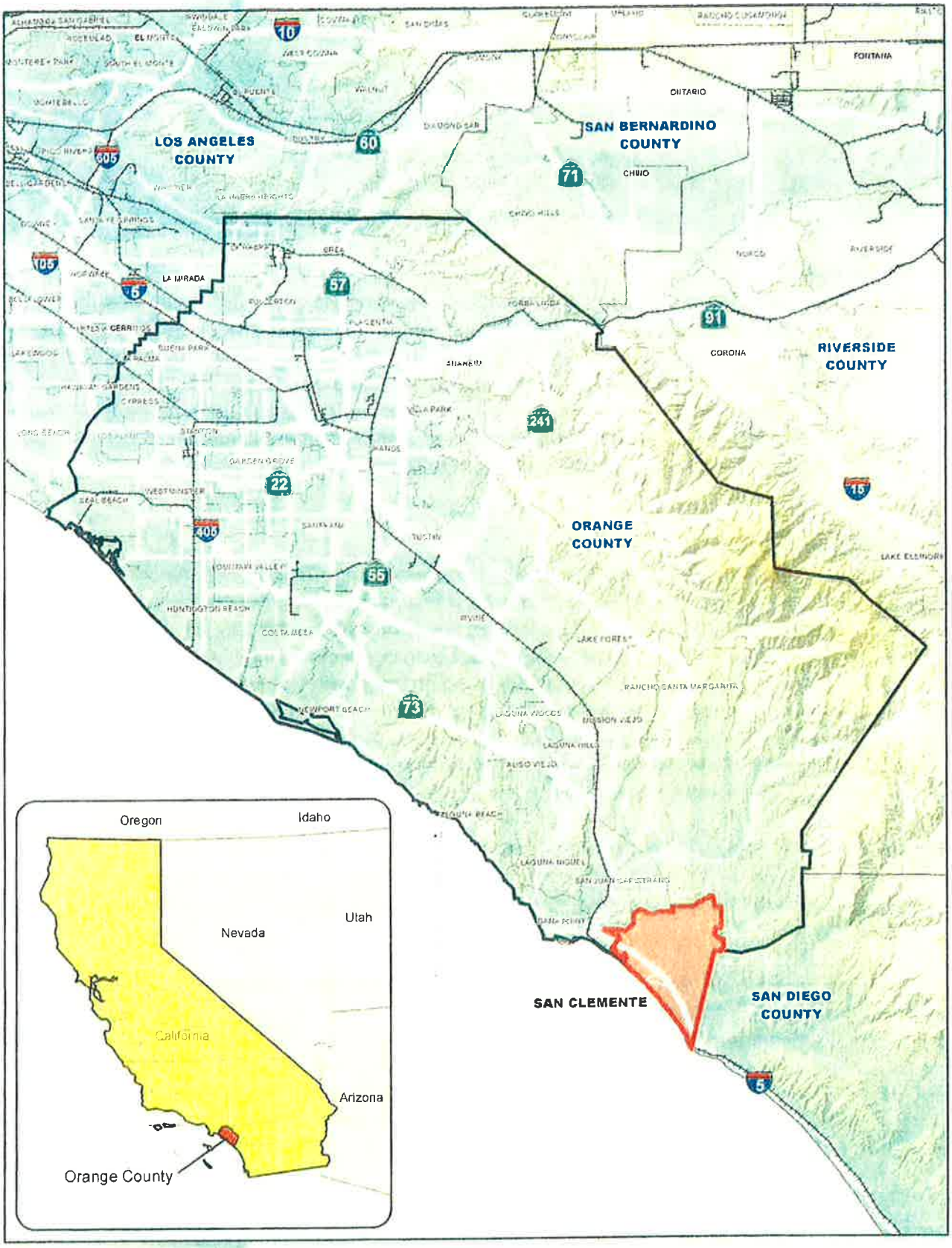
1.2 Methodology

The City of San Clemente wants to promote a safe, convenient and efficient environment for bicycle and pedestrian travel. During the development of this *Bicycle and Pedestrian Master Plan*, a comprehensive approach was used to identify bicycle and pedestrian needs throughout the City, to review conditions, to examine potential improvements, to identify opportunities to connect and integrate existing and proposed facilities and to prioritize implementation strategies in accordance with viable funding sources. This plan is conceptual, since precise alignments and details will be determined through the design and implementation process. This plan includes text and graphics from the Los Angeles County *Model Design Manual for Living Streets* (MDMLS), which the City is adopting as its design manual, particularly the manual's Chapters 5 to 9, and portions of Chapters 1, 2 and 11.

This *Bicycle and Pedestrian Master Plan* should be responsive to any *General Plan* changes that could affect circulation patterns. This plan provides a framework for the future development of the City's bicycle and pedestrian network and also ensures City eligibility for local, state and federal funding for bicycle and pedestrian projects.

From a regional perspective, San Clemente's location within the transportation network is addressed in related sections of the Circulation Element of the City's *General Plan*. This *Bicycle and Pedestrian Master Plan* emphasizes the importance of linking bicycle routes to regional transit routes. These routes are noted in the Southern California Association of Governments (SCAG) *Regional Transportation Plan Non-Motorized Transportation Report* and the Orange County Transportation Agency (OCTA) *Commuter Bikeway Strategic Plan* (CBSP) and will be included in SCAG's ongoing *Regional Bicycle and Pedestrian Plan* to ensure continued access to other transportation systems, such as bus and commuter rail.

Figure 1.1: Regional Setting



OCTA's Measure M grants are a primary source of funds for County roadway projects. To be eligible, local agencies must adopt a *General Plan* Circulation Element that does not preclude implementation of the Master Plan of Arterial Highways (MPAH). An MPAH roadway unilaterally removed from or downgraded on the local agency's Circulation Element, and/or does not meet the capacity criteria, will result in the local agency becoming ineligible to participate in the Orange County Combined Transportation Funding Programs (CTFP). Therefore, any bicycle (or pedestrian) project impacts on MPAH-defined roadway carrying capacity should be carefully evaluated.

1.3 Study Area

The project study area was the City of San Clemente. Surrounding communities and unincorporated County areas were also evaluated for connection opportunities with the regional network via San Clemente's bikeway system (See Figure 1.1: Regional Setting). This plan addresses on-street bicycle facilities, as well as discussing pedestrian walkways and multi-use pathways.

1.4 Objectives

Through public input and comments from community groups and City staff, three primary issues emerged:

- The community desires a comprehensive bikeway system serving destinations throughout the City.
- The community desires that pedestrian facilities be improved, especially sidewalk continuity and pedestrian safety.
- Driver and cyclist education and enforcement are needed to improve safety and awareness for all.

1.5 Understanding User Needs

This plan was developed with a "cyclist's and pedestrian's perspective" by planners who routinely commute by bicycle, as well as walk, and fully understand the implications of alternative travel. For example, many of the potential bicycle routes were ridden to experience them firsthand, particularly routes or locations noted in public comments as uncomfortable to most users due to high motor vehicle speeds and volumes. The planners' analysis resulted in recommendations portrayed in clear text and graphic format. Pedestrian needs were identified during field work and through review of documents and public input.

1.6 Cycling and Walking Benefits

There are numerous health, environmental and economic benefits related to cycling and walking:

Health Benefits

Stress Reduction

Exercise in general has been shown to decrease anxiety and stress levels. Cycling, running and walking on a regular basis are fun ways to exercise and take advantage of their stress-reducing capabilities.

Weight Loss

The United States' (and world's) population is becoming increasingly obese. Outdoor activities that encourage cycling and walking are a great way to help lose weight since they burn fat, which helps individuals feel better.

Health Benefits

Studies have shown that regular exercise lowers the risk of high blood pressure, heart attacks and strokes. In addition to heart disease, regular exercise can also help to prevent other health problems such as non-insulin dependent diabetes, osteoarthritis and osteoporosis. Exercise also relieves symptoms of depression and improves mental health.

Improved Cardiovascular Fitness

Exercise improves heart and lung fitness, as well as strength and stamina.

A smaller percentage of people cycle or walk in the United States than in many other parts of the world and the nation is a petroleum consumption leader. Motor vehicle traffic is a significant contributor to air pollution, leading to many negative effects on the environment, such as increased emissions of harmful greenhouse gases including carbon dioxide, carbon monoxide, methane, nitrous oxide and volatile organic compounds. These pollutants and irritants in the air can cause asthma, bronchitis, pneumonia and decreased resistance to respiratory infections. Increased cycling, walking and using public transportation helps to reduce fossil fuel emissions which helps to clean the air.

In other California cities like Palo Alto, Pasadena, Chico, Long Beach, Santa Barbara and San Diego, innovative projects, good facilities and bicycle-friendly local policies are boosting the share of trips taken by these pollution-free vehicles. San Clemente's Mediterranean climate supports cycling and walking virtually year round. State and federal fiscal support is available for bicycling and walking facilities. There is tremendous untapped potential, particularly for the increased use of bicycles, to meet our transportation needs. According to the California Environmental Protection Agency – Air Resources Board:

- More than half of commute trips and three out of four shopping trips are under five miles in length, which are ideal for cycling. Forty percent of all trips are under two miles.
- A comprehensive review of non-motorized travel data indicates *"considerable latent demand for bicycling and walking will be released if infrastructural impediments to these modes are removed or mitigated."*
- About 27.3 percent of the driving age public (age 16 and older) reported they rode a bicycle at least once during the summer of 2002, which equates to approximately 57 million persons age 16 or older who rode a bicycle.
- Cycling can be an excellent choice for exercise. Recent exercise recommendations include a minimum of one hour of daily moderate exercise, such as cycling, for children and adults to promote health and vigor and to maintain body weight.

Environmental Benefits

Reduced greenhouse gas (GHG) emissions, energy efficiency and reduced traffic fatalities and injuries are significant benefits attributable to cycling and walking. It will be especially difficult to reach State of California GHG reduction targets for transportation without increasing the amount of cycling and walking. The future impact of several recent legislative acts may therefore be enhanced by the implementation of effective bicycle and pedestrian master plans.

Replacing just one percent of vehicle trips with bicycle trips in the South Coast Air Quality Management District* would reduce vehicle miles traveled by 1,027,214 miles per year, as well as reduce smog-forming gases by 1.38 tons/day, particulates by 0.25 tons/day and carbon monoxide by 7.78 tons/day.

*Includes the southern two-thirds of Los Angeles County, all of Orange County, and the western urbanized portions of Riverside and San Bernardino Counties

Source: California Environmental Protection Agency – Air Resources Board

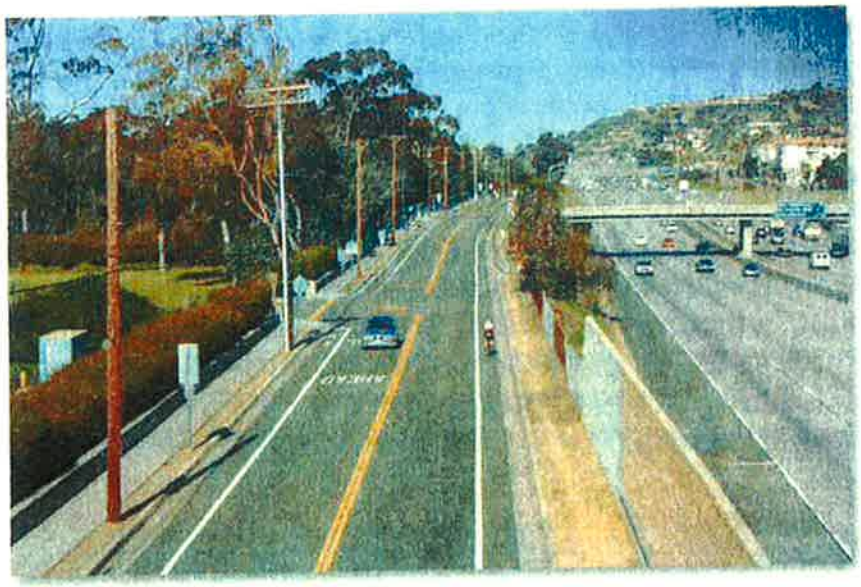
Assembly Bill 32 - Global Warming Solutions Act
AB 32 calls for the reduction of greenhouse gas emissions and sets the 2020 emissions reduction goal into law. This act also directs the California Air Resources Board to develop specific early actions to reduce greenhouse gases, while also preparing a scoping plan to identify how best to reach the 2020 limit.

Senate Bill 375 - Redesigning Communities to Reduce Greenhouse Gases
This bill seeks to reduce vehicle miles traveled through land use and planning incentives. Key provisions require the larger regional transportation planning agencies to develop more sophisticated transportation planning models and to use them for the purpose of creating "preferred growth scenarios" in their regional plans that limit greenhouse gas emissions. The bill also provides incentives for local governments to incorporate these preferred growth scenarios into the transportation elements of their general land use plans.

California Government Code Section 65302 (2)
This code section requires cities revising their circulation elements to modify them to plan for a "*...balanced, multimodal transportation network that meets the needs of all users of streets, roads, and highways for safe and convenient travel in a manner that is suitable to the rural, suburban, or urban context of the general plan.*" The code specifically defines users of streets, roads and highways as bicyclists, children, persons with disabilities, motorists, movers of commercial goods, pedestrians, users of public transportation and seniors.

Individual Economic Benefits
Cycling and walking are low cost activities easy to incorporate into an individual's daily life such as commuting to work or running errands. In mild climate areas, such as San Clemente, cycling and walking can occur year round. Cycling or walking to and from work can also save money. Based on an hourly wage of $10.00, a driver must work 300 hours per year to pay for his or her commute. A cyclist only has to work about 30 hours per year to operate his or her bicycle. Walking is even more cost-effective for short distances.

1.7 Field Work
Much of the fieldwork consisted of cycling San Clemente's streets to obtain firsthand experience. The remainder of the field work consisted of driving routes and examining areas about which public input had been given. To get a sense of daily bicycle use volumes, user counts for this project were conducted by members of PEDal, San Clemente's local cycling and walking advocacy organization. These counts are summarized in Appendix H.



Avenida Del Presidente and Interstate 5

1.8 Community Input

Community involvement consisted of project discussions at General Plan update workshops at two locations and an on-line questionnaire. While the primary focus of the General Plan meetings was the update itself, the *Bicycle and Pedestrian Master Plan* was an integral component of the update process. Facility description and existing condition informational plots on boards were displayed, along with large, high-resolution, color aerial photo maps of the entire community spread out on central tables. Attendees were encouraged to make comments on any of the provided maps about walking or cycling routes throughout the City. This included where they do or do not walk or ride now, why or why they do not walk or ride those routes, any gaps in existing facilities or other deficiencies, as well as where they would like to see additional facilities. Laptop computers with wireless Internet connection were provided at all public meetings for attendees to use to fill out the on-line questionnaire.

Additional meetings conducted for this project included a presentation at a Health in Motion forum sponsored by the Health Committee of the San Clemente Collaborative, an alliance of social service agencies, nonprofit organizations, educators and city officials who work together on issues that affect the San Clemente community, including community health and active transportation. Another project meeting was a combined Safe Routes to School walk audit and parent/volunteer training session at Marblehead Elementary School. There were also meetings with City staff and the General Plan Advisory Committee, as well as PEDal, San Clemente's bicycle and pedestrian advocacy organization, providing user counts at a number of locations.

Safe Routes to School - Walking and Biking Assessment Flyer

An on-line questionnaire was developed to solicit input from residents who either could not attend the General Plan workshops or who had additional comments after attending a workshop. On-line questionnaires have proved their value because they allow residents who are uncomfortable commenting in a public setting to do so privately. Being able to compose their thoughts at their leisure and usually at home often results in more comments overall and more in-depth insight about specific location than what is generally provided at public meetings alone. Two similar surveys for walking and biking were provided on-line throughout the project. 93 residents filled out the on-line pedestrian survey and 161 completed the cycling survey.

2 Policy Framework

This chapter lists the goals, policies and implementation measures developed for this Plan, in conjunction with the Mobility Element of the General Plan.

Goal:
City-wide bicycle and pedestrian facilities that provide an integrated, direct, safe and convenient network for all users.

Policies:

P-1.1. We shall consider every street in San Clemente as a street that cyclists could use.

P-1.2. We shall employ bicycle-friendly infrastructure design using new technologies and innovative treatments where necessary to improve bicyclists' safety and convenience.

P-1.3. We shall evaluate roadway level of service performance from a multi-modal, Complete Street perspective.

P-1.4. Traffic control devices and transportation infrastructure will be operated to serve the needs of all users of the roadway, including motorists, pedestrians and cyclists.

P-1.5. In determining the appropriate standard to apply to a given situation, the City will seek to maximize cyclists' and pedestrians' safety, comfort and convenience in balance with the other roadway users.

P-1.6. In preparing City land use plans and CIPS, we address bicycle needs, including:

a. attractive destination facilities such as bicycle lockers, showers, and changing rooms conveniently located for cyclists (e.g., a Bike Station);

b. facilities for bicycle parking within newly built and renovated multi-family residential developments, condominium and apartment conversions, multi-use and non-residential sites;

c. safe, secure and convenient bicycle parking; and

d. wayfinding systems and traffic control signage or markings for all bicycle routes.

P-1.7. We coordinate with other jurisdictions for regional on-road and off-road bicycle and pedestrian facility planning, as well as facility acquisition and development efforts.

P-1.8. We link on-road and off-road bicycle and pedestrian facilities within San Clemente to existing and planned facilities in adjacent and regional jurisdictions.

P-1-9. Where feasible, the City connects off-road trails with the on-road transportation.

P-1.10. The City encourages and supports bicycle use as an efficient and legitimate mode of transportation, especially for connecting gaps between destinations and transit stops and rail stations.

P-1-11. The City encourages and supports skateboard use as an efficient and legitimate mode of transportation to connect gaps between destinations and transit stops and rail stations.

P-1.12. All bicycle facilities are maintained according to a management plan to be adopted by the City.

P-1.13. We develop and maintain a network of sidewalks, crosswalks and other pedestrian facilities throughout the City as specified in the Bicycle and Pedestrian Master Plan.

P-1.14. We utilize Federal and State guidelines and standards for traffic operations, signal timing, geometric design, Universal Access (ADA) and roadway maintenance that facilitate walking and bicycling at intersections and other key crossing locations.

P-1.15. We shall utilize the Caltrans *Highway Design Manual* and other infrastructure guidelines as appropriate to design and maintain bicycle and pedestrian facilities to high safety standards.

P-1.16. The City shall require unpaved bicycle and pedestrian trails on City-controlled property to be built and maintained using recognized best practices.

P-1.17. The City shall require the intersections of local roads with the Interstate 5 freeway and toll roads to be designed using a "Complete Streets" approach.

P-1.18. Bicycle and pedestrian network wayfinding and information shall be provided through signs, markings or other technologies.

P-1.19. We shall consider using the right-of-way outside that of the roadway limits to install safe and convenient bicycle and pedestrian facilities.

P-1.20. We shall explore the formalization of existing informal bicycle and pedestrian paths where appropriate.

P-1.21. Integrate bicycle and pedestrian facility installation and maintenance into the roadway and maintenance planning process.

P-1.22. When roadway repairs are done by the City or other agencies, such as utilities, the roadway shall be restored in accordance with City standards, with restriping suitable for cycling, as appropriate.

P-1.23. Where feasible, we design bikeways beyond the minimum required widths, but within Federal, State or local standards (For example, Class 2 lanes should not exceed eight feet in width to avoid confusion as driving lanes.)

P-1.24. We retain existing bikeways when a roadway is reconstructed, reconfigured or improved. When designated bikeways must be temporarily removed, they should be replaced on nearby, convenient and parallel routes.

P-1.25. We review all new capital improvement projects and private development projects to ensure consistency with the Bicycle and Pedestrian Master Plan and with the Mobility and Complete Streets Element.

P-1.26. We shall consider implementing bicycle and pedestrian improvement projects as part of other street improvement projects.

P-1.27. We provide convenient, secure, attractive and easy to use bicycle parking at public buildings, commercial areas, multi-family residential development projects, and at schools and parks and encourage other agencies to provide bicycle parking for rail transit and Park-n-Ride facilities.

P-1.28. Provide access paths to transit centers and commuter rail stations to encourage walking and cycling.

P-1.29. Maintain riding surfaces suitable for cycling on all designated, on road bicycle facilities in accordance with a management plan to be adopted by the City.

P-1.30. Maintain and sweep streets and bikeways in compliance with the City Street Sweeping Program.

P-1.31. Maintain bicycle and pedestrian signage and pavement markings so they are in good working condition.

P-1.32. We encourage public pedestrian improvement projects such as public art, fountains, street trees, lighting and directional signs.

Implementation Programs:

I-1.1. Identify and designate Class 2 lanes where there is enough curb-to-curb pavement width.

I-1.2. Install vehicle actuation to detect bicycles when intersections with signals are rehabilitated (CVC 21450.5).

I-1.3. Install bicycle detector pavement markings at traffic signals using best practices and adopted State or Federal standards when intersections with signals are rehabilitated.

I-1.4 Integrate development of the cycling network into larger land use planning and development projects.

I-1.5. Maintain riding surfaces suitable for cycling on all designated, on-road bicycle facilities in accordance with a management plan to be adopted by the City.

I-1.6. Periodically (for example, when the BPMP is updated and as part of the LTFP), review official databases of bicycle and pedestrian accidents, analyze their causes and locations, and strive to reduce collisions through infrastructure improvements, community outreach and education, and law enforcement efforts.

I-1.7. Develop standards that require bicycle accommodations (such as parking, lockers and showers) in new or significantly rehabilitated non-residential developments.

I-1.8. Ensure walking routes are integrated into new greenways and open space areas, where appropriate, and encourage them in existing greenways and open space areas.

I-1-9. The City will recognize skateboarding as a legitimate form of transportation and accommodate it in its transportation policies and, where appropriate, in street and other public improvements. City will revise ordinances as necessary to accommodate safe skateboard use.

Goal:
Adults and children are educated and encouraged to be safe cyclists and pedestrians.

Policies:

P-2.1. We encourage and support the creation of comprehensive safety awareness programs for pedestrians, skateboarders, cyclists and drivers.

P-2.2. We encourage City staff, employees, residents and visitors to walk and bicycle as often as possible.

P-2.3 Support and promote education and awareness of pedestrian and bicyclists rights and behaviors, as well as risk avoidance, among the motoring public.

P-2.4 We improve appropriate legal access to public lands for cyclists and pedestrians.

Implementation Programs:

I-2.1. Include bicycle and walking safety lessons in City recreation programs and collaborate with local schools and law enforcement to offer bicycle and pedestrian skills and safety education programs.

I-2.2. Assist employers in implementing a comprehensive bicycle awareness program for their employees.

1-2.3. Expand the Safe Routes to School program, including International Walk/Bike to School events, and encourage all schools to get involved.

I-2.4. Consider designating a law enforcement liaison officer for the bicycle and pedestrian community.

I-2.5. Provide training opportunities for engineering and planning staff on ways to integrate bicyclists and pedestrians with the transportation network.

1-2.6. Provide training and public outreach opportunities about bicyclists' and pedestrians' legal rights and duties for City engineering and planning staff, as well as for law enforcement officials.

I-2.7. Provide an outreach and education component to coincide with the first installation of any new type of bicycle facility as part of the implementation of the associated capital improvement project.

I-2.8. Develop a City-wide bicycle map.

I-2.9. Collaborate with local businesses, bicycle shops, non-profits, schools, and government agencies to produce and distribute bicycle and pedestrian safety materials.

I-2.10. Encourage City officials and employees, as well as other employers, to participate in "Bike to Work Month" and "Bike to Work Week."

1.2.11. Collaborate with local off-road advocacy groups, conservation non-profits, State Parks, adjacent jurisdictions and the Donna O'Neil Land Conservancy to develop a plan for off-road trail facilities.

I-2.12. Establish a bicycle-friendly business program to encourage and facilitate use of alternative modes of transportation by employees and customers: http://www.bikeleague.org/programs/

I-2.13. Consider establishing an Active Transportation Coordinator position to work with City departments and advocacy groups to support and coordinate efforts to improve alternative transportation modes and to implement the Bicycle and Pedestrian Master Plan.

Goal:
Children in San Clemente have a safe environment in which to walk, skateboard and bicycle to school.

Policies:

P-3.1. We improve and maintain alternative transportation infrastructure and assign a high priority to improvements along primary pedestrian and bicycle routes to schools.

Implementation Program:

I-3.1. Provide assistance to school districts in facility planning and transportation operations to ensure safety for users of all modes during school pick-up, drop-off and other special events

Goal:
Cycling and walking are encouraged though improvements that support smart growth, public transit, lowered greenhouse gas emissions and healthy lifestyles.

Policies:

P-4.1. We utilize non-motorized transportation solutions as a tool for achieving economic development and environmental sustainability goals.

P-4.2. We pursue Federal, State, County, regional and local funding opportunities to increase bicycle and pedestrian mode share percentages to improve transportation system performance and air quality by creating a balanced multi-modal transportation system.

P-4.3 We require the construction or rehabilitation of bicycle facilities and/or "bicycle friendly" Improvements as a condition of approving new development in accordance with Zoning Ordinance Standards.

P-4.4 We encourage bicycle and pedestrian-oriented site design in commercial areas.

P-4.5 We design bicycle and pedestrian network linkages that directly connect to retail and commercial centers.

P-4.6 We require development projects and site plans to be designed to encourage pedestrian connectivity among buildings within a site, while linking buildings to the public bicycle and pedestrian network.

Implementation Programs:

I-4.1. Track mode shift to quantify greenhouse gas reductions.

I-4.2. Establish mode shift/share goals.

Goal:

Walking is encouraged with a complete pedestrian network that provides safe, continuous and convenient access to major destinations such as transit, employment centers, schools, beaches, parks, other recreation areas, retail and neighborhoods.

Policies:

P-5.1. Should the City defer construction of street improvements as part of any development approval, the property owner may be required to sign an agreement to participate in the installation of the improvements when a more complete street improvement project is feasible.

P-5.2. All new streets shall have provisions for the adequate and safe movement of pedestrians, in accordance with the American Disabilities Act.

P-5.3. Sidewalks or pathways are desirable in all areas.

P-5.4 As funding permits, we will install or require as a condition of development approval pedestrian facility improvements such as installation of signs, signals, street crosswalks, proper lighting, pedestrian-activated signals, street trees, placement of benches, transit shelters, shade and other ancillary pedestrian features.

P-5.5 We ensure that substandard public sidewalks and paving in public areas are repaired or replaced in accordance with the Sidewalk Repair Program.

P-5.6 We give high priority to providing pedestrian and bicycle access to all public facilities and transit stops and will coordinate with OCTA as necessary.

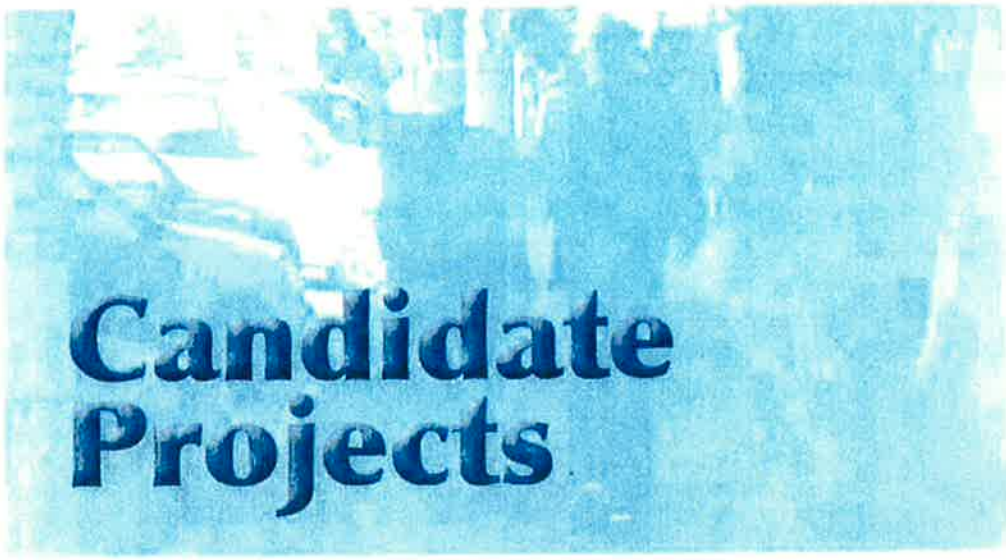
P-5.7 We may approve certain commercial uses in public sidewalks in the Pedestrian Overlay District when those uses benefit the overall pedestrian environment.

Implementation Programs:

I-5.1. Prepare and maintain an inventory of sidewalk facilities to determine where pedestrian improvements are most needed to insure continuous safe pedestrian routes throughout the City.

I-5.2. Retrofit streets and require developments to install public improvements that provide disabled access and mobility on public streets, as required by State or Federal law.

I-5.3. Work towards closing existing gaps in the City's pedestrian network.



Candidate Projects 3

3.1 Development Priorities

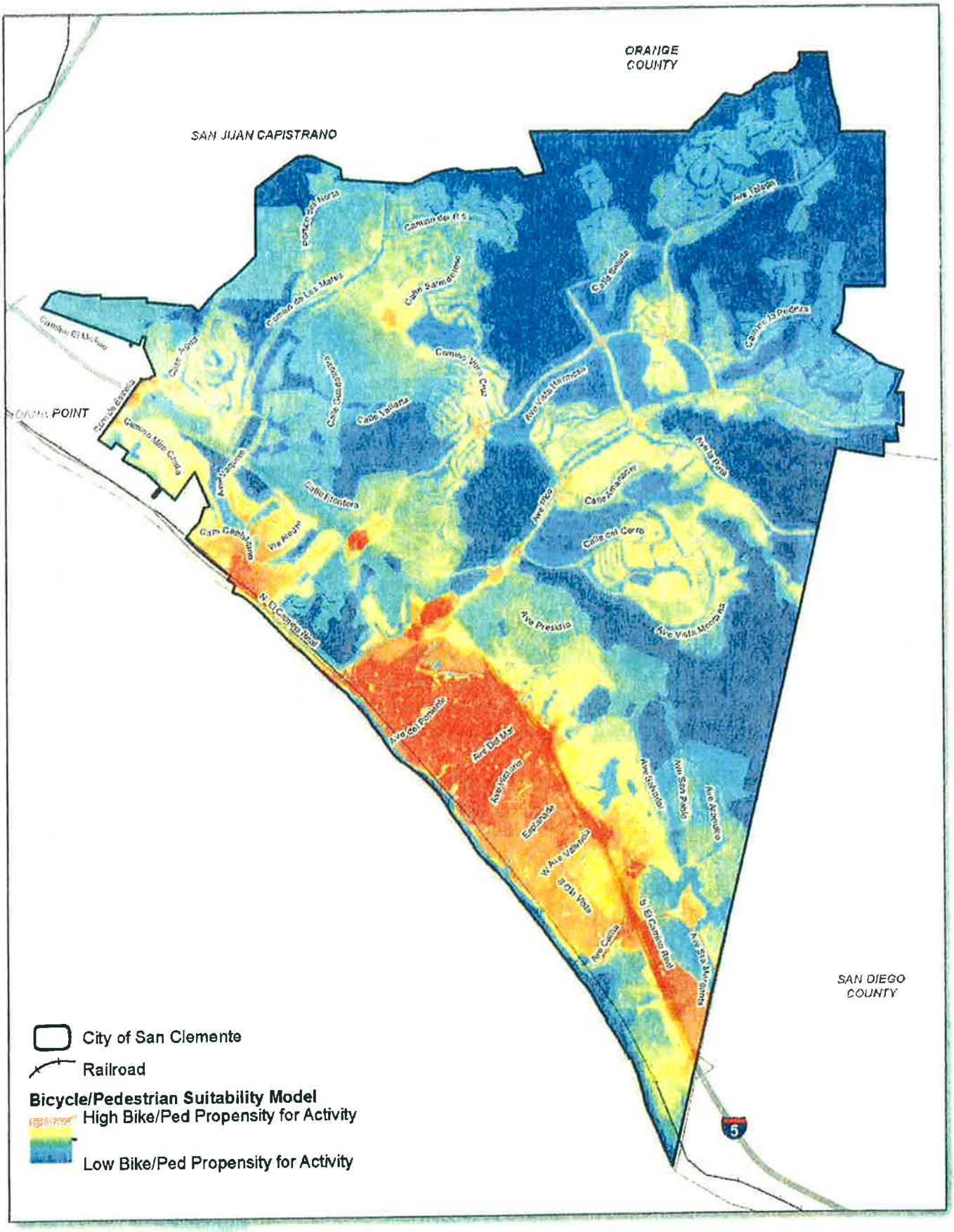
The proposed projects shown in this chapter are a combination of planned and candidate bicycle and pedestrian facilities. Planned projects are those in existing City plans and documents, but have yet to be implemented. Since these projects have yet to be implemented, analyzing them along with the candidate projects subjects all of them to the same level of scrutiny and prioritization criteria. These projects were then itemized into Prioritized Projects, which are those that will have a significant impact on the existing bikeway system, such as closing major gaps and extending or developing bicycle paths, lanes or routes along major transportation corridors.

As part of project analysis, a number of attributes were incorporated into a GIS model to produce Figure 3.1: Bicycle and Pedestrian Suitability Model, which depicts the areas most likely to support walking and biking. For the criteria used to develop this model, see the appendix. This relative suitability was used to help assign priorities. The prioritization criteria used to identify which routes are likely to provide the most benefit to the City's bikeway system can be found in the appendix.

The numbering used to identify projects within each bikeway facility class in the following sections does not necessarily imply priority beyond the facility category. Bikeway facility implementation has no specific time line, since the availability of funds for implementation is variable and tied to the priorities of the City's capital projects. This chapter's tables list candidate projects and the associated figures identify their locations. The candidate projects noted in the following tables as "additional" are follow-up recommendations to be evaluated for future prioritization and potential implementation.

This Plan also highlights a range of candidate public improvements to benefit pedestrians. Increasing sidewalk widths, landscaping, street furniture and parking in commercial areas all help separate pedestrian and vehicular traffic, while improving the appearance of the community and supporting retail storefronts and restaurant uses.

Figure 3.1: Bicycle and Pedestrian Suitability Model



The planned system builds upon existing bicycle and pedestrian facilities throughout the City with enhancements to overall connectivity, including support facilities. This network, coupled with driver, cyclist and pedestrian and education, enforcement and promotional programs, will create a more bicycle and pedestrian-friendly community. The anticipated result is an increase in residents choosing to ride a bicycle or walk to nearby destinations.

The Plan policies attempt to balance the need for pedestrian use of the public right-of-way within the physical limitations of certain areas of the City. In many cases, streets in hilly coastal areas have little or no space for sidewalks. In other areas, a lack of enough existing improvements may make it difficult for pedestrian facilities to be installed without leaving a piecemeal system. This occurs especially with in-fill developments, which are likely to be typical of future residential areas in the future. For these reasons, policies that allow flexibility in determining where pedestrian improvements will be required are included.

The enactment of the *Americans with Disabilities Act* (ADA) has made it mandatory that public rights-of-way be improved to permit safe and efficient wheelchair access and use. For this reason, pedestrian ramps will be needed throughout the City where sidewalks are provided. Other requirements will also have to be met to provide clearance for wheelchairs around street signs, street lights, trees, mailboxes, etc. Neighborhoods devoid of all sidewalks are not as problematic as areas with only piecemeal walkway systems. An able-bodied walker can more easily navigate abrupt ends to walkways than a person with disabilities. In neighborhoods with no walkways, all users have to utilize the street, making this more equitable under ADA.

In addition to sidewalk improvements and crosswalk enhancements, properly timed pedestrian crossing signals should be provided at all signalized intersections with pedestrian access. This is particularly important at major streets with wide roadways that may be difficult for senior citizens and disabled persons to cross. Balancing the needs of pedestrians with the need to move vehicular traffic will require the City's ongoing attention.

3.2 Candidate Bicycle Projects

The following maps and tables describe the candidate bicycle projects developed through project analysis and City staff, community and advocacy group input. Pedestrian project and criteria are addressed in a subsequent section of this chapter.

Figure 3.2: Candidate Class 1 Bicycle Facilities

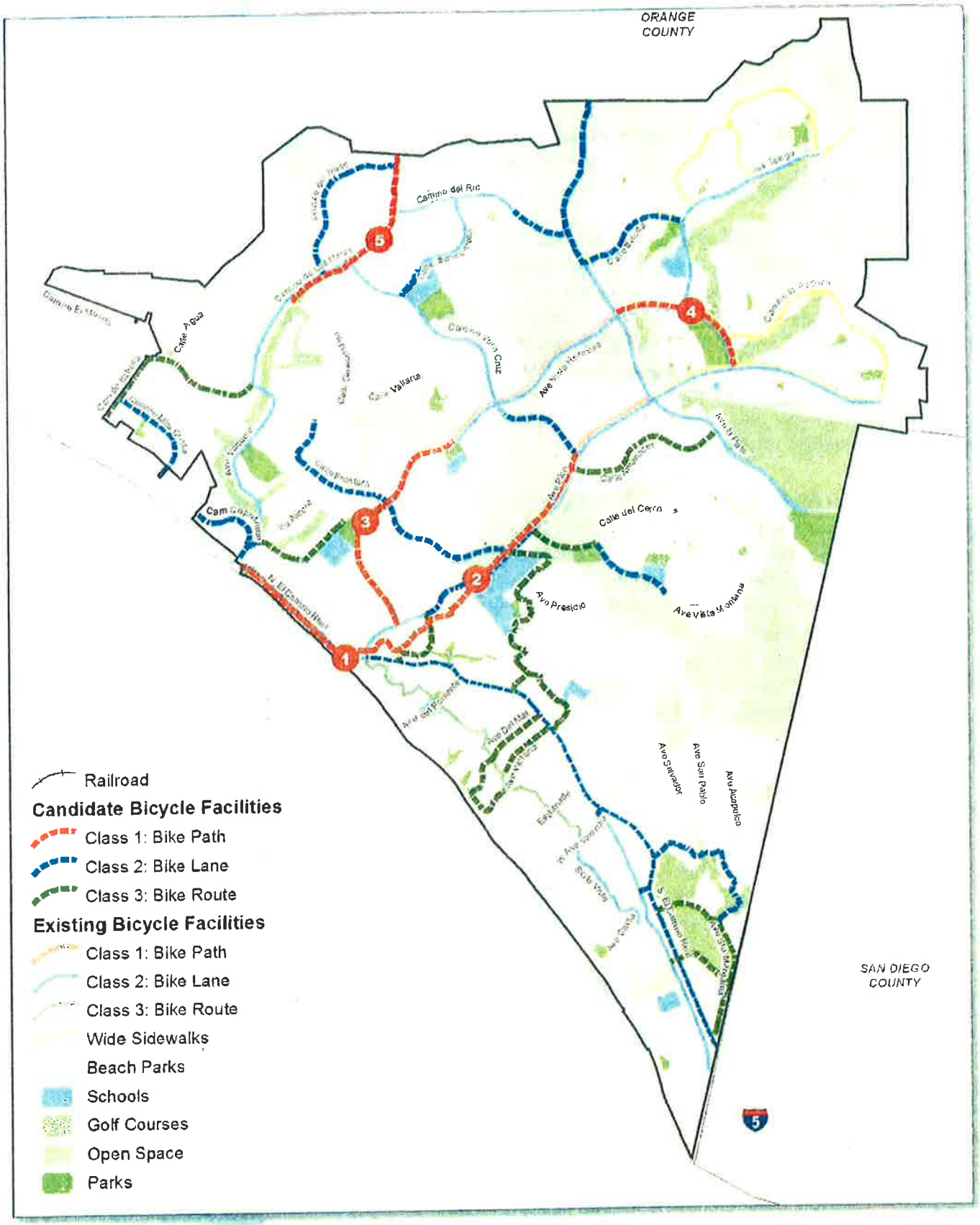


Table 3.1: Candidate Class 1 Bicycle Facilities

Rank	Roadway Segment	Miles	Limits	Avg Slope	Max Slope
1	**El Camino Real**	**0.9**	**Camino Capistrano and Avenida Estacion**	**0%**	**1%**
	• Connects with Dana Point's multi-use path • Provides mutli-use corridor along railroad tracks • 12' bicycle path • Precise layout to be determined • Planned City Project. Refer to El Camino Real Class 1 Bicycle Path Proposed Design Layout				
2	**Avenida Pico**	**2.1**	**Camino Vera Cruz and El Camino Real**	**4%**	**13%**
	• Provides bicycle path along Avenida Pico from Camino Vera Cruz to Metrolink Station • Primarily utilizes drainage channel parallel to Avenida Pico • At-grade crossings and tunnels provide connections to local streets and under I-5 • Reference Avenida Pico Cycling Corridor Study • Precise layout to be determined				
3	**Avenida Vista Hermosa**	**1.51**	**Camino Faro and Via Turqueza**	**3%**	**7%**
	• Expands existing bicycle path to Camino Faro • Provides access and connectivity to Marblehead Elementary School and Marblehead Park from neighborhoods across Ave Vista Hermosa • Moving existing sound wall near Camino Faro needed to fit bicycle path or sidewalk. Retaining wall may be needed for adjacent slope • Significant costs to acquire right-of-way needed • Potential impacts to resiential properties and existing landscaping • Design path to keep as many existing trees as possible to provide a buffer from roadway				
4	**Avenida Vista Hermosa**	**0.4**	**Ave La Pata and Ave Pico**	**3%**	**5%**
	• Convert existing wide sidewalks to meet Caltrans Class 1 requirements • Connects residential with regional commercial • Planned Project from OCTA Commuter Bikeways Strategic Plan				
5	**Camino De Los Mares**	**1.2**	**Calle Nuevo and Portico del Norte**	**1%**	**3%**
	• Existing 8' meandering sidewalk • Install graded 2' clearance one each side to meet Caltrans Class 1 Multi-use Path design criteria • Located on HOA property. City will need to coordinate with HOA to convert wide sidewalk into multi-use path • Increase wayfinding for bicycles • Increase bicycle crossing signage at intersections • Consider Class 2 if Class 1 not feasible				

Figure 3.3: Candidate Class 2 Bicycle Facilities

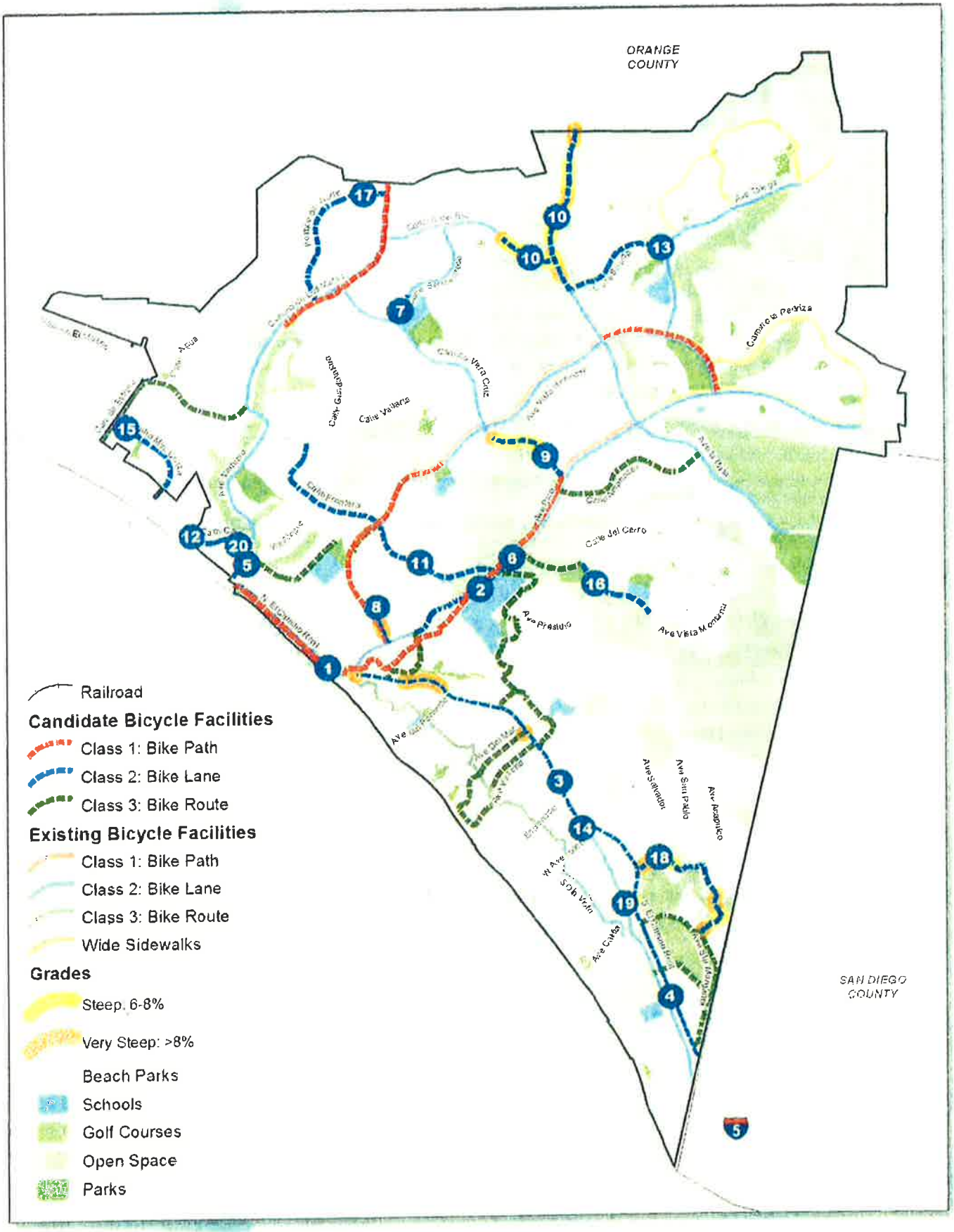


Table 3.2: Candidate Class 2 Bicycle Facilities

Rank	Roadway Segment	Length (Miles)	Limits	Avg. Slope	Max Slope
1	**North El Camino Real**	1.0	**City Limit and Ave Pico**	1%	4%
	• Existing pavement width: Varies - Connects with City of Dana Point • Suggested configuration at Camino Capistrano, 65': 2x11' travel lanes, 1x14' right-turn-only lane, 1x12' bicycle path, 1x2' bicycle path barrier, 1x6' bicycle lane, 1x4' bicycle lane buffer, 1x5' center median • Suggested configuration at Camino San Clemente, 64': 3x11' travel lanes, 1x12' bicycle path, 2x6' bicycle lanes and 1x2' center median, 1x2' bicycle path barrier, 1x3' bicycle lane buffer • Suggested configuration at narrowest point, 56': 2x11' outer travel lanes, 1x11' inside northbound lane, 1x12' bicycle path, 1x2' center median, 1x2' bicycle path barrier, 1x7' bicycle lane buffer • Suggested configuration between Avenida Estacion and Ave Pico: Enhanced Class 3 Bicycle Route with Sharrows due to narrow width • Planned Project from OCTA Commuter Bikeways Strategic Plan • Refer to El Camino Real Class 1 Bicycle Path Proposed Design Layout				
2	**Avenida Pico**	1.54	**Calle De Los Molinos and Calle Del Cerro**	1%	5%
	• Planned pavement width: Varies • Planned Project from OCTA Commuter Bikeways Strategic Plan and I-5 HOV Lane Extension and Reconstruction of Avenida Pico Interchange Project • Precise layout to be determined • Reference Avenida Pico Cycling Corridor Project				
3	**El Camino Real**	2.8	**Ave Pico and Calle Del Comercio**	3%	5%
	• See El Camino Real Alternatives - Precise layout to be determined • Planned Project from OCTA Commuter Bikeways Strategic Plan				
4	**El Camino Real**	0.9	**Calle Del Comercio and City limit**	1%	3%
	• See El Camino Real Alternatives - Precise layout to be determined				
5	**Avenida Vaquero**	0.1	**Via Cascadita and Camino Capistrano**	2%	4%
	• Existing pavement width: 55' - Suggested configuration: Four 11' travel lanes, 5.5' bicycle lanes • Completes missing bicycle lane on westbound lanes • Precise layout to be determined				
6	**Ave Pico**	0.87	**Calle Frontera/Ave Presidio and Calle Del Cerro**	2%	6%
	• Existing southbound pavement width: 44' (Bicycle lanes exist on northbound side) • Suggested configuration: Three 11' travel lanes, 6' bicycle lane and 5' bicycle lane buffer and increase bicycle awareness signage and directional signage • Completes missing southbound bicycle lanes. Study needed to address deceleration lanes. Precise layout to be determined • MPAH Designation. Any road diet or physical reconfiguration will need OCTA approval				
7	**Calle Sarmentoso**	0.2	**Camino Vera Cruz and Via Sage**	3%	5%
	• Existing pavement width: 36'- Connects Truman Benedict Elementary and Bernice Ayer Middle School • Bicycle lane exists on northbound lane adjacent to school and on both sides north of school • Suggested configuration: Stripe bicycle lane on southbound lane to provide "climbing lane" for cyclists going uphill to Camino Vera Cruz. Install Shared Lane Markings on northbound lane to connect to school and existing bicycle lanes north of school entrance. Lanes should retain existing width for school buses. Increase bicycle awareness signage, school zone and directional signage • Requires right-of-way acquisition and potentially significant costs • Planned Project from OCTA Commuter Bikeways Strategic Plan				

Table 3.2: Candidate Class 2 Bicycle Facilities (Continued)

Rank	Roadway Segment	Length (Miles)	Limits	Avg. Slope	Max Slope
8	Ave Vista Hermosa	0.2	Marblehead Coastal	5%	6%
	• Existing pavement width: 51' - Suggested configuration: Two 13' travel lanes, one 12' center turn lane and one 8' bicycle lane (northbound) with 5' parkway strip between travel and bicycle lane • Connects to planned commercial development within Marblehead Coastal from Ave Pico • Planned Project from Marblehead Coastal Specific Plan				
9	Camino Vera Cruz	0.6	Calle Aquamarina and Ave Pico	7%	9%
	• Existing pavement width: 64' - Proposed configuration: Four 11' travel lanes, one 10' raised median, two 5' bicycle lanes • Closes bicycle lane gap between existing bicycle lanes on Camino Vera Cruz to Ave Pico • Reducing raised landscaped center median from 15' to 10' required to install bicycle lanes • Increase bicycle awareness signage and directional signage • MPAH Designation. Any road diet or physical reconfiguration will need OCTA approval • Planned Project from OCTA Commuter Bikeways Strategic Plan				
10	Camino Del Rio/ Ave La Pata extension	1.5	Ave La Pata and City limit	N/A	N/A
	• Continues bicycle lanes on Avenida La Pata throughout entire segment • See La Pata Avenue Gap Closure and Del Rio Extension Project • Planned Project from OCTA Commuter Bikeways Strategic Plan				
11	Calle Frontera	1.8	Calle Guadalajara and Ave Pico	5%	12%
	• Existing pavement width: 39' and 40' - Provides parallel route to I-5 between Ave Vaquero and Ave Pico • Consider adding east side sidewalk, complete streets concepts such as roundabouts as intersection control at Avenida Faceta and increase bicycle awareness signage and directional signage • Planned Project from OCTA Commuter Bikeways Strategic Plan				
12	Camino Capistrano	0.5	City limit and Ave Vaquero	4%	10%
	• Existing pavement width: 40' and 65' - Provides connection to El Camino Real/PCH and Shorecliffs Middle School • Increase bicycle awareness signage and directional signage • MPAH Designation - Any road diet or physical reconfiguration will need OCTA approval • Planned Project from OCTA Commuter Bikeways Strategic Plan				
13	Calle Saluda	0.7	Ave La Pata and Ave Talega	6%	10%
	• Existing pavement width: 45' (Adjacent existing multi-use path) • Provides on-street connection between multi-use path and bicycle lanes on Ave La Pata and Ave Talega • Increase bicycle awareness signage and directional signage • Candidate San Clemente Bicycle and Pedestrian Master Plan Project				
14	Ave Valencia	0.1	El Camino Real and Ave Del Presidente	8%	9%
	• Existing pavement width: 52' - Connects planned route on El Camino Real with bicycle lanes on Ave Del Presidente • Increase bicycle awareness signage and directional signage • Planned Project from OCTA Commuter Bikeways Strategic Plan				

Rank	Roadway Segment	Length (Miles)	Limits	Avg. Slope	Max Slope
15	**Camino Mira Costa**	0.7	**Camino De Estrella and Camino Capistrano**	2%	5%
	• Existing pavement width: 63' - Connects Calle De Estrella and Camino Capistrano • Add additional bicycle awareness signage and directional signage • MPAH Designation. Any road diet or physical reconfiguration will require OCTA approval				
16	**Ave Vista Montana**	0.6	**Calle Del Cerro**	5%	10%
	• Existing pavement width: 44' - Connection Clarence Lobo Elementary and Rancho San Clemente Park • Increase bicycle awareness signage, school route and directional signage • Candidate for bicycle lanes if cycling activity increases • Bicycle lane configuration: two 11' travel lanes, one 12' center turn lane, two 5' bicycle lanes • Climbing lane configuration: 11' travel lane with adjacent 6' bicycle lane southbound between Cam Del Cerro and Futura, including both entrances to Ave Vista Montana from Calle Del Cerro. 13' center turn lane and 14' lanes with Shared Lane Markings northbound between Futura and Calle Del Cerro. • Climbing lane configuration provides dedicated bicycle lane for cyclists climbing on Ave Vista Montana without impeding vehicular traffic. Downhill shared lanes since some cyclists can travel at vehicular speeds. Also increases drivers' awareness that cyclists will be sharing lane.				
17	**Portico del Norte**	1.0	**Camino De Los Mares and Diamante**	6%	12%
	• Existing pavement width: 39' - Connects residences to Camino De Los Mares • Increase bicycle awareness signage and directional signage • Downhill direction can be Class 3 with Sharrows				
18	**Ave San Gabriel, Ave San Pablo, Ave Acapulco, Ave Adobe and Calle Bahia**	1.1	**El Camino Real and Ave Santa Margarita**	5%	14%
	• Existing pavement width: Varies • Provides connection to El Camino Real, Vista Bahia Park, Trestles, existing trails, and San Clemente Municipal Golf Course from residential neighborhoods • Increase bicycle awareness signage and directional signage • Downhill direction can be Class 3 with Sharrows • Planned Project from the OCTA Commuter Bikeways Strategic Plan				
19	**I-5 Crossing**	0.1	**Ave Del Presidente and El Camino Real**	5%	14%
	• Existing pavement width: 28' • Connects bicycle lanes on Ave Del Presidente and El Camino Real • Crosses over I-5 without an interchange • Add additional bicycle awareness signage and directional signage				

Figure 3.4: Candidate Class 3 Bicycle Facilities

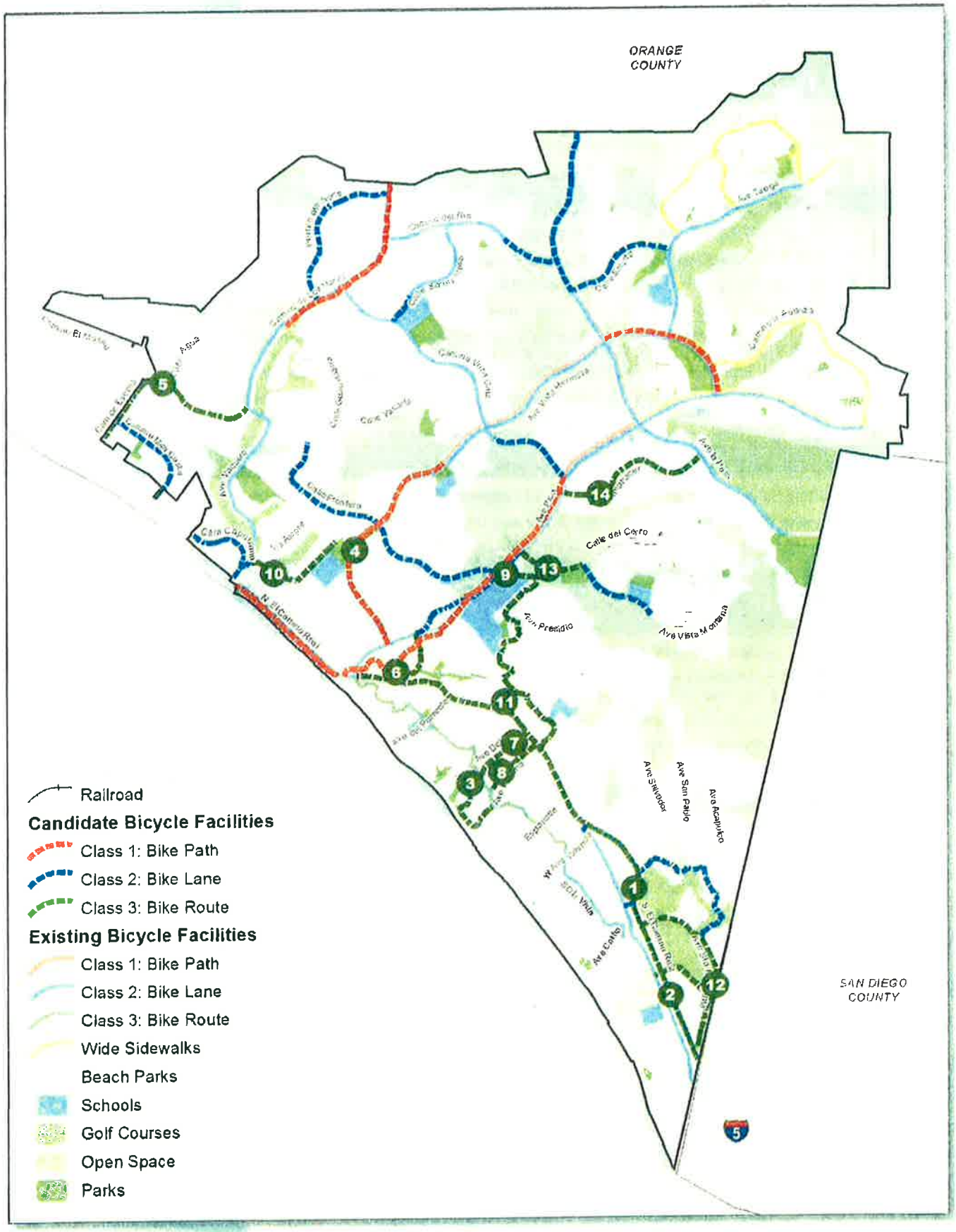


Table 3.3: Candidate Class 3 Bicycle Facilities

Rank	Roadway Segment	Length (Miles)	Limits	Avg Slope	Max Slope	Install Sharrows
1	**El Camino Real**	**2.8**	**Ave Pico and Calle Del Comercio**	**3%**	**5%**	**Yes**
	• See El Camino Real Alternatives • Evaluate El Camino Real corridor for all multi-modal users • Planned Project from the OCTA Commuter Bikeways Strategic Plan					
2	**El Camino Real**	**0.9**	**Calle Del Comercio and City limit**	**1%**	**3%**	**Yes**
	• See El Camino Real Alternatives • Evaluate El Camino Real corridor for all multi-modal users • Planned Project from OCTA Commuter Bikeways Strategic Plan					
3	**Ave Del Mar and Ave Victoria**	**0.6**	**Calle Seville and Ave Madrid**	**7%**	**11%**	**Yes**
	• Existing pavement width: 39' and 40' • Provides connection between the Ola Vista bicycle route and Pier • Shared Lane Markings or "Sharrows" recommended throughout • Increase bicycle awareness signage and directional signage					
4	**Avenida Vista Hermosa**	**0.2**	**Marblehead Development and Calle Frontera**	**4%**	**13%**	
	• Existing pavement width: 54' • Provides connection between existing bicycle lanes and future bicycle path in Marblehead Development • Increase bicycle awareness signage and directional signage • MPAH Designation. Any road diet or physical reconfiguration will need OCTA approval • Planned Project from OCTA Commuter Bikeways Strategic Plan					
5	**Camino De Los Mares and Camino De Estrella**	**1.2**	**City limit and Ave Vaquero**	**3%**	**5%**	**Yes**
	• Existing pavement width: 82' • Existing I-5 overpass pavement width: 62' • Suggested configuration: Green Lane with Shared Lane Markings similar to Second Street in Long Beach, CA on outside lane. This treatment allows on-street parking to remain and still provides a facility for cyclists. Note Green Lane not approved by Caltrans and would not be allowed on overpass without experimental waiver. Increase bicycle awareness, such as "Share the Road" or "Bikes May Use Full Lane" signage on overpass • Connects to Ocean View Plaza, medical facilities, movie theaters, shopping centers and crosses I-5 • Heavy vehicular traffic • Increase bicycle parking, awareness signage and directional signage along this route • MPAH Designation. Any road diet or physical reconfiguration will need OCTA approval • Planned Project from OCTA Commuter Bikeways Strategic Plan • Study needed to determine feasibility of implementing Class 1 or 2 facility along this route					
6	**Calle De Los Molinos and Calle Valle**	**0.6**	**Ave Pico and El Camino Real**	**4%**	**11%**	**Yes**
	• Existing pavement widths: Calle Valle = 29' and Calle De Los Molinos = 39' and 42' • Provides connection to between El Camino Real/PCH and Ave Pico • Provides connection to industrial businesses • Increase bicycle awareness signage and directional signage					

Table 3.3: Candidate Class 3 Bicycle Facilities (Continued)

Rank	Roadway Segment	Length (Miles)	Limits	Avg Slope	Max Slope	Install Sharrows
7	**Ave Del Mar**	**0.4**	**El Camino Real and Calle Seville**	**4%**	**7%**	**Yes**
	• Existing pavement width: 59' • Provides facility along this main commercial corridor • Provides connection to Community Center, Public Library and the Pier • Not enough room for bicycle lanes with existing angled on-street parking • Shared Lane Markings or "Sharrows" recommended throughout • Increase bicycle parking along this corridor - Only existing bicycle parking is at library • Increase bicycle awareness signage and directional signage • Planned Project from OCTA Commuter Bikeways Strategic Plan					
8	**Ave Victoria**	**0.4**	**El Camino Real and Calle Seville**	**5%**	**10%**	**Yes**
	• Existing pavement width: 40' • Provides facility along adjacent to Ave Del Mar commercial corridor • Provides connection to the Pier and utilizes part of the existing Ola Vista bicycle route • Shared Lane Markings or "Sharrows" recommended throughout • Increase bicycle awareness signage and directional signage					
9	**Ave Presidio, La Esperanza, Ave Caballeros, El Oriente, Ave De La Paz, Ave La Cuesta, Calle Empalme, Calle Miguel, Calle Escuela**	**1.9**	**El Camino Real and Ave Pico**	**6%**	**16%**	**Yes**
	• Existing pavement width: Varies • Provides connection from El Camino Real/PCH and Ave Pico • Provides connection to San Clemente High School from El Camino Real/PCH • Increase bicycle awareness signage, school and directional signage • Least amount of elevation gain between El Camino Real/PCH and Ave Pico • Directional signage important due to circuitous nature, especially at I-5 undercrossing • Shared Lane Markings or "Sharrows" recommended throughout					
10	**Via Cascadita and Via Socorro**	**0.7**	**Ave Vaquero and Via Ballena**	**5%**	**11%**	**Yes**
	• Existing pavement width: 40' • Provides connection to El Camino Real/PCH and Shorecliffs Middle School • Increase bicycle awareness signage, school route signage and directional signage					

Rank	Roadway Segment	Length (Miles)	Limits	Avg Slope	Max Slope	Install Sharrows
11	**Ave Palizada**	0.2	**El Camino Real and Ave Caballeros**	5%	7%	Yes
	• Existing pavement width: 63' • Provides connection from El Camino Real/PCH and proposed bicycle route on Ave de la Paz • Provides connection to San Clemente High School from El Camino Real/PCH • Increase bicycle awareness signage, school and directional signage • Directional and bicycle awareness signage important at I-5 undercrossing • Shared Lane Markings or "Sharrows" recommended throughout • Caltrans approval required within their right-of-way					
12	**Ave Magdalena, Ave Santa Margarita and Ave San Luis Rey**	1.7	**El Camino Real**	3%	23%	
	• Existing pavement width: Varies • Provides connection to El Camino Real, Vista Bahia Park, Trestles, existing trails, San Clemente Municipal Golf Course, Concordia Bridge and I-5 crossings without interchanges • Increase bicycle awareness signage and directional signage • Planned Project from the OCTA Commuter Bikeways Strategic Plan					
13	**Calle Del Cerro**	0.4	**Ave Pico and Ave Vista Montana**	6%	12%	
	• Existing pavement width: Varies between 46'-56' • Existing four lanes between Ave Pico and Ave Vista Montana. Two lanes between Ave Vista Montana and Ave La Pata • Provides connection to Clarence Lobo Elementary and Rancho San Clemente Park • Increase bicycle awareness signage, school route and directional signage • Because of grade, two lanes are needed to allow vehicles to pass slower cars, trucks and cyclists. Busy street during peak times					
14	**Calle Amanacer**	1.0	**Ave Pico and Ave La Pata**	4%	9%	Yes
	• Existing pavement width: 44' • Connects to industrial businesses • Provides an alternative route to Ave La Pata • Planned Project from the OCTA Commuter Bikeways Strategic Plan					

Table 3.4: Candidate El Camino Real Alternatives

Class 2 Bicycle Lane Alternative

Roadway Segment	Length (Miles)	Limits	Avg Slope	Max Slope
El Camino Real	2.8	Ave Pico and Calle Del Comercio	3%	5%
• Existing pavement width: 56' • Road diet needed to accommodate bicycle lanes. Existing four travel lanes and on-street parking on both sides • Road diet alignment: two 11' travel lanes, one 10' center turn lane, two 7' parking lanes, two 5' bicycle lanes • Connects to core commercial district and I-5 • Increase bicycle parking, bicycle awareness signage and directional signage along this route • MPAH designation - road diet or other reconfiguration will require OCTA approval for continued Measure M funding • To increase efficiency of cyclist movements along this route, complete streets concepts (e.g. roundabouts) can be considered as intersection control				
El Camino Real	0.9	Calle Del Comercio and City limit	1%	3%
• Existing pavement width: 56' • Variety of road diet options can be utilized to accommodate Class 2 facility • Consider complete streets concepts along this route • Connects to commercial district, Concordia Pedestrian Bridge, Trestles and I-5 crossings without interchanges • Increase bicycle parking, bicycle awareness signage and directional signage along this route				

Class 3 Bicycle Route Alternative

Roadway Segment	Length (Miles)	Limits	Avg Slope	Max Slope	Install Sharrows
El Camino Real	2.8	Ave Pico and Calle Del Comercio	3%	5%	Yes
• Existing pavement width: 56' • Install Shared Lane Markings or "Sharrows" throughout • Connects to core commercial district and I-5 • Increase bicycle parking, bicycle awareness signage and directional signage along this route • Consider complete steets concepts along this route					

Enhanced Class 3 Bicycle Route Alternative

Roadway Segment	Length (Miles)	Limits	Avg Slope	Max Slope	Install Sharrows
El Camino Real	2.8	Ave Pico and Calle Del Comercio	3%	5%	Yes
• Existing pavement width: 56' • Proposed alignment: Green Lane with Shared Lane Markings similar to Second Street in Long Beach, CA. Treatment allows on-street parking to remain while providing facility for cyclists • Connects to core commercial district • Increase bicycle parking, bicycle awareness signage and directional signage along this route • Consider complete steets concepts along this route					

Table 3.5: Candidate Ola Vista Bicycle Improvements to Existing Class 2 and 3 Route

Roadway Segment	Length (Miles)	Limits	Avg Slope	Max Slope	Install Sharrows
Ola Vista Bicycle Path Improvements	2.2	**Ave Pico and W Ave Valencia**			Yes
• Stop signs on slope cause cyclists to stop on incline, making it difficult to start again. This tends to dissuade cyclists from stopping at these stop signs • Increase bicycle awareness signage and directional signage due to circuitous nature of route • Consider complete steets concepts along this route (e.g. roundabouts and continental style crosswalks, as allowed by City Policy).					

Table 3.6: Additional Candidate Bicycle Projects

Roadway Segment	Limits and/or Remarks
Camino De Los Mares and Camino De Estrella	**City limit and Ave Vaquero**
Ave Del Presidente	**Ave Del Presidente and El Camino Real**
Ave La Pata	**Entire corridor**
Wide walkways in Talega	**Vista Hermosa, Saluda, Talega, Fuerte, Tierra Grande, La Pedriza, Pico** - Wide sidewalks along these roadways do not meet Class 1 standards since they do not have 5' separation from roadways and have obstacles reducing usuable width. Designation as Class 1 will require study to determine challenges and costs versus benefits.
Camino La Padreza	Narrow roadway. PEDal suggestion to install roundabouts.
North Ola Vista	PEDal suggestion to install roundabouts.

3.3 Candidate Pedestrian Projects

Substantial funding is needed to bring all of the City's pedestrian facilities up to a standard that makes them safe, walkable, accessible, connected and assets to their neighborhoods. However, the funding needs far exceeds what is likely to be obtained. To be cost-effective, a system of ranking projects for funding was developed to assist in prioritizing individual pedestrian projects. (See Figure 3.1.)

The following list of priority projects were collected from existing City plans, public input, collision data and the Bicycle and Pedestrian Priority Model. Formulating the list was based on City staff and public input, project knowledge, guidelines, designs of existing plans and extensive field work. The projects were then analyzed and scored based on the following criteria. Other projects can be compared to those in this chapter to gauge their relative priority using these criteria.

Pedestrian Demand

The pedestrian demand criterion acquires the projects' total model score and is then divided by the acreage of that project. This technique normalizes the scores throughout all the projects. This allows projects with larger footprints to have the same scoring parameters as smaller projects.

Safety Criteria

Safety was calculated by analyzing the pedestrian-related collisions within 100 feet of the project segment. For instance, if the project was at an intersection, then a 100 foot buffer was created and all the pedestrian-related collisions that fell within the buffer were collected and analyzed as part of the project. If a fatal collision occurred, it would get a higher score than those with major or minor injuries. The total number of specific injury types was multiplied by the appropriate point resulting in a sub-score for that injury criterion. All the sub-scores were then added as the final score for the Safety Criteria.

Feasibility Criteria

Project feasibility is defined by the probability of completion. Projects having high ratios of "value received" relative to likely project costs will receive higher ratings. Pedestrian's improvements values include increasing roadway users' safety and mobility. This increased safety and mobility will also likely improve quality of life, increase surrounding property values and improve the business environment in commercial areas. Other factors in determining the feasibility of a project include funding opportunities, right-of-way and easements, environmental permitting and utility relocations.

Accessibility Criteria

These address issues that can be improved for each project. A score is applied if issues will be addressed based on the criteria. Extensive accessibility measures, such as pop-outs and adding paths of travel, are given higher scores due to their overall accessibility improvement within the project. Smaller improvements, such as removing obstacles and trip hazards, are given lower scores due to their smaller accessibility role.

Connectivity Criteria

The Connectivity Criteria looks at missing connections relevant to the pedestrian use of the activity center and the connections between different land uses. The higher level of use such as schools, parks, beach access and transit centers are given the higher scores. There is more pedestrian activity to these activity centers than any other. Connections between different land uses such as between commercial, residential and recreational areas have lower scores because they have lower pedestrian activity levels.

Walkability Criteria

Improvement in walkability, such as shade and amenities like benches, are scored in this section. Major improvements such as creating a buffer from fast moving vehicles, public spaces, plazas and providing shade trees within the project receive higher scores for their overall sense of comfort

to walk within the area. Smaller improvements such as benches, increased lighting and improving dilapidated properties receive lower scores, but are still important in the overall walking environment.

Based on these criteria, nine projects were selected as candidate recommendations and are shown in Figure 3.5 and described in Table 3.7.

3.4 Other Candidate Recommendations

Formalize Pathways

Where legal public access rights exist, formalize well-used pathways that have served as important circulation routes for a significant amount of time. Most of these occur along the Interstate 5 frontage. Some of these could serve a Safe Routes to School function.

One-way Streets

Make some low volume streets one-way to allow space for sidewalks. Not all streets need this treatment, but entire neighborhoods may benefit from it, especially if busier streets are maintained as two-way to function more as collectors. City Staff will evaluate one-way streets on a case-by-case basis for opportunities to accommodate safe pedestrian and bicycle movement.

Extend Beach Route

Extend the beach route north and south to adjacent communities and the state park and make it more accessible to all non-motorized users.

Alleys

Alleys are generally considered utilitarian spaces intended to serve simply as access routes to parking facilities or loading zones. These "mini-streets" are not often thought of as noteworthy elements of the urban fabric, but that attitude is changing. In most cities reconsidering alleys, the primary objective has been to reduce urban runoff through permeable pavement, landscaping and bio-swales. Called "green alley" programs, this has been the approach of cities like Chicago, Detroit, Seattle and Vancouver.

San Clemente could consider broader functions, such as encouraging the use of certain alleys as bicycle and pedestrian circulation routes paralleling busy streets where room for bicycle facilities is limited or simply not available. In particular, a number of survey respondents questioned why the alley parallel with El Camino Real to the southeast could not be designated a low speed, two-way pathway available to cyclists and walkers to provide a safer and more pleasant route paralleling the very busy street. This section of El Camino Real has limited room for additional facilities like bicycle lanes without eliminating existing parking or travel lanes and many other survey respondents said they felt very uncomfortable riding on it. Some said they use the alley for shopping trips to stores along this segment of El Camino Real.

Figure 3.5: Candidate Pedestrian Projects

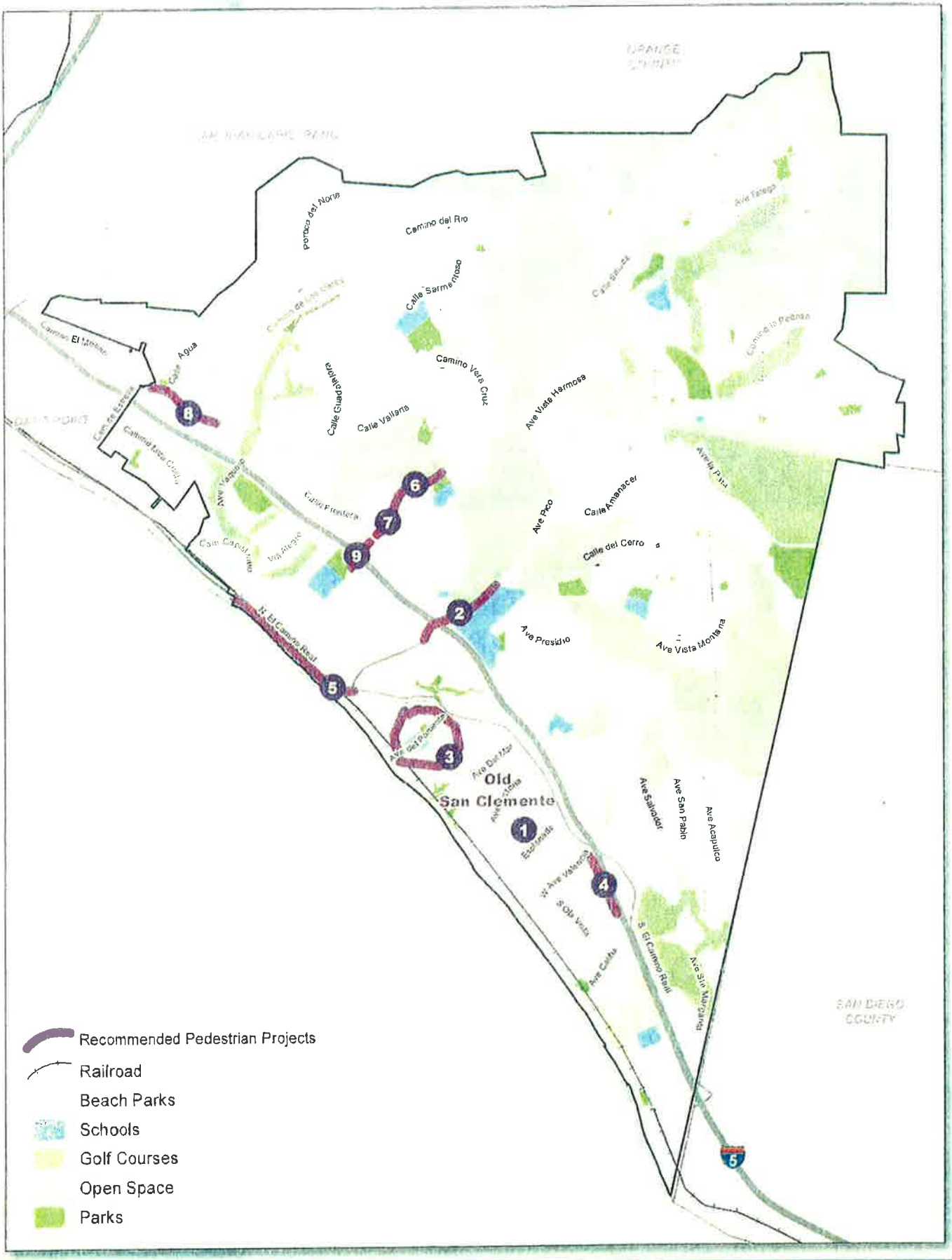


Table 3.7: Candidate Pedestrian Projects

Rank	Project Name	Issues	Potential Solutions	Total Score
1	"Old" San Clemente Sidewalk Study	Sidewalk gaps throughout "Old" San Clemente need further study to determine how to systematically correct	Update sidewalk network data, measure public right-of-way. Review possible solutions including one-way street network or right-of-way acquisition. Determine ranking system to decide which gaps to fill first.	42
2	Avenida Pico between Calle de Industrias and Avenida Presidio	Narrow sidewalks, lack of bicycle facilities, no pedestrian buffer, high volume traffic, unsafe on- and off-ramp crossings	Widen sidewalks, add bicycle lanes, improve pedestrian signals and crosswalks. Implement Avenida Pico Corridor Plan.	32
3	Sidewalks near Las Palmas Elementary School	Sidewalk gaps near school	Add missing sidewalks.	31
4	Avenida del Presidente between Ave De Los Lobos Marinos and Avenida Junipero	Missing sidewalks	Add missing sidewalks.	29
5	El Camino Real from Camino Capistrano to Avenida Pico	High volume pedestrian and cyclist use. Lack of adequate sidewalk width and continuity	Implement 12' multi-use path.	26
6	Avenida Vista Hermosa between Via Turqueza and Camino Faro	Public comments reported sidewalk ends abruptly and missing walkway across from school	Install sidewalk on west side of the street	24
7	Avenida Vista Hermosa between Camino Faro and I-5	Continuation of missing walkway adjacent to school	Continuation of installation of sidewalk on west side of street.	22
8	Camino De Los Mares between Marbella and I-5	Numerous sidewalk obstructions, sufficient density for "park-once" district, but currently poor pedestrian environment	Complete Streets project to remove obstructions while preserving street trees, and study to limit vehicular entry/exit points.	21
9	Avenida Vista Hermosa over I-5	High speed traffic, high speed turns and close pedestrian proximity along routes to school	Improve freeway crossing for pedestrians.	20

The Hollywood Business Improvement District set a precedent by approving a new tax assessment for a $125,000 annual fund dedicated to the area's alleys, supported by about 50 business owners. While the initial goals were cleanup and maintenance, merchants are hopeful that their alleys can become more than dumping grounds. By taking advantage of their very pedestrian scale, cities like Portland and San Francisco have shown that alleys can be embraced in commercial areas, with successful dining and retail establishments taking advantage of them as distinctive outdoor areas.

Table 3.8: Additional Candidate Pedestrian Projects

Project Name	Issues	Potential Solutions
Marblehead Coastal Bike/Ped Bridge to North Beach	Bicycle and pedestrian access between Marblehead development and North Beach	City should conduct study to determine feasibility of and potential funding for this suggested project
Avenida Talega between Avenida Talega and Portofino	Cars parking in bicycle lane and light pole in sidewalk at SW quadrant of bridge	Potential SRTS project. City should conduct study to evaluate improving student safety around school utilizing complete streets approach. MPAH designation - Any road diet or reconfiguration will require OCTA approval to ensure continued Measure M funding.
Pedestrian path between south end of Buena Vista and West Mariposa	Route improvements needed	PEDal suggestion to invest in proper stairs along this route.
Poche/County Beach access	Bridge needed over railroad and Pacific Coast Highway	PEDal suggestion that beach parking can be procured from DMV-areas lots.
Mariposa ramp to Beach Trail	Route improvements needed	PEDal suggestion to make path ADA-accessible and add benches.
Lost Winds stairs to Beach Trail	Route improvements needed	PEDal suggestion to use rail road ties to repair and extend stairs to Beach Trail.
Trail access between Lost Winds and Calafia (at intersection of Lobeiro and Montalvo)	Route improvements needed	PEDal suggestion to use rail road ties or decomposed granite to create better trail.
El Portal access to Beach Trail	Route improvements needed	PEDal suggestion to replace stair structure.

Alleys can even become landscaped connections between housing and schools, parks and shopping. The Los Angeles neighborhood of Canoga Park is considering improvements to alleys paralleling its main downtown commercial street to include higher quality paving, trees, signage, seating and lighting. The desire is to encourage alleys as alternative routes to access local businesses and adjacent blocks as part of transit-oriented development immediately around a new light rail station.

A similar street configuration is the European *"woonerf,"* (Dutch, from wonen *"reside"* + erf *"premises, ground"*). A woonerf is a minor street where pedestrians and cyclists have legal priority over vehicle traffic. Woonerfs are intended to serve multiple functions, including vehicle, bicycle and pedestrian access and as outdoor play and social space. They are analogous to green alleys and many of their principles could be employed to produce the desired ambience. They both employ shared spaces, traffic-calming and low speed limits to improve safety for all users. In the Netherlands and Germany, drivers are legally restricted to very low speeds, generally a walking pace. Pedestrians, including children, may use the entire street and are even permitted to play in it.

Given the recent economic downturn, an obvious hurdle in implementing green alleys is funding. However, if project design incorporates stormwater management, public-private partnerships and various stormwater-related state and federal programs may be available to help fund alley greening projects. A green alleys program will also need to establish design and project selection criteria to be included in planning documents like specific plans that make alley consideration a planning requirement.

Such criteria could include security and lighting, for examples, but the critical issue is safety. Since alleys generally intersect intervening streets at mid-block, they have not been the focus of mobility planning on a city-wide scale and have therefore not typically been recommended as designated bicycle routes. This is primarily because traveling by bicycle via an alley across multiple blocks exposes cyclists to potential conflict points at each travel lane in each roadway the alley intersects.

In the case of El Camino Real's alley, this is a specific location with an obvious need for a more fundamental solution. The key will be to design the alley/cross street intersections properly to warn drivers and alley users alike to be aware of each other's presence. Making the alley crossing points visible will be crucial to safely implementing this concept, but there are other potential impacts. For example, prohibiting parking near crossing streets would be a safety improvement, but this would also reduce available parking. Finally, the cross streets tend to be low volume, but it may be advantageous to initiate a pedestrian-oriented program at first and add bicycle provisions if use warrants it.

City staff will evaluate alleys on a case-by-case basis and look at all opportunities to accommodate safe pedestrian and bicycle movement.

"Green Alley": Detroit, MI

Woonerfs: Utrecht and Haarlem, Netherlands

Power-Assist for Bicycles

A number of survey respondents from this and other municipalities have said that given the region's climate, the primary reason they do not ride more instead of drive is their local hilly terrain. They either do not have the physical strength to climb hills, or they do not want to arrive at their destination disheveled and sweaty from the effort of getting over steep hills. In the past, not much could be done about this issue except to try to route bicycle facilities to avoid the steepest and longest grades, but especially in cities like San Clemente, this is not always an option.

Power-assisted bicycles

Many bicycle manufacturers have been developing battery power assist technology to make riding easier. These manufacturers perceive significant latent demand and constantly evolving battery technology has supported this market as power units continue to shrink in size, weigh less and operate longer with more consistent output.

Power-assist systems are either built-in on bicycles designed for the purpose, or retrofitted after the fact. Many purpose-built examples not easily distinguishable from conventional bicycles. One is actually a motorized trailer that can be attached to virtually any bicycle and pushes the rider. These systems allow the rider to adjust the amount of assist the electric motor provides to tailor it to the terrain and the individual's physical capabilities. While these systems add weight, the assistive force effectively negates it.

Federal law requires that for power-assisted bicycles to be legally considered a bicycle, they must have functional pedals, be limited to 750 watts of power and cannot exceed 20 miles per hour. Units that meet these standards are allowed on all bicycle facilities, including off-street Class 1 bicycle paths (*HR 727 – amends Consumer Product Safety Act Section 38.(a): Low Speed Electric Bicycles).*

The City could promote awareness of this technology as a way to encourage more people to ride instead of drive, which would reduce congestion and improve air quality and health, while supporting sustainability goals. In particular, residents in the eastern areas indicated in surveys, were it not for the arduous climb home, that they would bicycle to the beach area more often instead of driving. Power-assist could be the key to changing their minds and habits.

Context 4

4.1 Street Classification

A key feature of Circulation Elements is establishment of a street classification system. This system provides policy direction and design standards to support future decisions regarding improvements to the public rights-of-way. These classifications are also used to assist in the regulation of speed limits and other traffic safety control methods.

It is important to keep in mind that San Clemente has few opportunities to add new streets. Instead, most improvements to traffic flow and safety will be made through techniques such as changes to traffic signal timing at key intersections and improvements to transit services. Encouraging carpooling, walking and cycling are other ways to increase mobility throughout the City.

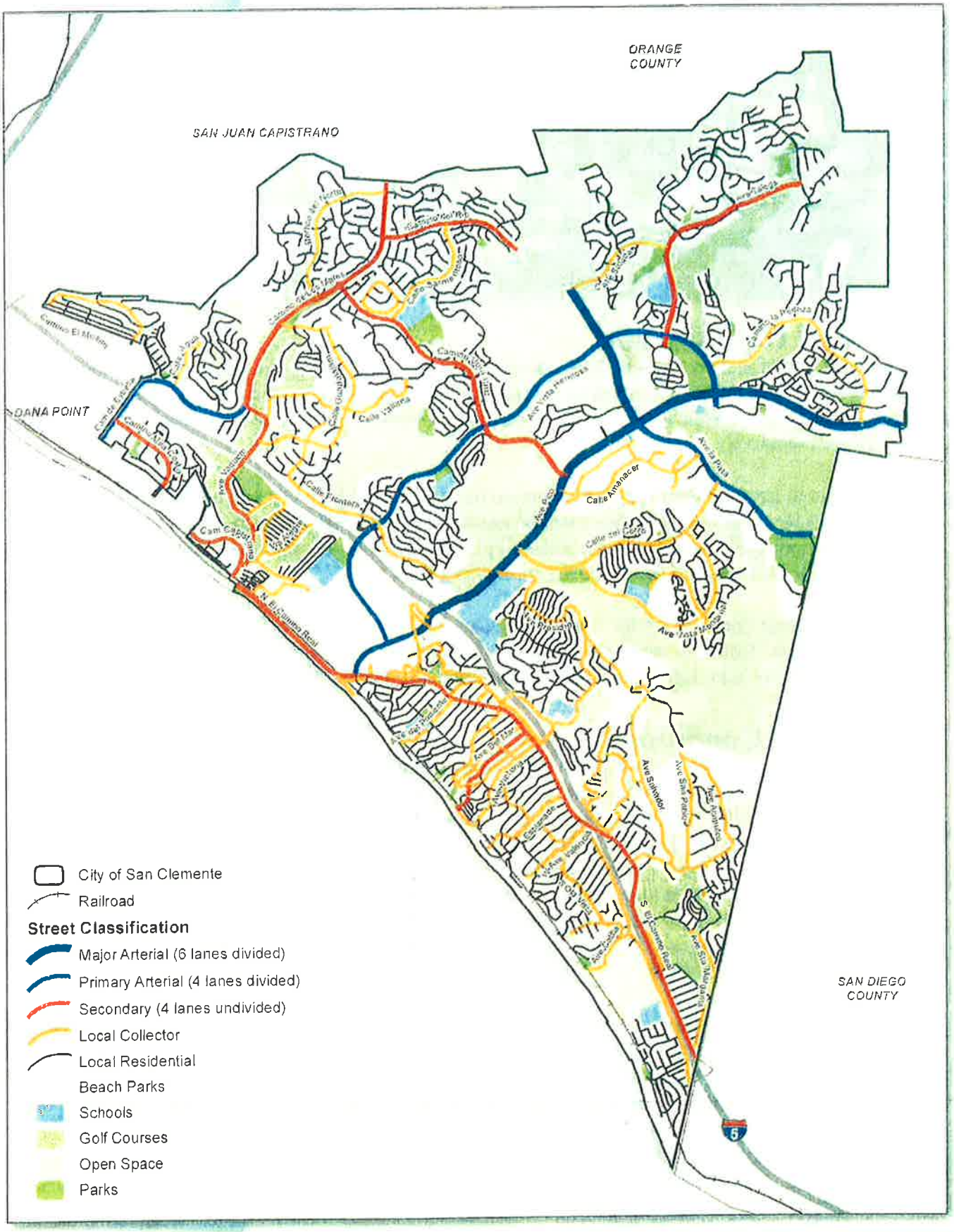
The streets of most concern are the transition streets linking low volume local streets with high volume specialized streets. Collector and arterial streets demand the most attention and investment to balance circulation functions with other street uses. Figure 4.1 illustrates the City's street classifications.

4.2 Existing Conditions

San Clemente's topography is varied, providing vistas that have helped to make the City such a desirable place to live and work. However, from the cyclist's and pedestrian's perspective, this terrain, with its steep streets and gaps in road connections, significantly limits the routes available for easy and direct access to key destinations. This terrain has also helped to define the primary road system by minimizing overly steep grades on City streets wherever possible, though there are some streets with steep grades over considerable distances. It is important for cyclists and pedestrians to find direct routes with the least challenging grades, as well as through the City to neighboring jurisdictions and regional destinations. Since opportunities for off-street shared-use paths are generally rare, this plan focuses primarily on the integration and coordination of bicycle facilities within the existing street network.

There is typically high demand for limited transportation infrastructure funds. The facilities goals and policies established in this Plan (Chapter 2) provide the justification for these important elements of the overall circulation plan. When well planned and properly integrated into the City's circulation network, the facilities are just as important as other auto-related safety and vehicular carrying capacity needs of the City's streets. San Clemente's roadways are the paths that must carry children to schools and parks, allow commuters to get to work and give recreational cyclists and walkers a chance to enjoy the community and access to regional open space and park resources.

Figure 4.1: Street Classification



The maps on the following pages were compiled from applicable GIS data gathered and created for use in analysis throughout this Plan. Existing bikeway system mapping was derived from the Southern California Association of Government's (SCAG) regional bikeway GIS data, field review and input from City staff.

Bicycle Facility Types

Three bikeway facility types are recognized by the state of California and in use within the City. See the section on Bikeway Facility Design for more information. Their existing locations are illustrated in Figure 4.2.

Pedestrian Facility Types

The key to safe and efficient pedestrian circulation is the design, construction and maintenance of walking facilities. As in most cities, the existence and condition of San Clemente's sidewalks is inconsistent. Comments gathered from the on-line survey and public workshops indicate that missing sidewalks or pathways was the top pedestrian issue.

In the downtown area of San Clemente, sidewalks are also extensions of commercial businesses, which add to the pedestrian experience intended with this "village" environment. Sidewalk cafes and shopping displays are features the City allows in the proper circumstances through existing design guidelines.

Different areas require differing levels of pedestrian improvements based upon adjacent roadways, levels of use, topography and land uses. This section defines some of the walkway classifications and the corresponding levels of treatment that each type warrants.

Figure 4.3 shows sidewalks types and Figure 4.4 is a summary of pedestrian route types found throughout San Clemente based on GIS analysis of available data for adjacent land use, street classification, ADT and posted speed limits. However, many factors can affect route classification. City-wide field work would be required to verify the actual on-site conditions and limits of all walkways. Therefore, the maps should only be used to indicate the relative extent of these different route types (See Table 4.1 and Figures 4.5 through 4.9).

Figure 4.2: Bicycle Facilities

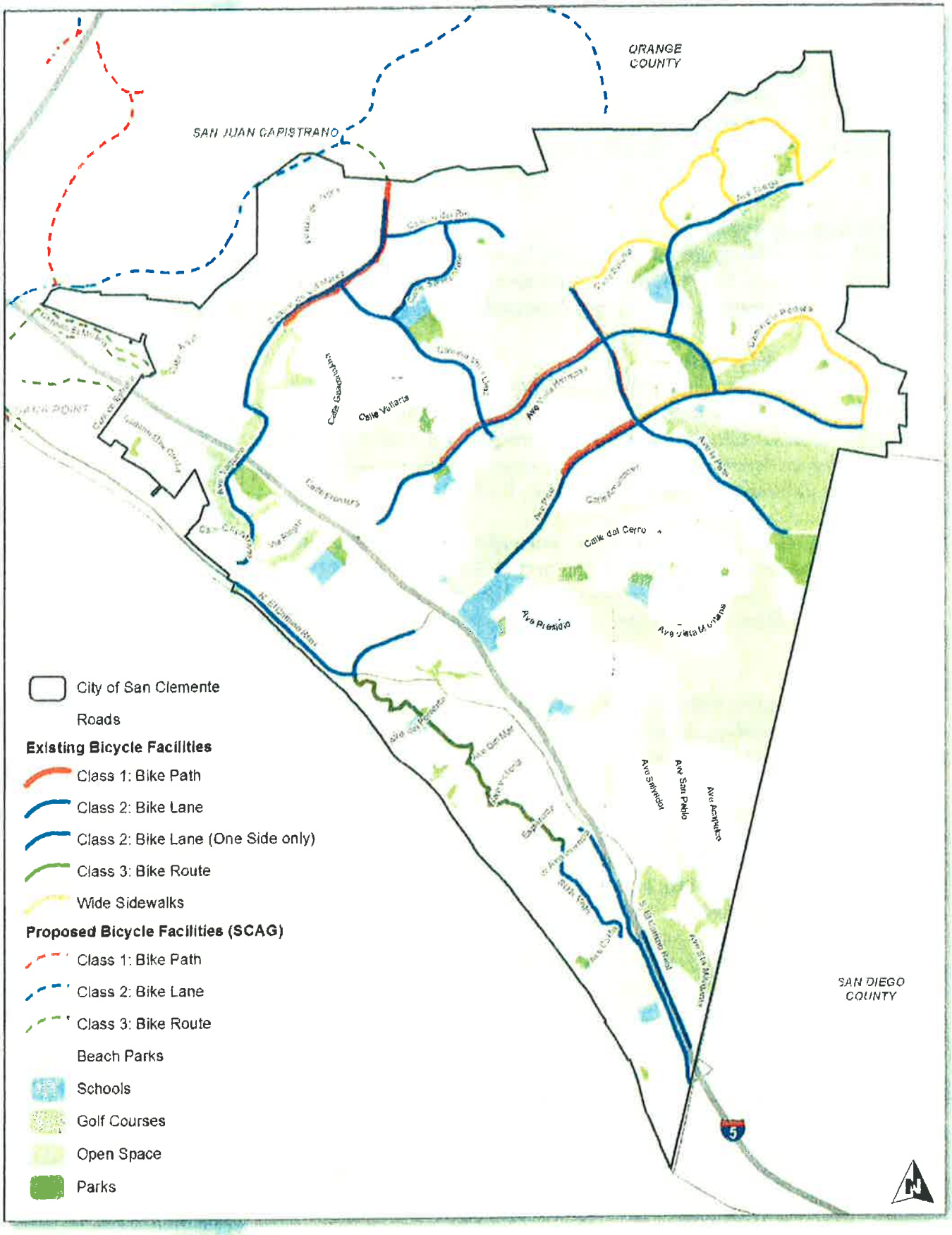


Figure 4.3: Pedestrian Facilities

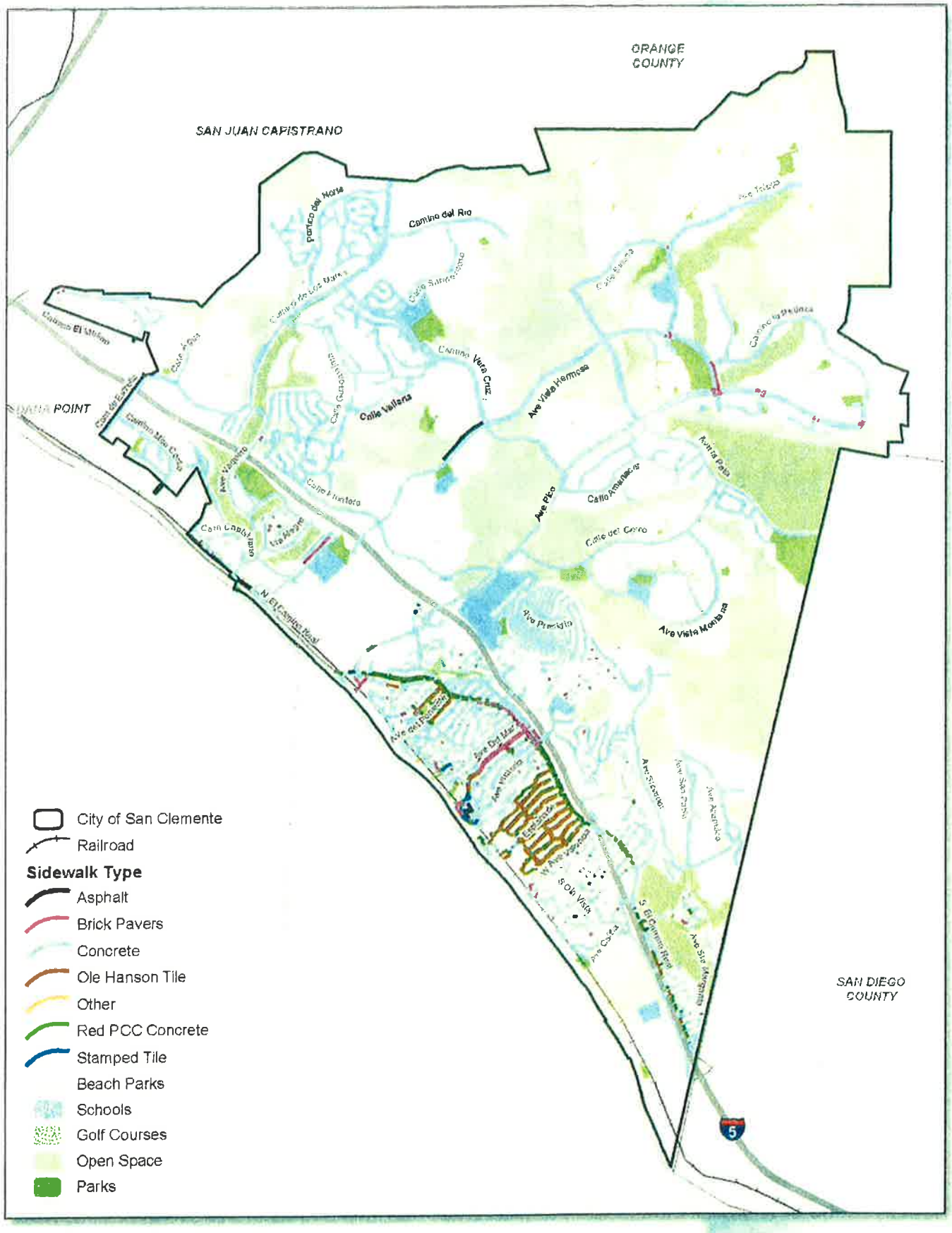
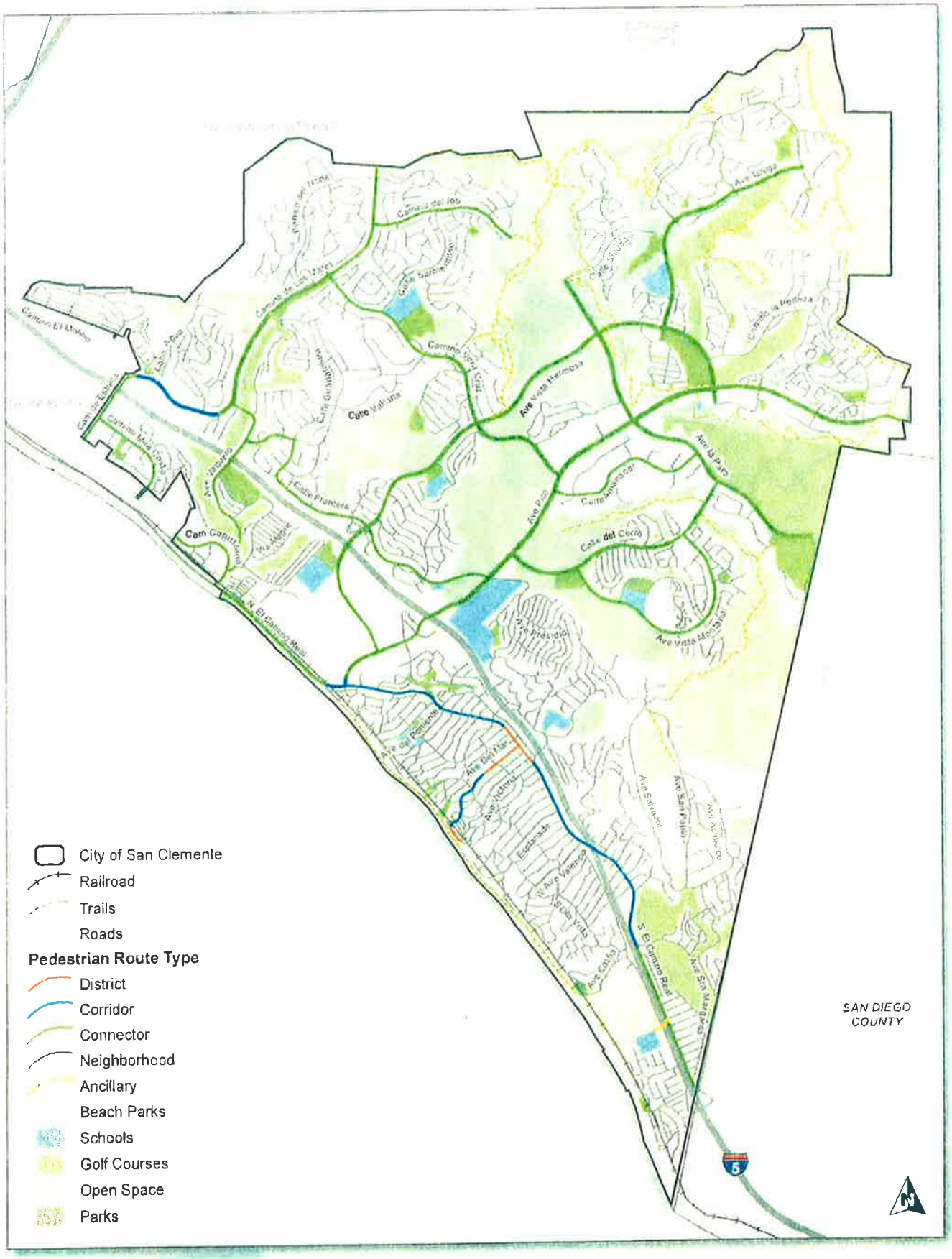


Figure 4.4: Pedestrian Route Types



District Sidewalks

District sidewalks are sidewalks along roads that support heavy pedestrian levels in mixed-use concentrated urban areas. Usually, the district is an urbanized area with special functions, such as theater districts, office parks, shopping centers, or college campuses. In this case, District Sidewalks are primarily in the Downtown area. The district may be adjacent to neighborhoods, but can be distinguished from neighborhood streets by adjacent land uses, densities and urban form. It has an identifiable focus that provides orientation and character and reinforces a sense of community among users by encouraging walking. Avenida Del Mar is an example of a district sidewalk.

Corridor Sidewalks

Corridor sidewalks are defined as sidewalks along roads that support moderate density business and shopping districts with moderate pedestrian levels. They can range from wide sidewalks along boulevards to small sidewalks along a heavily auto oriented roadway. They may connect moderate to high density residential areas, but only if they are located along major arterials. Examples include Avenida Pico between Calle Del Cerro and El Camino Real, Camino De Los Mares between Camino El Molino and Marbella and El Camino Real between Avenida Pico and Avenida Valencia.

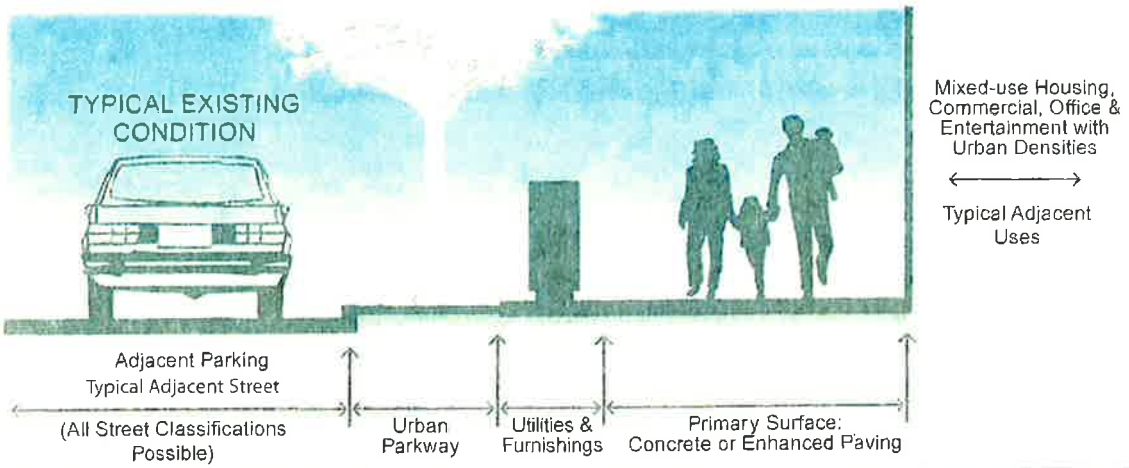
Table 4.1: Pedestrian Route Types and Typical Conditions

ROUTE TYPE:	District Sidewalks	Corridor Sidewalks	Connector Sidewalks	Neighborhood Sidewalks	Ancillary Pedestrian Facilities
Purpose	Sidewalks along roads that support heavy pedestrian levels in mixed-use urban areas	Sidewalks along roads that support moderate density business and shopping districts with moderate pedestrian levels	Sidewalks along roads that support institutional, industrial or business complexes with limited lateral access and low pedestrian levels	Sidewalks along roads that support low to moderate density housing with low to moderate pedestrian levels	Facilities away or crossing over streets such as plazas, paseos, promenades, courtyards or pedestrian bridges and stairways
Typical Adjacent Circulation Classifications	All types of adjacent streets are possible	Major, primary	Secondary	Local collector, local/ residential	Not associated with a street
Typical Adjacent Land Uses	Mixed-use housing, commercial, office and entertainment with urban densities	Multiple land uses but may be separated. Often strip commercial or office complex.	Open space, industrial uses, institutional uses or other pedestrian restricted uses	Single-family and moderate density multi-family with limited supporting neighborhood commercial	Adjacent land uses vary

Figure 4.5: District Sidewalks

District Sidewalks

Sidewalks Along Roads that Support Heavy Pedestrian Levels in Mixed-use Concentrated Urban Areas




Sidewalk with lighting along Avenida Del Mar


Sidewalk with street trees and enhanced paving along El Camino Real


Sidewalk with outdoor cafes on Avenida Del Mar

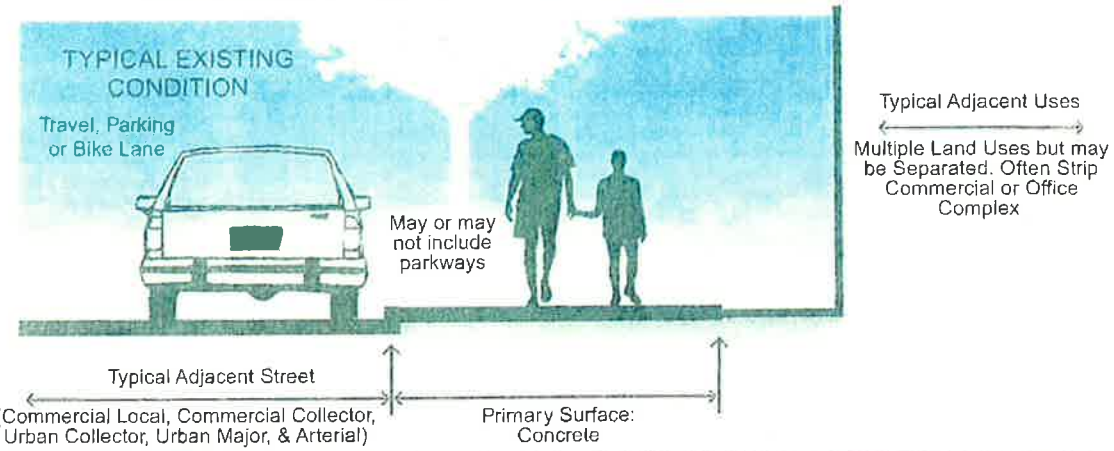

Walkways with street furnishings in business district on Avenida Del Mar

EXAMPLE LOCATIONS

Figure 4.6: Corridor Sidewalks

Corridor Sidewalks

Sidewalks Along Roads that Support Moderate Density Business and Shopping Districts with Moderate Pedestrian Levels



Sidewalks on El Camino Real

Corridor sidewalks with street trees on Camino de Los Mares

Sidewalk on Avenida Pico

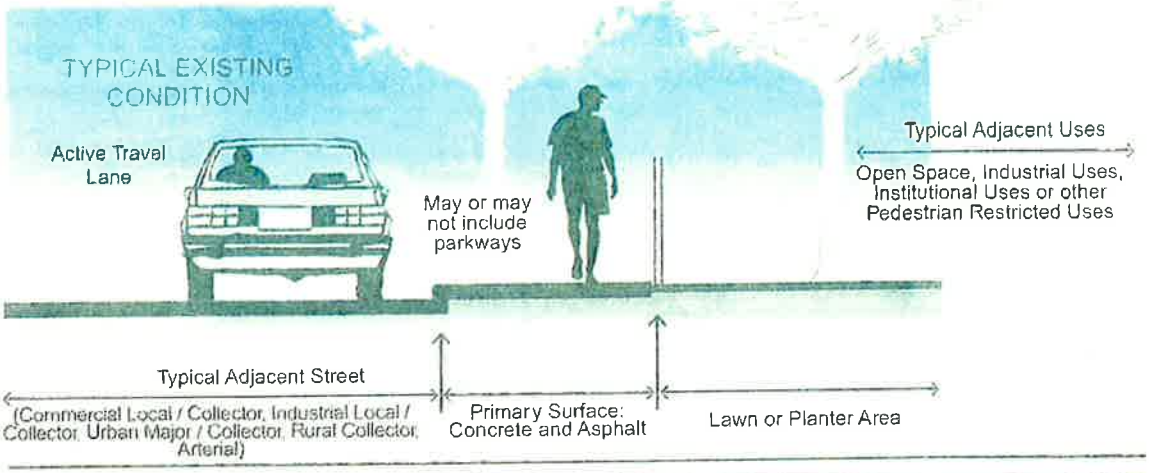
Brick sidewalk paving on South El Camino Real

EXAMPLE LOCATIONS

Figure 4.7: Connector Sidewalks

Connector Sidewalks

Sidewalks Along Roads that Support Institutional, Industrial or Business Complexes with Limited Lateral Access and Low Pedestrian Levels



Ave Pico sidewalk just east of I-5

Ave Del Presidente and Ave San Luis Rey

Connector sidewalk on Calle Saluda

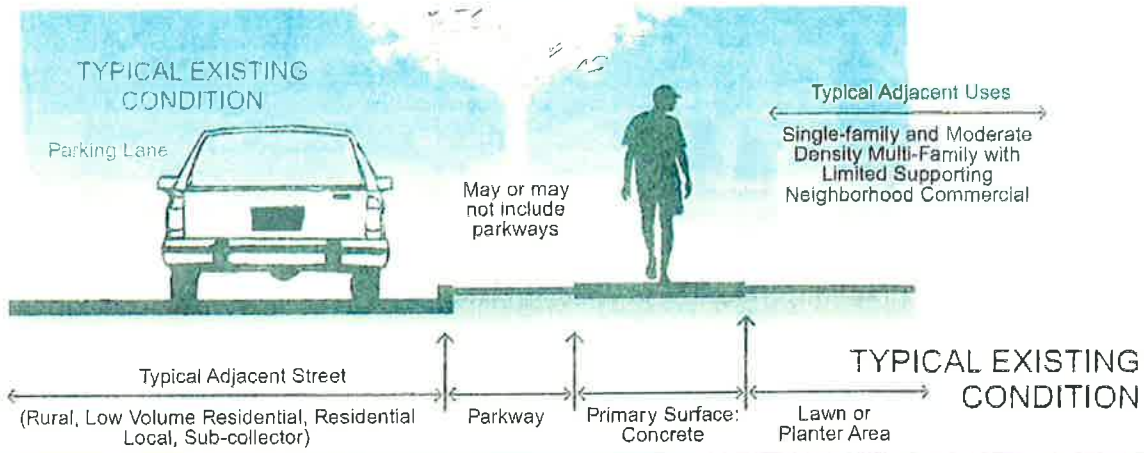
Sidewalks along Calle Frontera

EXAMPLE LOCATIONS

Figure 4.8: Neighborhood Sidewalks

Neighborhood Sidewalk

Sidewalks Along Roads that Support Low to Moderate Density Housing with Low to Moderate Pedestrian Levels



Sidewalk along Ave Cabrillo

Sidewalk with driveways

Sidewalk with Parkway

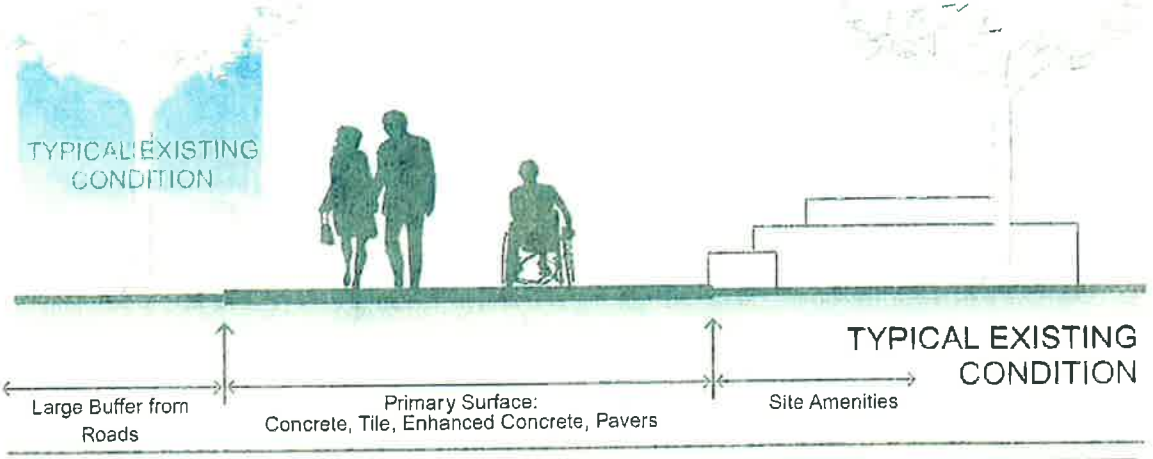
Intermittent sidewalks and short driveways west of I-5

EXAMPLE LOCATIONS

Figure 4.9: Ancillary Pedestrian Facilities

Ancillary Pedestrian Facilities

Facilities Away From or Crossing Over Streets such as Plazas, Paseos, Promenades, Courtyards or Pedestrian Bridges and Stairways



San Clemente Beach Trail

Pedestrian bridge over I-5

Trail Access

Mixed-use trail along Avenida Pico

EXAMPLE LOCATIONS

Connector Sidewalks

Connector sidewalks tend to have low pedestrian levels and are along roads with moderate to high average vehicular traffic. Connector sidewalks tend to be long and, in some cases, do not have accessible land uses directly adjacent to the sidewalk. This can include sidewalks along major arterials that run parallel to open space and canyon lands. Often, they are along land uses that require buffering from the street noise, resulting in noise walls that further isolate the pedestrian from the adjacent land uses.

These sidewalks have limited pedestrian use levels typically due to their remoteness and lack of nearby destinations. Often they lead to nowhere, with the sidewalk stopping a distance away from other uses. For pedestrians, neighborhood streets are less difficult to cross and result in less pedestrian collisions than higher traffic streets. This is partially due to lower speed limits typically where topography restricts the width of the road or where a development ends its improvements. Even though they have limited use, they are often along high speed streets. Without the existence of these walkways, the pedestrian may be forced to walk in a high speed and high volume street. Examples include northeastern sections of Avenida Pico, Avenida Vista Hermosa and Avenida La Pata.

Neighborhood Sidewalks

Neighborhood sidewalks are sidewalks along roads that support low to moderate density housing with low to moderate pedestrian levels. Neighborhood streets and their associated walkways are generally lower volume streets, with low to moderate widths, single lanes in each direction and posted speed limits of 25 miles per hour. They are not as difficult to cross and pedestrian and pedestrian collisions occur less frequently because drivers have ample time to see, react and brake. However, excessive speeding does occur on these streets and often physical design cannot address carelessness of drivers.

Ancillary Pedestrian Facilities

Ancillary pedestrian facilities are away from or crossing over streets such as plazas, paseos, promenades, courtyards or pedestrian bridges and stairways. Many of these ancillary facilities attract local residents, visitors and workers, generating moderate to high pedestrian use.

Pedestrian Issues

Connectivity

Connectivity refers to the existence of a defined, continuous pedestrian path (generally along streets) between where a walker starts and where she or he wants to go. Community connectivity is the foundation of a pedestrian-friendly environment. Typical walking distance is typically not much more than a quarter mile distance, which is equivalent to a five to ten minute walk at an easy pace of two to three mph. Within this ten minute radius, able-bodied residents should be able to walk to the center from anywhere in a neighborhood to take care of daily needs or to use public transit. The pedestrian system is an integral component of the overall transit system and serves as a connector between where we live, where we work and how we connect with the urban environment. In San Clemente, sidewalk obstacles that make walking difficult include gaps in the sidewalks, multi-block areas without pedestrian facilities, steep slope/canyon barriers, "difficult to cross" road barriers such as freeway overpasses, high volume, high speed arterials and land use barriers that prevent easy pedestrian flow through a site.

Walkway Gaps

Walkway gaps are predominantly in the City's southwestern and coastal neighborhoods. These neighborhoods are older and were developed before sidewalks were conditions of development. The neighborhoods northeast of Interstate 5 have less missing walkways since they are newer. West of Interstate 5, there are gaps where walkways have not been completed due to lack of right-of-way, short driveways or funding. A typical situation is where a vehicle overhangs an existing sidewalk because the driveway is too short and garage is too small to accommodate the vehicle. Some parcels' landscaped yards extend to the curb with no public right-of-way. Lack of walkway facilities exist at the community level as well. This is most common at a large shopping center development with expansive parking lots. Often pedestrian movement around a development, community or commercial center is difficult because there is no separation between the vehicular driving and parking environment and the pedestrian environment.

Steep Grades

San Clemente's hilly topography is one of its defining features, but these landforms can make pedestrian movement difficult. Slope is always an issue for both pedestrians and cyclists. In many locations, this poses a constraint that is difficult to remedy.

Road Barriers/Freeway Crossings

Designing for the movement of vehicles has often relegated the pedestrian to a secondary status. This includes practices such as wide curb radii that allow drivers to make turns without significantly reducing speed and freeway-like ramping, turn lanes and merge lanes that require a pedestrian to cross high speed traffic. Also, high speed, high volume and wide streets represent barriers because of the length of time needed to wait between cycles to cross, the overall crossing distance and the fear of safety issues.

San Clemente is typical of coastal southern California cities in that a freeway bisects the City, essentially dividing it two. There are several freeway crossings with little or no pedestrian facilities. They are often designed for crossing on one side only and offer little space for pedestrians. Fortunately, there are several pedestrian-accommodating bridges and undercrossings away from interchanges that provide safer crossings of Interstate 5, including at Avenida Vaquero, at Avenida Palizada, at bridge connecting Avenida Del Presidente and El Camino Real and at Avenida San Luis Rey, as well as a pedestrian bridge at Concordia Elementary School.

Rail Lines

Amtrak and Metrolink trains share a single rail line along the coast through the length of the City. This tends to focus pedestrian access to and from the beach area to the legal pedestrian crossing points, most of which are at-grade, though there is a pedestrian bridge off Paseo De Cristobal and underpasses at the pier and other locations.

Unlit Areas

The typical spacing of streetlights is often a deterrent to pedestrian movement. In some areas of the City, streetlights are located only at intersections. The lack of pedestrian-scale streetlights deters walkers who do not feel comfortable or safe on dark sidewalks. This can become a deterrent for transit riders if, after alighting from the bus or train, they must walk from a lit stop through dark streets to reach their destinations. Longer, but better lit routes may be selected, avoiding darker areas, which contributes to a connectivity problem.

Walkway Capacity and Associated Obstructions

The location and size of walkways can also be a connectivity problem if the route is avoided because of other walkability issues. A walkway, even one that meets the City's minimum required width, can be a deterrent to pedestrian travel if streetlight and traffic signal poles, utility boxes, newspaper racks, backflow preventers, vending machines, etc., are located in the path of travel, making it difficult to maneuver, even if there is only a small number of pedestrians using the walkway.

Street Patterns that Limit Pedestrian Connections

The typical suburban street layout, with its hierarchal designation of streets, long blocks without cross-streets and streets ending in cul-de-sacs, makes it difficult for pedestrians to walk from home to school, to shopping, or to recreation. This is due to the street pattern that does not allow easy access to destinations, even if they are relatively close by. In turn, this forces potential walkers to rely on the automobile. Locally hilly topography often drives this pattern. The neighborhoods northeast of Interstate 5 tend to follow this trend with large arterials such as Avenida Vista Hermosa and Camino Vera Cruz serving as the major connector street to some of these neighborhoods.

In some of the region's newer developments, such as Talega, has a connected street system. While not as formalized and geometrically arranged as the grid street systems in older communities, these systems do allow many options for people to walk around the neighborhood. In neighborhoods where the street connectivity is not possible due to topography or traffic, pedestrian-only walkways have been put in place and some cul-de-sacs have pedestrian connections to adjacent areas. However, there is no mixed-use development, so many typical destinations such as schools or shopping remain too far away to walk and major connector streets remain a barrier.

Additional Analysis Mapping

The remaining maps in this chapter represent factors required for state compliance with bicycle transportation plans. These data were incorporated into overall analysis and the prioritization modeling developed for candidate project identification.

Figure 4.10: Activity Centers

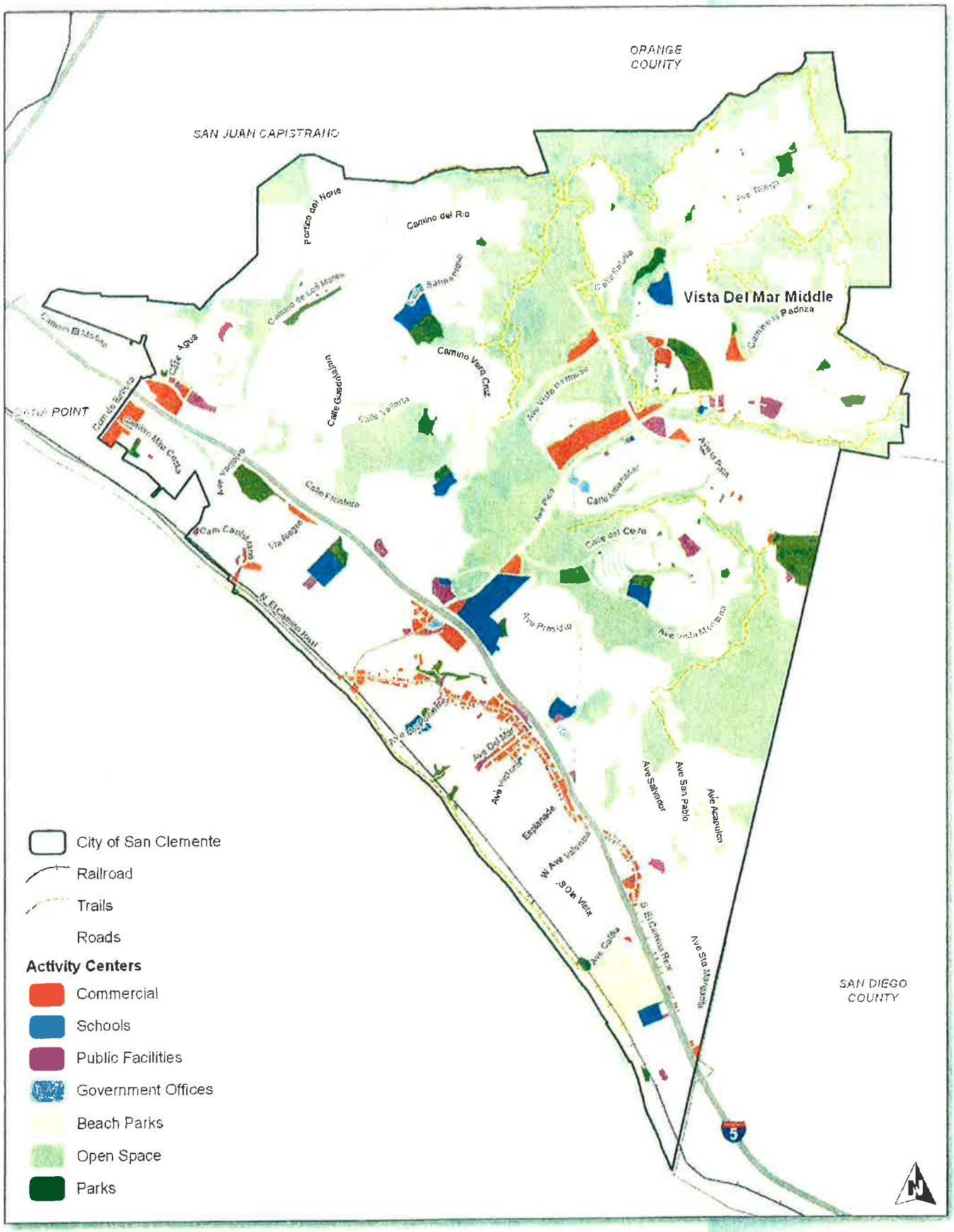


Figure 4.11: Land Use

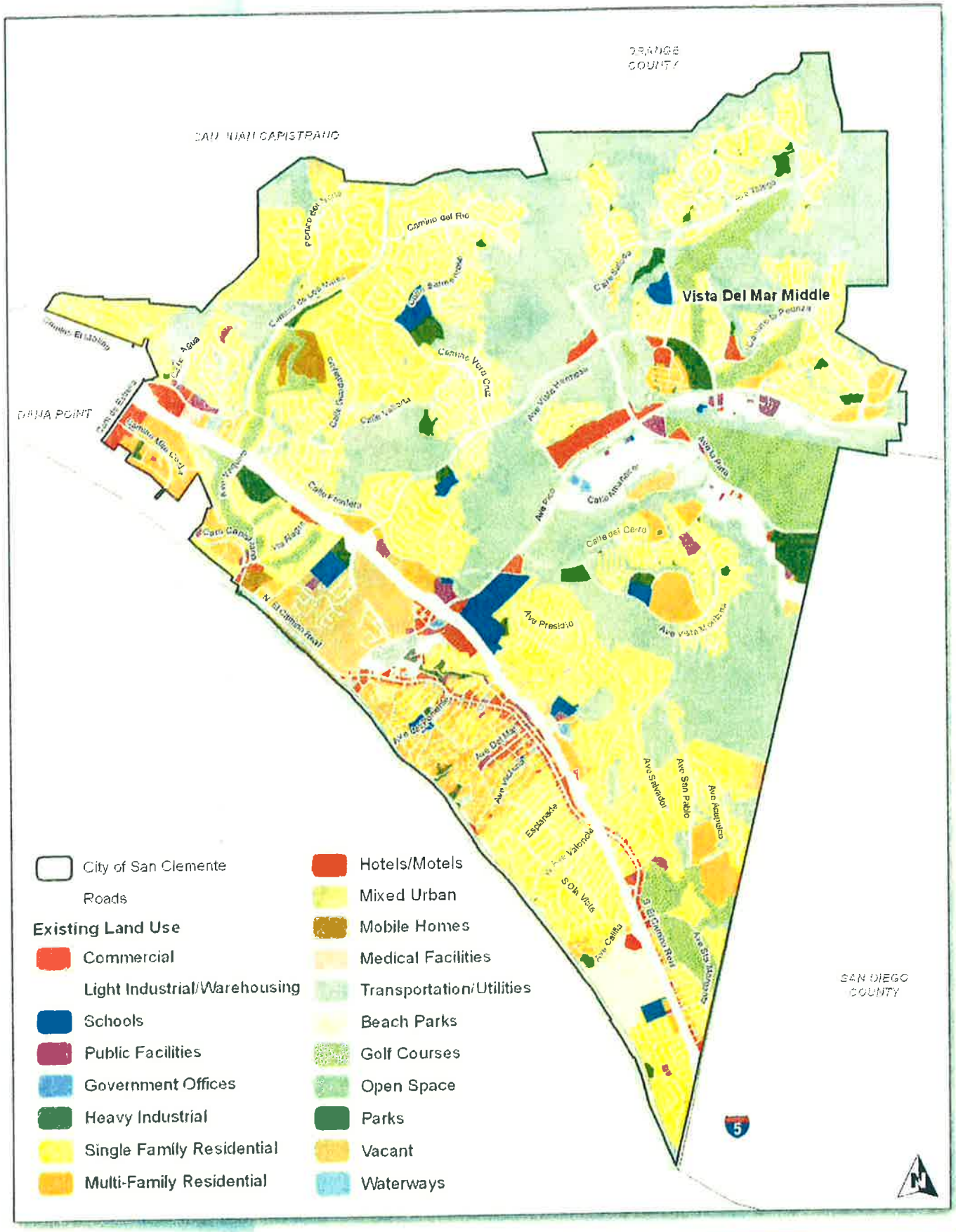


Figure 4.12: Posted Speed Limits

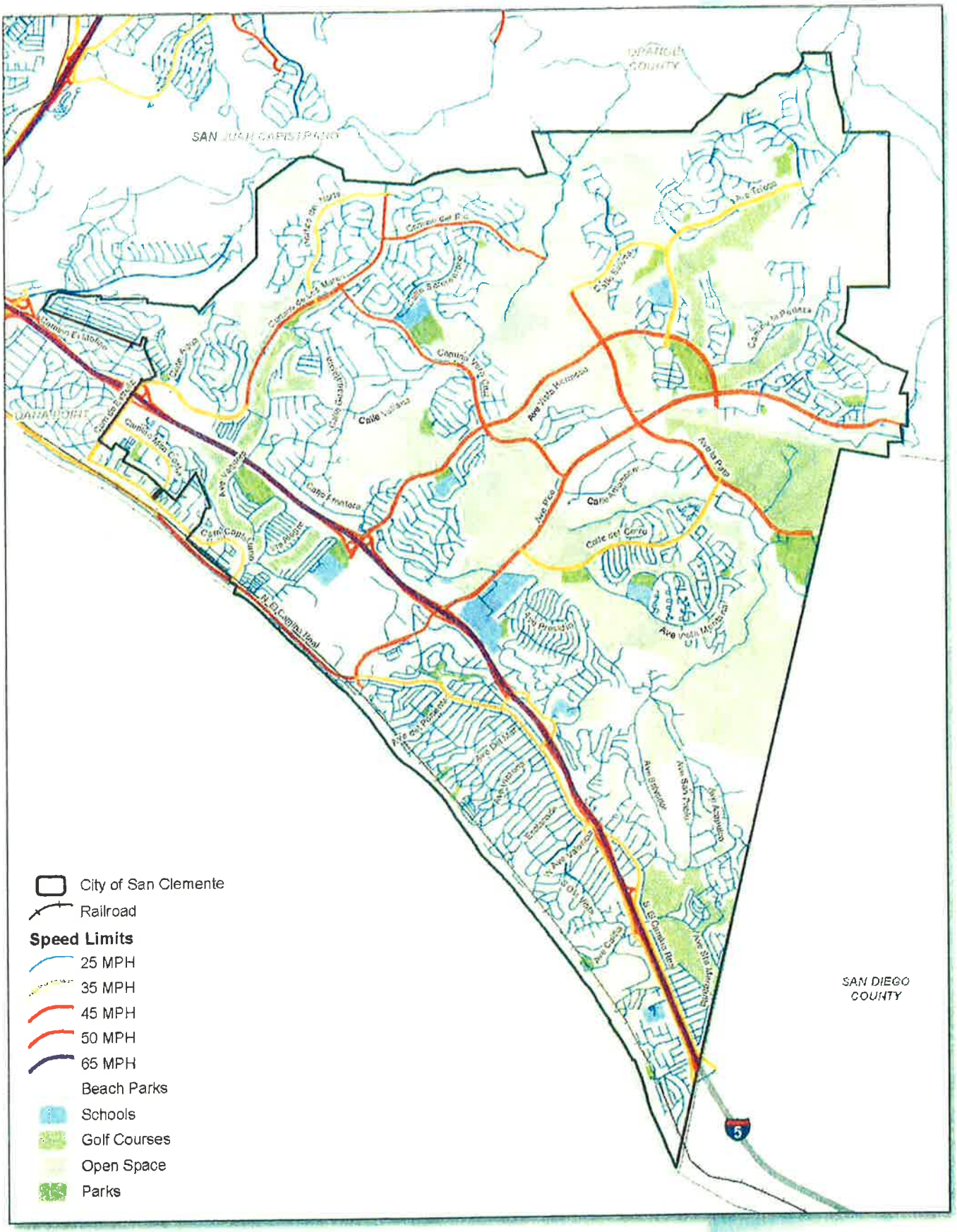


Figure 4.13: Average Daily Trips (ADTs)

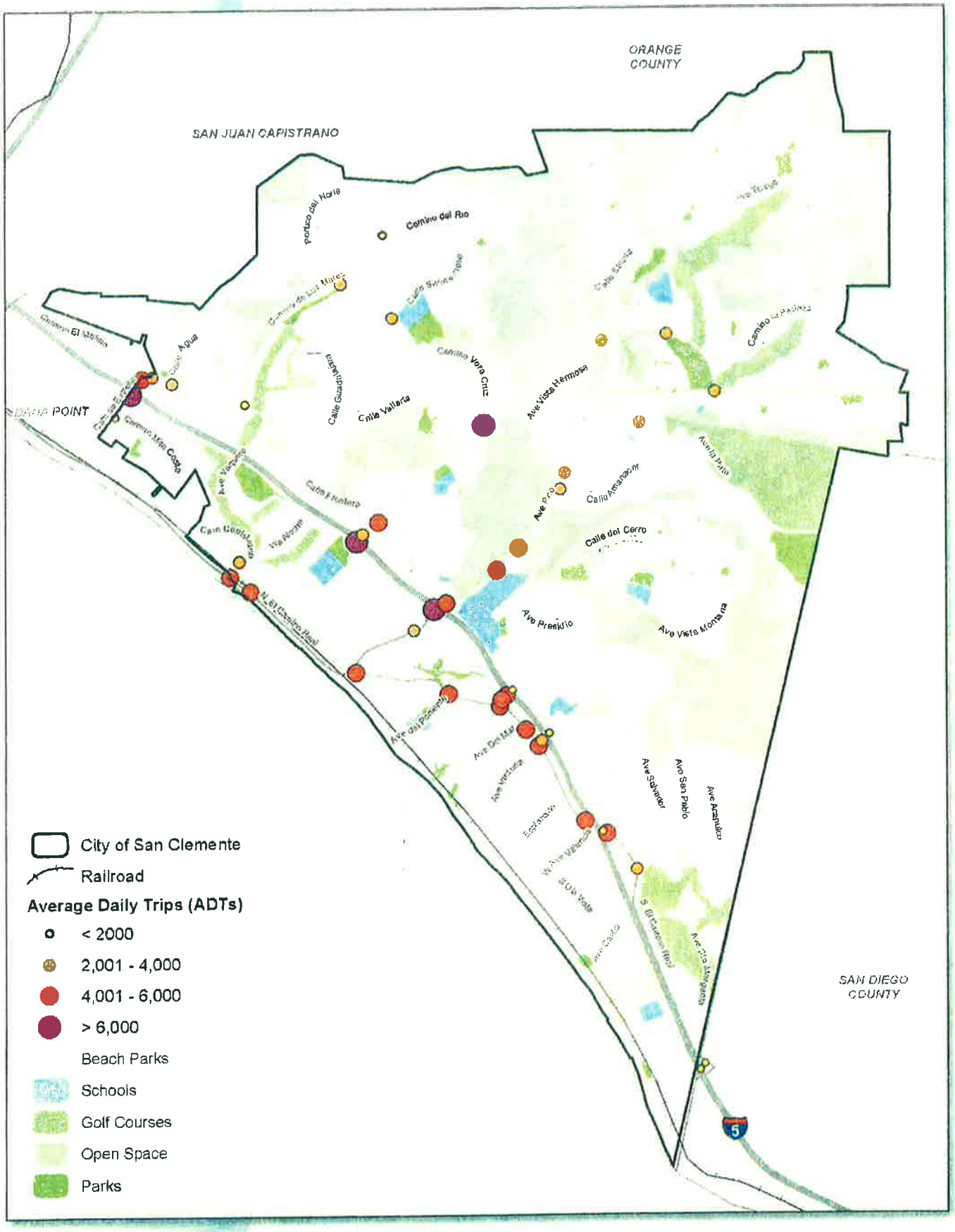


Figure 4.14: Bicycle-Related Collisions

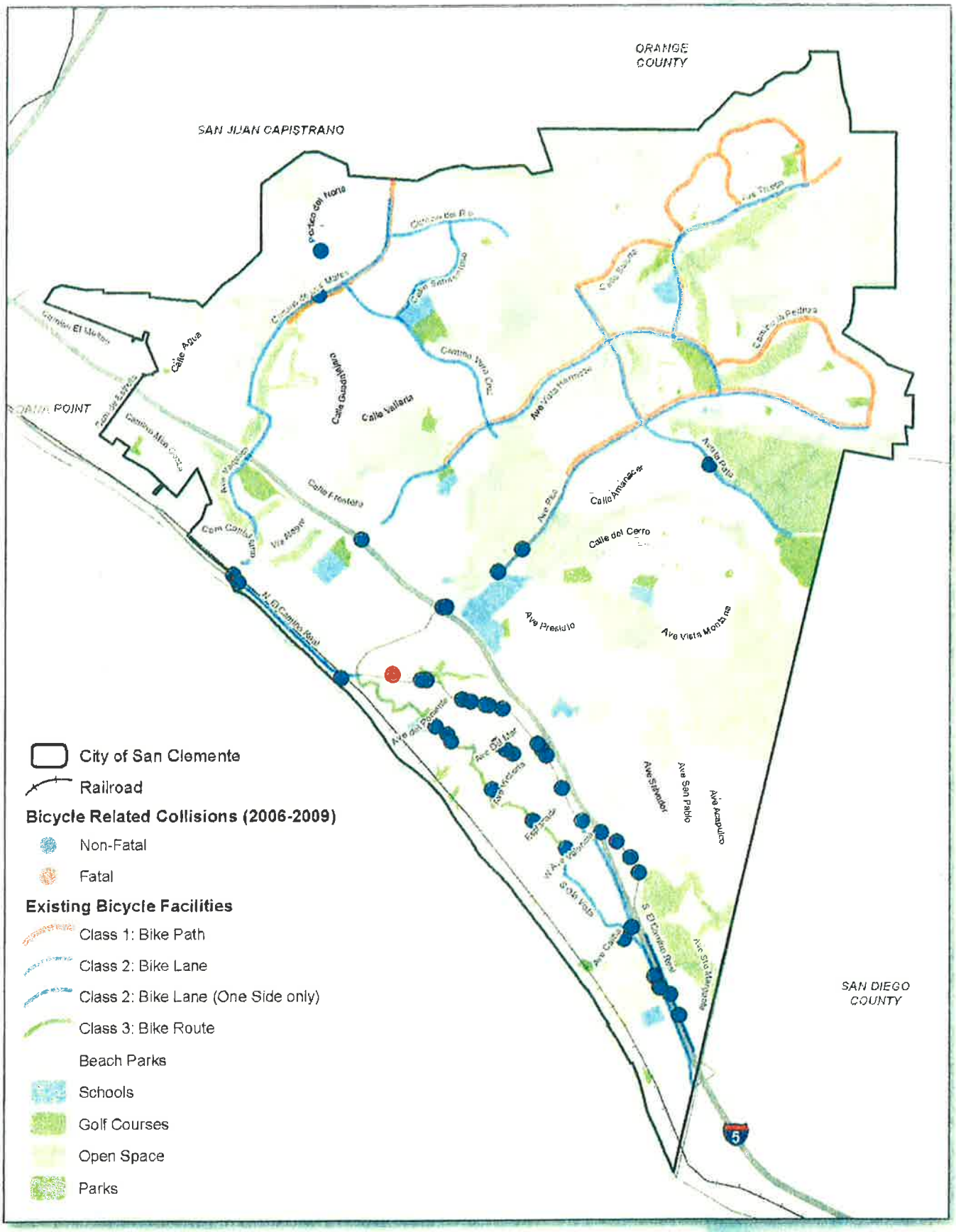
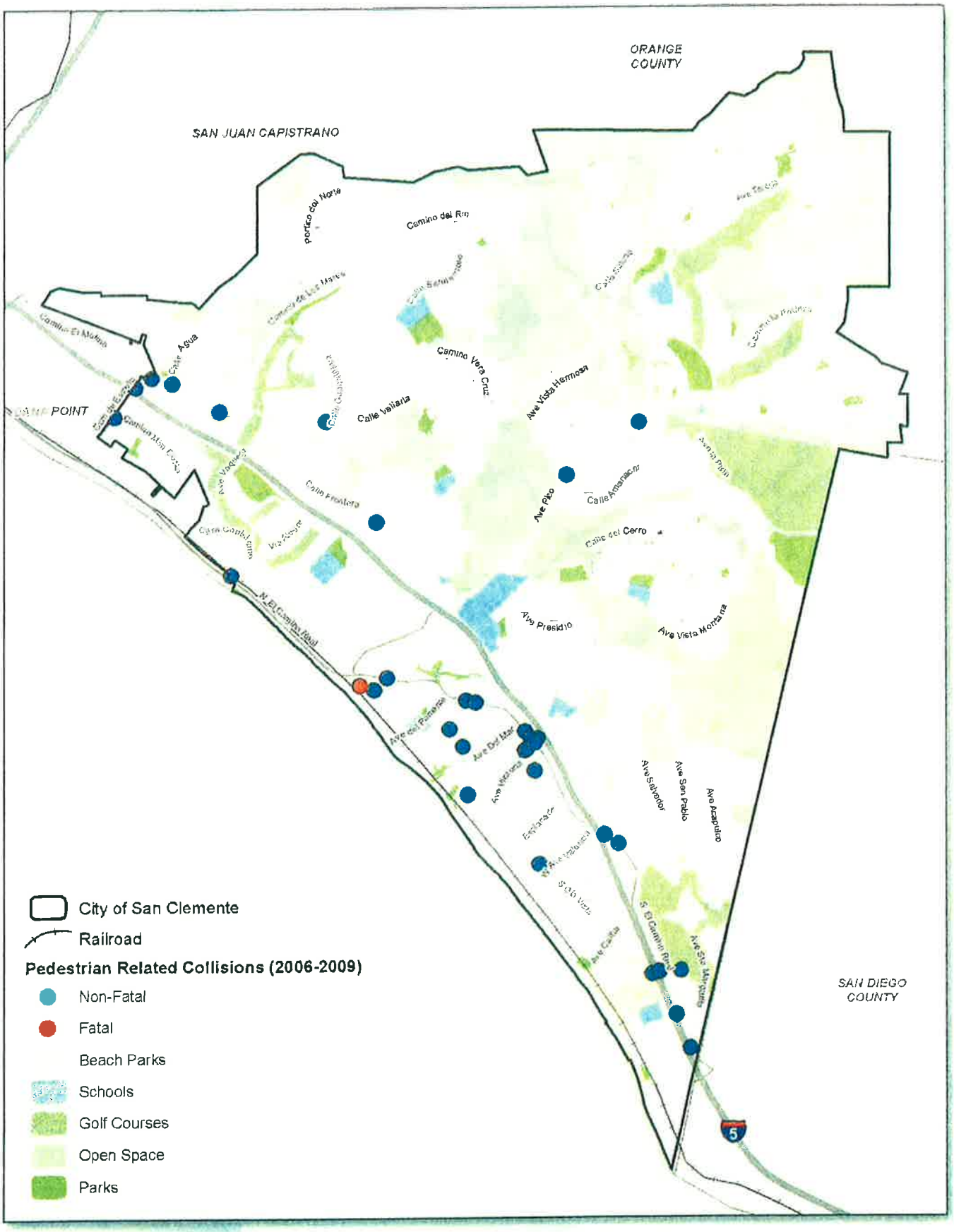


Figure 4.15: Pedestrian-Related Collisions



5 Design

5.1 Bikeway Facility Design

The following principles support the provisions suggested in this chapter:

- Cyclists should have safe, convenient and comfortable access to all destinations.
- Every street is a bicycle street, regardless of bikeway designation.
- Street design should accommodate all types, levels and ages of cyclists.
- Cyclists should be separated from pedestrians.
- Bikeway facilities should take into account vehicle speeds and volumes, with shared use on low volume, low-speed roads.
- Separation on higher volume, higher-speeds roads.
- Bikeway treatments should provide clear guidance to enhance safety for all users.
- Since most bicycle trips are short, a complete network of designated bikeways has a grid of roughly ½ mile.

Planning for a Range of Bikeway Users

Many early bikeway designs assumed that cyclists resemble pedestrians in their behavior. This led to undesirable situations: cyclists being under-served by inadequate facilities, pedestrians resenting cyclists in their space and drivers being confused by cyclists entering and leaving the traffic stream in unpredictable ways. Only under special circumstances (e.g., on shared-use paths or shared-space streets) should cyclists and pedestrians share the same space.

Plan bicycle facilities for various skill levels (Credit: Dan Burden)

Cyclists operate a vehicle and are legitimate road users, but they are slower and less visible than motor vehicles. Cyclists are also more vulnerable in a crash than drivers. They need accommodation on busy, high-speed roads and at complex intersections. In congested urban areas, cyclists provided with well-designed facilities can often proceed faster than drivers.

Cyclists use their own power must constantly maintain their balance and do not like to interrupt their momentum. Typical cyclist speeds range from 10 to 15 mph, enabling them to make trips of up to five miles in urban areas in about 25 minutes, the equivalent of a typical suburban commuter trip time. Cyclists may wish to ride side-by-side so they can interact socially with a riding companion.

Well-designed bicycle facilities guide cyclists to ride in a manner that generally conforms to the vehicle code: in the same direction as traffic and usually in a position three to four feet from the right edge of the traveled way or parked cars to avoid debris, drainage grates and other potential hazards. Cyclists should be able to proceed through intersections in a direct, predictable and safe manner.

Cyclist skill level also provides a wide variety of speeds and expected behaviors. Several systems of cyclist classification are used within the bicycle planning and engineering professions. These classifications can be helpful in understanding the characteristics and infrastructure preferences of different cyclists. However, these classifications may change in type or proportion over time as infrastructure and culture evolve. Bicycle infrastructure should use planning and designing options, from shared roadways to separate facilities, to accommodate as many user types as possible and to provide a comfortable experience for the greatest number of cyclists.

Proficient rider (Credit: Dan Burden)

A classification system developed by the City of Portland, Oregon, describes the following bicycle user types:

Strong and Fearless

Cyclists who will ride anywhere regardless of roadway conditions. These cyclists can ride faster than other user types, prefer direct routes and will typically choose roadways, even if shared with vehicles, over separate bicycle facilities such as paths. Very low percentage of the population.

Less-experienced riders prefer paths (Credit: Dan Burden)

Enthused and Confident

This group encompasses intermediate cyclists who are mostly comfortable riding on all types of bicycle facilities but will usually prefer low traffic streets, bicycle lanes, or separate paths when available. They may deviate from a more direct route in favor of a preferred facility type. This group includes commuters, utilitarian cyclists and recreational riders and probably represents less than 10 percent of the population.

Interested but Concerned

This user type makes up the bulk (likely between half and two-thirds) of the cycling or potential cycling population. They are cyclists who typically ride only on low traffic streets or paths under favorable conditions and weather. They perceive traffic and safety as significant barriers towards increased use of cycling. These cyclists may become "Enthused and Confident" with encouragement, education and experience.

No Way, No How

People in this category are not cyclists. Many perceive severe safety issues with riding in traffic and will never ride a bicycle under any circumstances. Some may eventually give cycling a second look and progress to the user types above. This group likely comprises between a quarter and a third of the population.

Bikeway Types

A designated bikeway network provides a system of facilities that offers enhancement or priority to cyclists over other roadways in the network. However, it is important to remember that all streets in a city should safely and comfortably accommodate cyclists, regardless of whether the street is designated as a bikeway. Several general types of bikeways are listed below with no implied order of preference. In California, local jurisdictions should follow minimum width and geometric criteria in the *Highway Design Manual* Chapter 1000, or follow proper procedures for exemptions and experiments. It should be noted that Chapter 1000 contains minimums. Many jurisdictions read this to mean exact dimension. In many circumstances, exceeding these minimums provides for a more desirable bicycling environment.

Shared Use Paths

Shared use paths are facilities separated from motor vehicle traffic by an open space or barrier, either within the highway right-of-way or within an independent right-of-way. Cyclists, pedestrians, joggers and skaters often use these paths. Shared-use paths are appropriate in areas not well served by the street system, such as in long, relatively uninterrupted corridors like waterways, utility corridors and rail lines. They are often elements of a community trail plan. Shared use paths may also be integrated into the street network with new subdivisions. In California shared-use paths are designated as Class 1 bikeways.

Class 1 Shared Use Path

The path should be wide enough (Caltrans requirements call for eight feet minimum with two feet of clear space on each side) to accommodate multiple user types and should include an unpaved side path (two to four feet) as a safety zone and for users who prefer a softer surface. This width is suitable for rural or small-town settings. Wider pavement may be needed in high-use areas. Generally, 12 feet of paved path is preferred. Additional width also helps to prevent pavement edge damage from maintenance or patrol vehicles. Where significant numbers of pedestrians, cyclists, skaters and other users use the paths,

Example of a shared-use path; Burbank, CA (Credit: Ryan Snyder)

either wider pavement or separate walkways help to eliminate conflicts. Most important in designing shared use paths is good design of intersections where they cross streets. These crossing should be treated as intersections with appropriate treatment.

A wide physical separation is recommended where a Class 1 facility parallels a motor vehicle route. Any separation of less than five feet from the pavement edge of a motor vehicle route requires a physical barrier to prevent encroachment between the bicycle path and roadway. Class 1 routes immediately adjacent to a street are not recommended because many cyclists will find it less convenient to ride on them compared to streets, especially for utility trips such as commuting. Other reasons that Class 1 routes immediately adjacent to a street are not recommended are that they can encourage wrong-way riding on the street and they can also create safety problems at intersection crossings.

Because Class 1 facilities are independent of roadways that already have defined minimum design speeds, the design speed of Class 1 facilities is a factor to consider, which on relatively flat routes is 25 mph.

The opportunity sometimes exists for the installation of Class 1 facilities that would not only provide the relaxed recreational atmosphere associated with an off-street facility, but also a commuter connection.

Class 2 Bicycle Lane

Bicycle Lanes

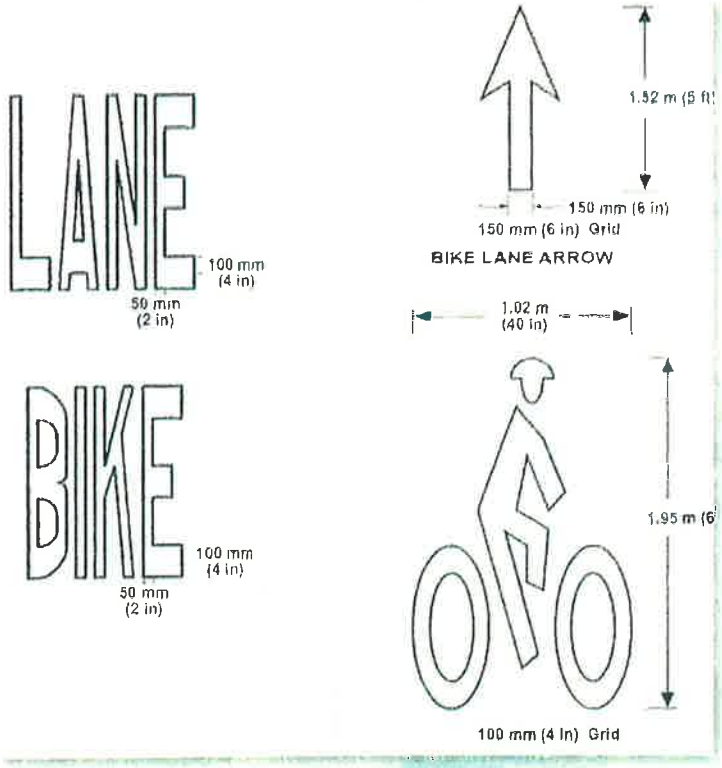
Bicycle lanes are a portion of the traveled way designated for preferential use by cyclists. They are most suitable on avenues and boulevards. Bicycle lanes may also be provided on rural roads where there is high bicycle use. Bicycle lanes are generally not recommended on local streets with relatively low traffic volumes and speeds, where a shared roadway is the appropriate facility. There are no hard and fast mandates for providing bicycle lanes, but as a general rule, most jurisdictions consider bicycle lanes on roads with traffic volumes in excess of 3,000-5,000 ADT or traffic speeds of 30 mph or greater. In California bicycle lanes are designated as Class 2 bikeways.

Bicycle lanes have the following advantages:

- They enable cyclists to ride at a constant speed, especially when traffic in the adjacent travel lanes speeds up or slows down (stop-and-go).
- They enable cyclists to position themselves where they will be visible to drivers.
- They encourage cyclists to ride on the traveled way rather than the sidewalk.

Cyclist using bicycle lane (Credit: Dan Burden)

Bicycle lanes are delineated with a solid stripe and stencils. Portions of the traveled way designated with striping, stencils and signs for preferential use by cyclists, bicycle lanes are appropriate on avenues and boulevards. They may be used on other streets where bicycle travel and demand is substantial. Where on-street parking is provided, bicycle lanes are striped on the left side of the parking lane.



Bicycle lane markings (CA MUTCD Figure 9C-6)

The minimum bicycle lane width is five feet from the face of a curb, or four feet on open shoulders. If on-street parking is permitted, the bicycle lane should be placed between parking and the travel lane with a preferred width of six feet so cyclists can ride outside the door zone. Streets with high volumes of traffic and/or higher speeds need wider bicycle lanes (six to eight feet) than those with less traffic or slow speeds. On curbed sections, a four foot (minimum three feet) wide smooth surface should be provided between the gutter pan and stripe. This minimum width enables cyclists to ride far enough from the curb to avoid debris and drainage grates and far enough from other vehicles to avoid conflicts. By riding away from the curb, cyclists are more visible to drivers than when hugging the curb. Where on-street parking is permitted, delineating the bicycle lane with two stripes, one on the street side and one on the parking side, is preferable to a single stripe.

Sign R81-A

Sign R81

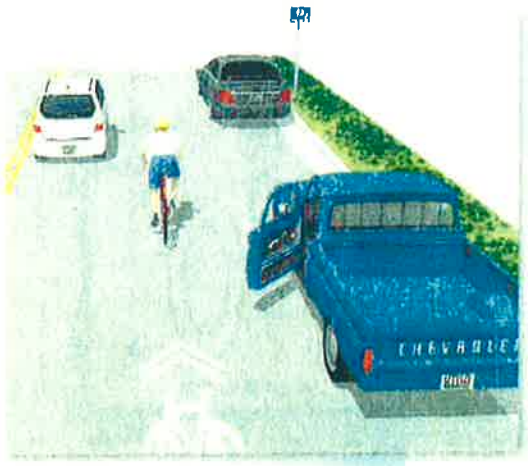
Sign R81-B

Typical Class 2 Bicycle Lane signs (CA MUTCD)

If parking volume is substantial or turnover is high, an additional one or two feet of width, or buffer, is desirable for safe bicycle operation. Bicycle lanes should always be placed between the parking lane and the motor vehicle lanes. Bicycle lanes between the curb and the parking lane can create obstacles for cyclists and eliminate a cyclist's ability to avoid a car door as it is opened.

Bicycle lanes must be one-way facilities and carry traffic in the same direction as adjacent motor vehicle traffic. Two-way bicycle lanes on one side of the roadway are unacceptable because they promote riding against the flow of motor vehicle traffic. Wrong-way riding is the primary cause of bicycle crashes and violates the "rules of the road" of the Uniform Vehicle Code. Bicycle lanes on one-way streets should be on the right side of the street. In unique situations, it may be appropriate to provide a contra-flow bicycle lane on the left side of a one-way street where it will decrease the number of conflicts (e.g., those caused by heavy bus traffic). Where this occurs, the lane should be marked with a solid, double yellow line and the width of the lane should be increased by one foot.

Drivers are prohibited from using bicycle lanes for driving and parking, but may use them for emergency avoidance maneuvers or breakdowns. Bicycle lanes are one-way facilities that carry bicycle traffic in the same direction as adjacent motor-vehicle traffic. Bicycle lanes should always be provided on both sides of a two-way street. One exception is on hills where topographical constraints limit the width to a bicycle lane on one side only. The bicycle lane should be provided in the uphill direction as cyclists ride slower uphill and they can ride in a shared lane in the downhill direction.



Class 3 Bicycle Route

Sign R4-11

Sign D11-1

Sign D1-1b (R)

Sign SG45

Typical Class 3 Bicycle Route signs (CA MUTCD)

Bicycle Routes

A term used for planning purposes or to designate recommended bicycle touring routes, a bicycle route can be any bikeway type. In California bicycle routes are designated as Class 3 bikeways.

The designation of a roadway as a Class 3 facility should be based primarily on the advisability of encouraging bicycle use on that particular roadway. In general, the most important considerations are pavement width and geometrics, traffic conditions and appropriateness of the intended purpose. A certain amount of risk and liability exists for any area signed as a Class 3 bicycle route. The message to the user public is that the facility is a relatively safe route. While the roadways chosen for bicycle routes may not be free of problems, they should offer the best balance of safety and convenience of the available alternatives.

How appropriate a particular roadway is for a bicycle route includes directness, connectivity with other bicycle facilities, scenery and available services. Directness is important for cyclists traveling for a purpose, such as commuting, though this is not the case for recreational riders, for whom scenery or fitness may be the primary factor in selecting a route. For recreational riders traveling more than a few miles, services such as food, water and restrooms may be of interest.

According to the *California Manual of Uniform Traffic Control Devices* (CA MUTCD), Bicycle Route Guide (MUTCD Sign Type D11-1) signs should be provided at decision points along designated bicycle routes, including signs to inform cyclists of bicycle route direction changes and confirmation signs for route direction, distance and destination. These signs should be repeated at regular intervals so that cyclists entering from side streets will know that they are on a bicycle route. Similar guide signing should be used for shared roadways with intermediate signs placed for cyclist guidance.

Shared roadway bicycle marking symbols or "sharrows" are an optional signage method for roadways with maximum posted speed limits of 35 mph to alert drivers to the expected presence of cyclists, as well as to direct cyclists to the proper distance out from the curb to avoid suddenly opened car doors.

Climbing Lane

A climbing lane is a hybrid facility composed of a Class 2 lane on one side of the roadway (in the uphill direction) and a Class 3 route on the other side (in the downhill direction). This facility is particularly useful on steep roadways where existing width is not sufficient to accommodate Class 2 lanes in both directions, but where bicycle facilities are desired.

Climbing Lane (Class 3 with sharrows downhill and Class 2 uphill)

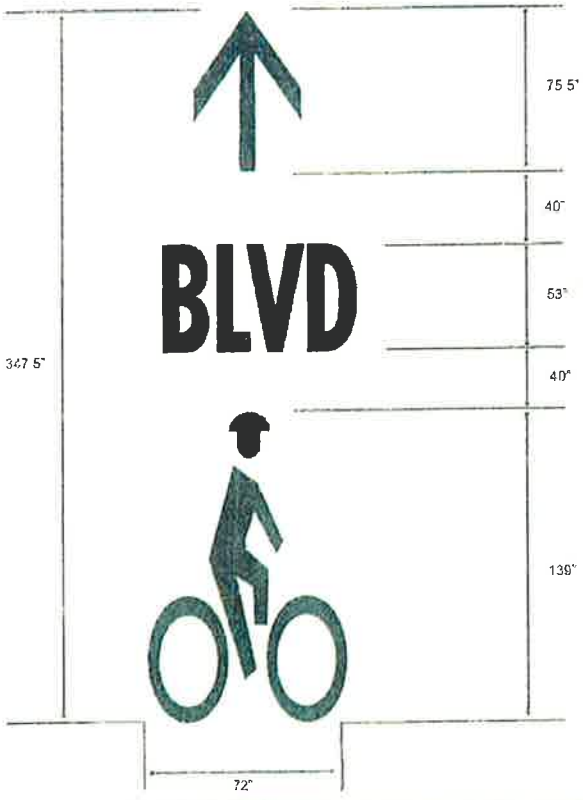
Note that the preferred configuration is Class 2 lanes in both directions. The climbing lane configuration is only recommended on steep roadway segments where dual Class 2 lanes cannot be accommodated. Where there is enough room for a bicycle lane in only one direction, it should always be provided on the uphill side because the effort of climbing makes all cyclists move slower and some will also weave more than normal. It is therefore prudent to provide more maneuvering space such as a designated bicycle lane that facilitates easier and safer passing by motor vehicle drivers.

The downhill Class 3 bicycle route portion also allows faster-moving cyclists to share the lane with motor vehicle traffic, which is appropriate because the speed differential between drivers and cyclists is not nearly as great when going downhill as uphill. In many cases, downhill cyclists can actually match motor vehicle speeds. The Class 2 lane portion in the uphill direction should employ standard pavement markings (including directional arrows) and signage as directed by the CA MUTCD. In addition, shared lane pavement markings (sharrows) should be provided as part of the Class 3 route facility within the travel lane in the downhill direction. These markings help alert drivers that faster-moving cyclists are likely to ride within the travel lane and also indicate to cyclists the proper direction to travel on either side of the roadway.

Shared Roadways

A shared roadway is a street in which cyclists ride in the same travel lanes as other traffic. There are no specific dimensions for shared roadways. On narrow travel lanes, drivers have to cross over into the adjacent travel lane to pass a cyclist. Shared roadways work well and are common on low-volume, low-speed neighborhood residential streets, rural roads and even many low-volume highways. In California shared roadways are known as Class 3 bikeways.

Bicycle boulevard: Portland, OR (Credit: Ryan Snyder)



Bicycle boulevard pavement marking (Berkeley, CA)

Bicycle Boulevards

A bicycle boulevard is a street that has been modified to prioritize through bicycle traffic but discourage through motor vehicle traffic. Traffic-calming devices control traffic speeds and discourage through trips by automobiles. Traffic controls limit conflicts between automobiles and cyclists and give priority to through bicycle movement at intersections.

Shoulder Bikeways

This facility accommodates bicycle travel on rural highways and country roads by providing a suitable area for bicycling and reducing conflicts with faster moving motor vehicles.

Cycle Tracks

Cycle tracks are specially designed bikeways separated from the parallel motor vehicle travelway by a line of parked cars, landscaping, or a physical buffer that motor vehicles cannot cross. Cycle tracks are effective in attracting users who are concerned about conflicts with motorized traffic. Cycle tracks are designed as protected bicycle lanes, often placed between parked cars and the curb, either one- or two-way. Just like any other facility, cycle tracks have their drawbacks. Two-way facilities can have some of the same safety problems as Class 1 paths where they intersect roadways. Cycle tracks are not supported by Caltrans and the City would need to use other funding sources to develop these facilities if desired.

Integrating with the Street System

Most bikeways are part of the street. Therefore, well-connected street systems are very conducive to bicycling, especially those with a fine-meshed network of low-volume, low-speed streets suitable for shared roadways. In less well-connected street systems, where wide streets carry the bulk of traffic, cyclists need supplementary facilities, such as short sections of paths and bridges, to connect otherwise unconnected streets.

There are no hard and fast rules for when a specific type of bikeway should be used, but some general principles guide selection. As a general rule, as traffic volumes and speeds increase, greater separation from motor vehicle traffic is desirable. Other factors to consider are users (more children or recreational cyclists may warrant greater separation), adjacent land uses (multiple driveways may cause conflicts with shared-use paths), available right-of-way (separated facilities require greater width) and costs.

As a general rule, designated bicycle facilities (e.g., bicycle lanes and cycle tracks) should be provided on all major streets (avenues and boulevards), since these roads generally offer the greatest level of directness and connectivity in the network and are typically where destinations are located. There are occasions when it is infeasible or impractical to provide bikeways on a busy street, or the street does not serve the mobility and access needs of cyclists. The following guidelines should be used to determine if it is more appropriate to provide facilities on a parallel local street:

- Conditions exist such that it is not economically or environmentally feasible to provide adequate bicycle facilities on the street.
- The street does not provide adequate access to destination points within reasonable walking distances, or separated bikeways on the street would not be considered safe.
- The parallel route provides continuity and convenient access to destinations served by the street.
- Costs to improve the parallel route are no greater than costs to improve the street.

If any of these factors are met, cyclists may actually prefer the parallel local street facility in that it may offer a higher level of comfort (bicycle boulevards are based on this approach).

Off-street paths can also be used to provide transportation in corridors otherwise not served by the street system, such as along rivers and canals, through parks, along utility corridors, on abandoned railroad tracks, or along active railroad rights-of-way. While paths offer the safety and scenic advantages of separation from traffic, they must also offer frequent connections to the street system and to destinations such as residential areas, employment sites, shopping and schools. Street crossings must be well designed with measures such as signals or median refuge islands.

Design of Each Bikeway Type

The following sections provide design guidance for each type of bikeway.

Shared Roadways

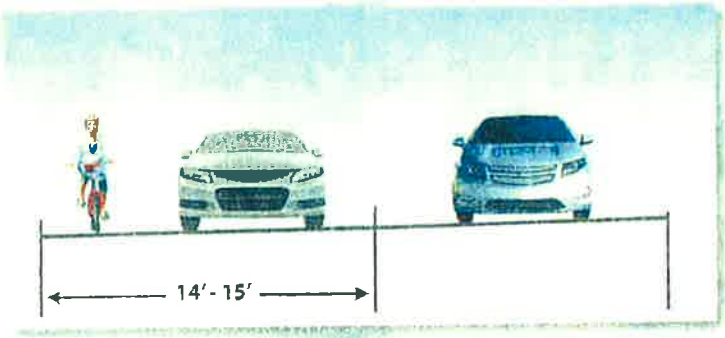
Shared roadways are the most common bikeway type. There are no specific width standards for shared roadways. Most are fairly narrow and are simply the streets as constructed. Shared roadways are suitable on streets with low motor vehicle speeds or traffic volumes and on low-volume rural roads and highways. The suitability of a shared roadway decreases as motor vehicle traffic speeds and volumes increase, especially on rural roads with poor sight distance.

Shared roadway (Credit: Michele Weisbart)

Many local streets carry excessive traffic volumes at speeds higher than they were designed to carry. These can function better as shared roadways if traffic speeds and volumes are reduced. For a local street to function acceptably as a shared roadway, traffic volumes should not be more than 3,000 to 5,000 vehicles per day and speeds should be 25 mph or less. If traffic speeds and volumes exceed those thresholds, separated facilities (e.g., bicycle lanes) should be considered or traffic-calming should be applied to reduce the vehicle speeds/volumes. Many traffic-calming techniques can make these streets more amenable to bicycling.

Wide Curb Lanes

On streets where bicycle lanes would be more appropriate but with insufficient width for bicycle lanes, wide curb lanes may be provided. This may occur on retrofit projects where there are physical constraints and all other options, such as narrowing travel lanes, have been pursued. Wide curb lanes are not particularly attractive to most cyclists. They simply allow a passenger vehicle to pass cyclists within a travel lane, if cyclists are riding far enough to the right. Wide curb lanes may also encourage higher motor vehicle speeds, which is contrary to the design principles of *Los Angeles County Model Design Manual for Living Streets*. Wide lanes should never be used on local residential streets. A 14 to 15 foot wide lane allows a passenger car to pass a cyclist in the same lane. Widths 16 feet or greater encourage the undesirable operation of two motor vehicles in one lane. In this situation, a bicycle lane should be striped.



Wide curb lane (Credit: Michele Weisbart)

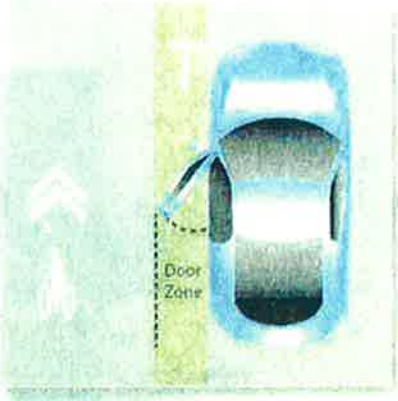
Sharrows

Shared-lane marking stencils ("SLMs," also commonly called "sharrows") may be used as an additional treatment for shared roadways. The stencils can serve a number of purposes: they remind cyclists to ride further from parked cars to prevent "dooring" collisions, they make drivers aware of bicycles potentially in the travel lane and they show cyclists the correct direction of travel. Sharrows installed next to parallel parking should be a minimum distance of 11 feet from the curb. Installing farther than 11 feet from the curb may be desired in areas with wider parking lanes or in situations where the sharrow is best situated in the center of the shared travel lane to promote cyclists taking the lane. Placing the sharrow between vehicle tire tracks increases the life of the markings and decreases long-term maintenance costs.

Sharrow: Washington, DC (Credit: John Holloway)

Centerline Removal

On streets with one travel lane in each direction, removal of the centerline is a way to facilitate passing of cyclists by drivers. Drivers may be unwilling to cross over a centerline to pass a cyclist, resulting in instances where drivers feel like they are stuck behind a slower moving cyclist and attempt to pass the cyclist too closely. Cyclists in these situations may feel pressured to ride to the extreme far right or in the gutter to allow drivers to pass. Removal of the centerline opens the entire traveled way for passing and allows cyclists to position themselves at a safe and comfortable distance from the curb. Lack of centerlines is also a traffic-calming technique since drivers tend to drive slower without the visible separation from oncoming traffic. The MUTCD mandates centerline stripes on urban streets with ADT of 6,000 or more. Most neighborhood streets suitable for sharing are well below that threshold



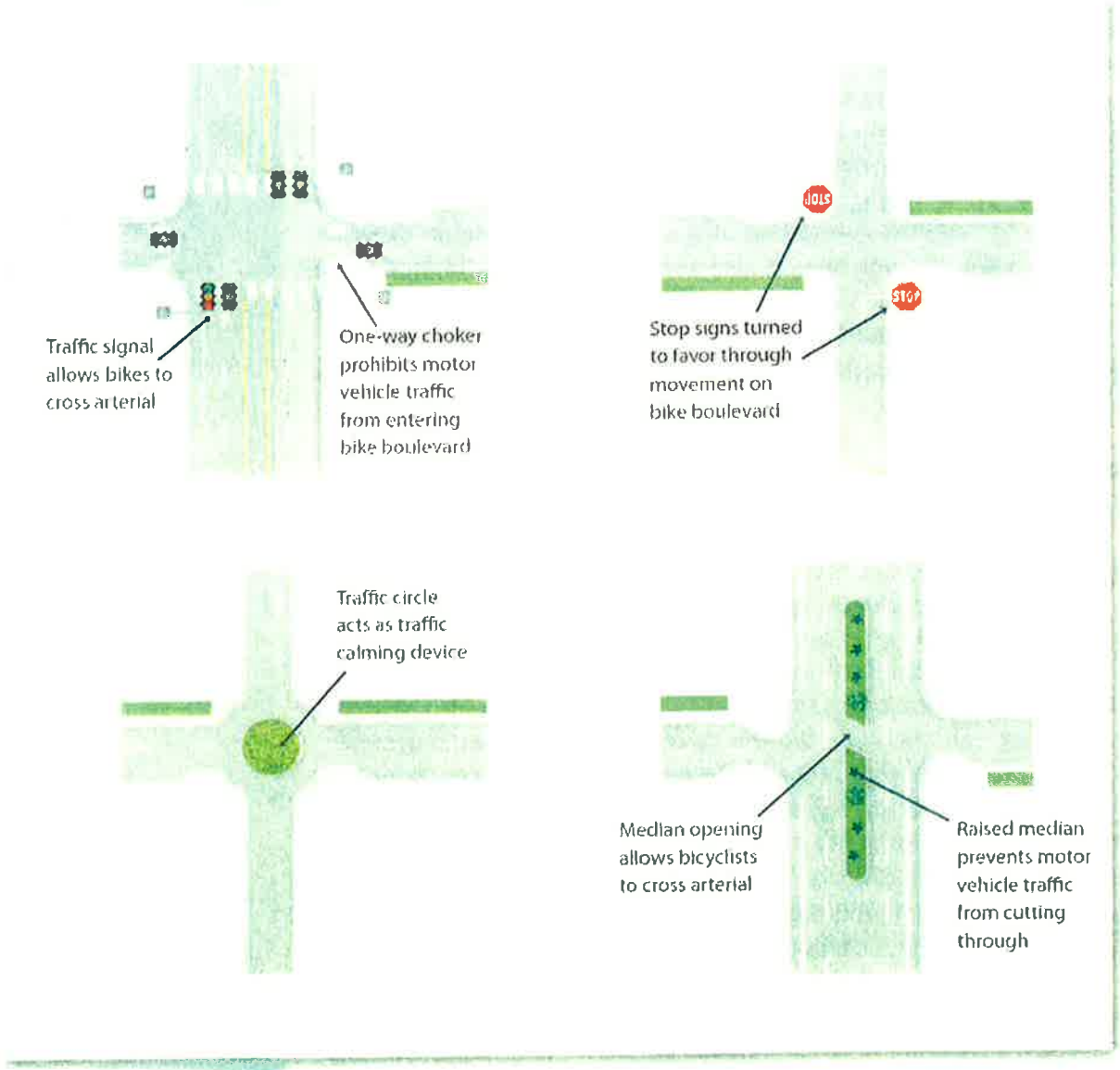
Sharrow placement (Credit: Michele Weisbart)

Bicycle Boulevards

A bicycle boulevard is an enhanced shared roadway. A local street is modified to function as a prioritized through street for cyclists while maintaining local access for automobiles. This is done by adding traffic-calming devices to reduce motor vehicle speeds and through trips and installing traffic controls that limit conflicts between drivers and cyclists and give priority to through cyclist movement. One key advantage of bicycle boulevards is that they attract cyclists who do not feel comfortable on busy streets and prefer to ride on lower traffic streets. Bicycle travel on local streets is generally compatible with local land uses (e.g., residential and some retail). Residents who want slower traffic on neighborhood streets often like measures that support bicycle boulevards. By reducing traffic and improving crossings, bicycle boulevards also improve conditions for pedestrians. Successful bicycle boulevard implementation requires careful planning with residents and businesses to ensure acceptance.

A successful bicycle boulevard includes the following design elements:

- Selecting a direct and continuous street, rather than a circuitous route that winds through neighborhoods. Bicycle boulevards work best on a street grid. If any traffic diversion will likely result from the bicycle boulevard, selecting streets that have parallel higher-level streets can prevent unpopular diversion to other residential streets.
- Placing motor vehicle traffic diverters at key intersections to reduce through motor vehicle traffic (diverters are designed to allow through cyclist movement)
- Turning stop signs towards intersecting streets, so cyclists can ride with few interruptions



Components of bicycle boulevards (Credit: Michele Weisbart)

- Replacing stop-controlled intersections with mini-circles and mini-roundabouts to reduce the number of stops cyclists have to make
- Placing traffic-calming devices to lower motor vehicle traffic speeds
- Placing wayfinding and other signs or markings to route cyclists to key destinations, to guide cyclists through difficult situations and to alert drivers of the presence of cyclists
- Where the bicycle boulevard crosses high-speed or high-volume streets, providing crossing improvements such as:
- Signals, where a traffic study has shown that a signal will be safe and effective. To ensure that cyclists can activate the signal, loop detection should be installed in the pavement where cyclists ride.
- Roundabouts where appropriate.
- Median refuges wide enough to provide a refuge (eight feet minimum) and with an opening wide enough to allow cyclists to pass through (six feet). The design should allow cyclists to see the travel lanes they must cross.

Traffic circles allow for landscaping opportunities (Credit: Ryan Snyder)

Shoulder Bikeways

Paved shoulders are provided on rural highways for a variety of safety, operational and maintenance reasons. They also provide a place for cyclists to ride at their own pace, out of the stream of motorized traffic.

When providing shoulders for bicycle use, a minimum width of six feet is recommended. This allows a cyclist to ride far enough from the edge of pavement to avoid debris and far enough from passing vehicles to avoid conflicts. On roads with prevailing speeds over 45 mph, eight feet is preferred. If there are physical width limitations, a minimum four foot shoulder may be used.

Bicycle Lanes on Two-Way Streets

Basic bicycle lanes on two-way streets comprise the majority of bicycle lanes. They should follow the design guidelines for width with and without on-street parking.

Bicycle Lanes on One-Way Streets

Bicycle lanes on one-way streets should generally be on the right side of the traveled way and should always be provided on both legs of a one-way couplet. The bicycle lane may be placed on the left of a one-way street if it decreases the number of conflicts (e.g., those caused by heavy bus traffic or parking) and if cyclists can safely and conveniently transition in and out of the bicycle lane. If sufficient width exists, the bicycle lanes can be striped on both sides.

Contra-flow bicycle lane design (Credit: Michele Weisbart)

Contra-Flow Bicycle Lanes

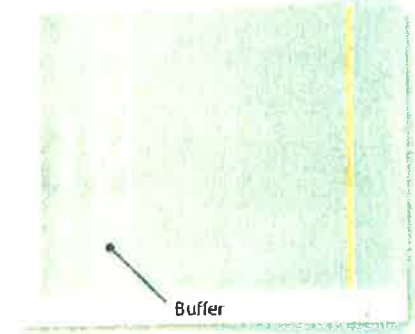
Contra-flow bicycle lanes are provided to allow cyclists to ride in the opposite direction of motor vehicle traffic. They convert a one-way traffic street into a two-way street: one direction for motor vehicles and bikes and the other for bikes only. Contra-flow lanes are separated with yellow center lane striping. Combining both directions of bicycle travel on one side of the street to accommodate contra-flow movement results in a two-way cycle track.

Contra-flow bicycle lanes are useful where they provide a substantial savings in out-of-direction travel with direct access to high-use destinations and safety is improved because of reduced conflicts compared to the longer route. The contra-flow design introduces new design challenges and may create additional conflict points as drivers may not expect on-coming cyclists.

Bicycle Lanes and Bus Lanes

In most instances, bicycles and buses can share the available road space. On routes heavily traveled by both cyclists and buses, separation can reduce conflicts (stopped buses hinder bicycle movement and slower moving bicycles hinder buses). Ideally, shared bicycle/bus lanes should be 13 feet to 15 feet wide to allow passing by both buses and cyclists.

Separate bus lanes and bicycle lanes should be considered to reduce conflicts between passengers and cyclists, with the bus lane at the curbside. Buses will be passing cyclists on the right, but the fewer merging and turning movements reduce overall conflicts.



Painted-buffer bicycle lanes (Credit: Michele Weisbart)

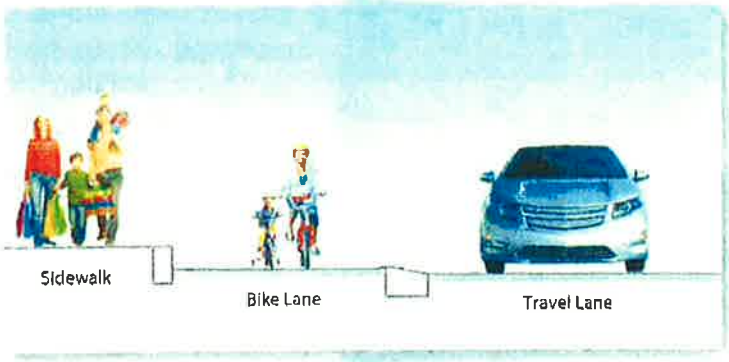
Buffered Bicycle Lanes

Buffered bicycle lanes provide a painted divider between the bicycle lane and the travel lanes. This additional space can improve the comfort of cyclists since they do not have to ride as close to motor vehicles. Buffered bicycle lanes can also be used to slow traffic as they narrow the travel lanes. An additional buffer may be used between parked cars and bicycle lanes to direct cyclists to ride outside of the door zone of the parked cars. Buffered bicycle lanes are most appropriate on wide, busy streets. They can be used on streets where physically separating the bicycle lanes with cycle tracks is undesirable for cost, operational, or maintenance reasons.

Raised Bicycle Lanes

Bicycle lanes are typically an integral portion of the traveled way and are delineated from motor vehicle lanes with painted stripes. Though most cyclists ride on these facilities comfortably, others prefer more separation. Raised bicycle lanes incorporate the convenience of riding on the street with some physical separation. This is done by elevating the bicycle lane surface two to four inches above street level, while providing a traversable curb to separate the bikeway from the motor vehicle travelway. This treatment offers the following advantages:

- Drivers know they are straying from the travel way when they feel the slight bump created by the curb.
- The mountable curb allows drivers to make turns into and out of driveways.
- The mountable curb allows cyclists to enter or leave the bicycle lane (e.g., for turning left or overtaking another cyclist).
- The raised bicycle lane drains towards the centerline, leaving it clear of debris and puddles.
- Novice cyclists are more likely to ride in the bicycle lane, leaving the sidewalk for pedestrians.



Raised bicycle lanes (Credit: Michele Weisbart)

Raised bicycle lanes can be constructed at little additional expense for new roads. Retrofitting streets with raised bicycle lanes is more costly. It is best to integrate raised bicycle lanes into a larger project to remodel the street due to drainage replacement. Special maintenance procedures may be needed to keep raised bicycle lanes swept.

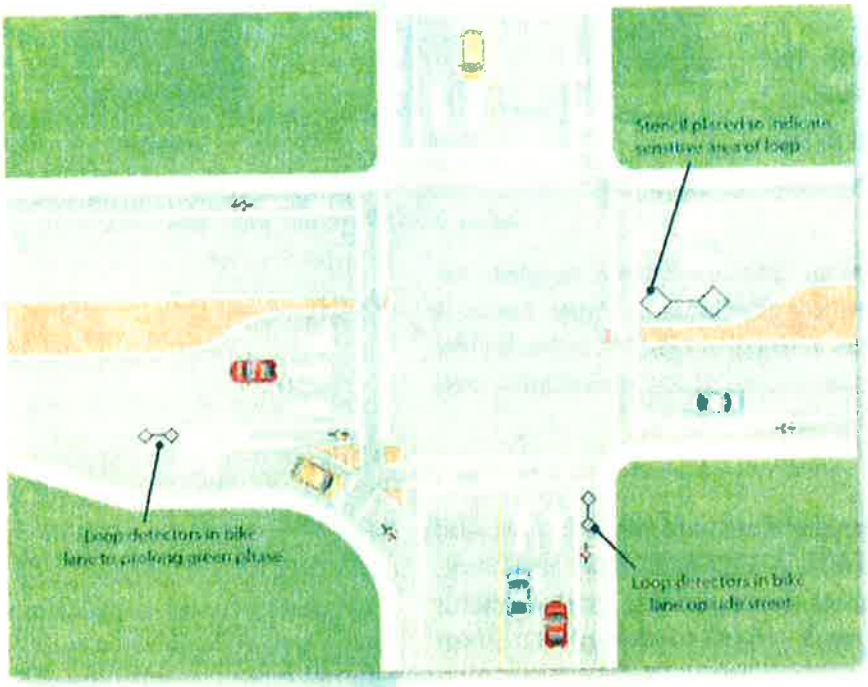
Cycle Tracks

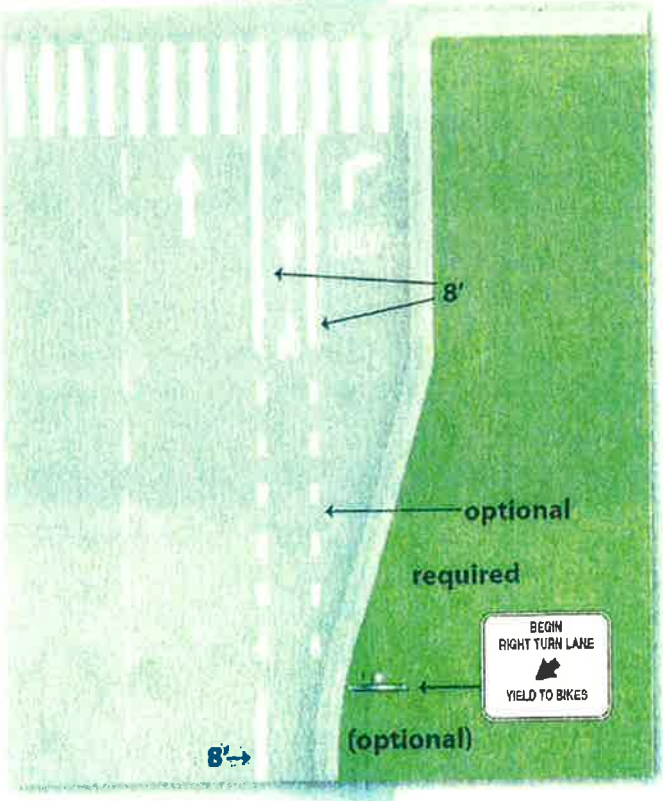
Cycle tracks, also known as protected bicycle lanes, are bikeways located on or adjacent to streets where bicycle traffic is separated from motor vehicle traffic by physical barriers, such as on-street parking, posts/bollards and landscaped islands. They can be well suited to downtown areas where they minimize traffic conflicts with pedestrians. Streets selected for cycle tracks should have minimal pedestrian crossings and driveways. They should also have minimal loading/unloading activity and other street activity. The cycle tracks should be designed to minimize conflicts with these activities as well as with pedestrians and driveways.

Cycle tracks can be provided on new facilities, but they require more width than other types of bikeways. They are best suited for existing streets where surplus width is available. The combined width of the cycle track and the barrier is more or less the width of a travel lane. The area to be used by bicycles should be designed with adequate width for street sweeping to ensure that debris will not accumulate.

Cycle track (Credit: Dan Burden)

Cycle tracks tend to work most effectively where there are few uncontrolled crossing points with unexpected traffic conflicts. Cycle track concerns include treatment at intersections, uncontrolled midblock driveways and crossings, wrong-way bicycle traffic and difficulty accessing or exiting the facility at midblock locations. There is some controversy regarding the comparative safety of cycle tracks. Recent studies have concluded that cycle tracks are as safe as other treatments when high usage is expected and when measures such as separate signal phases for right-turning motor vehicles and through cyclists and left-turning cyclists and through motor vehicles, are deployed to regulate crossing traffic.





Bikeway markings at intersections (Credit: Michele Weisbart)

Bikeway Markings at Intersections

Continuing marked bicycle facilities at intersections (up to the crosswalk) ensures that separation, guidance on proper positioning and awareness by drivers are maintained through these potential conflict areas. The appropriate treatment for right-turn only lanes is to place a bicycle lane pocket between the right-turn lane and the rightmost through lane. If a full bicycle lane pocket cannot be accommodated, a shared bicycle/right turn lane can be installed that places a standard-width bicycle lane on the left side of a dedicated right-turn lane. A dashed strip delineates the space for cyclists and drivers within the shared lane. This treatment includes signs advising drivers and cyclists of proper positioning within the lane. Sharrows are another option for marking a bikeway through an intersection where a bicycle lane pocket cannot be accommodated.

Bicycle Signal Heads

Bicycle signal heads may be installed at signalized intersections to improve identified safety or operational problems for cyclists. They provide guidance for cyclists at intersections where cyclists may have different needs from other road users (e.g., bicycle-only movements and leading bicycle intervals) or to indicate separate bicycle signal phases and other bicycle-specific timing

strategies. A bicycle signal should only be used in combination with an existing conventional or hybrid beacon. In the United States, bicycle signal heads typically use standard three-lens signal heads in green, yellow and red with a stencil of a bicycle.

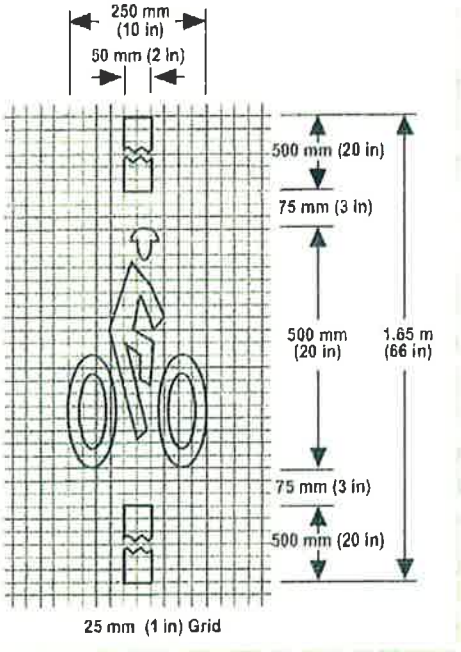
Bicycle signal head: Long Beach, CA (Credit: Charlie Gandy)

Bicycle Signal Detection

Bicycle detection is used at actuated traffic signals to alert the signal controller of bicycle crossing demand on a particular approach. Bicycle detection occurs either through the use of push buttons or by automated means (e.g., in-pavement loops, video and microwave). Inductive loop vehicle detection at many signalized intersections is calibrated to the size or metallic mass of a vehicle, meaning that bicycles may often go undetected. The result is that cyclists must either wait for a vehicle to arrive, dismount and push the pedestrian button (if available), or cross illegally. Loop sensitivity can be increased to detect bicycles.

Proper bicycle detection must accurately detect cyclists (be sensitive to the mass and volume of a bicycle and its rider) and provide clear guidance to cyclists on how to actuate detection (e.g., what button to push or where to stand). California law requires that newly constructed actuated traffic signals and newly installed detector systems be designed to detect bicycles.

Bicycle signal head with vehicular left turn signal: New York, NY



Bicycle detector symbol (CA MUTCD Figure 9C-7)

Bicycle signals: Tucson, AZ (Credit: John Holloway)

Bicycle box: Portland, OR (Credit: Ryan Snyder)

Bicycle Boxes

A bicycle box is a designated area at the head of a traffic lane at a signalized intersection that provides cyclists with a safe and visible way to get ahead of queuing traffic during the red signal phase. Appropriate locations include:

- At signalized intersections with high bicycle and/or motor vehicle volumes, especially those with frequent cyclist left-turns and/or driver right-turns
- Where there may be right or left-turning conflicts between cyclists and drivers
- Where there is a desire to better accommodate left-turning bicycle traffic
- Where a left turn is required to follow a designated bicycle route or boulevard or access a shared-use path, or when the bicycle lane moves to the left side of the street
- When the dominant motor vehicle traffic flows right and bicycle traffic continues through (such as at a Y intersection or access ramp)

Bicycle Countdown Timers

Near-side bicycle signals may incorporate a "countdown to green" display to provide information about how long until the green bicycle indication is shown, enabling riders to push off as soon as the light turns green.

Leading Bicycle Intervals

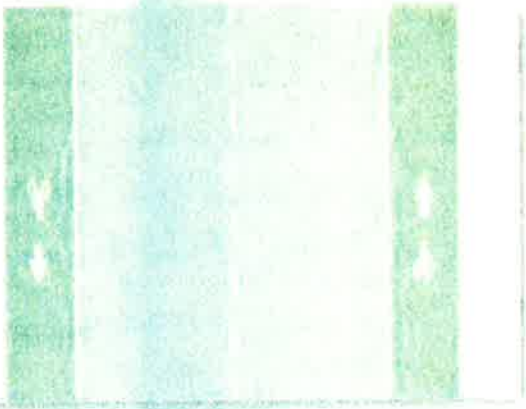
Based on the Leading Pedestrian Interval, a Leading Bicycle Interval (LBI) can be implemented in conjunction with a bicycle signal head. Under an LBI, cyclists are given a green signal while the vehicular traffic is held at all red for several seconds, providing a head start for cyclists to advance through the intersection. This treatment is particularly effective in locations where cyclists are required to make a challenging merge or lane change (e.g., to access a left turn pocket) shortly after the intersection, since the LBI would give them sufficient time to make the merge before being overtaken by vehicular traffic. This treatment can be used to enhance a bicycle box.

Two-Stage Turn Queue Boxes

On right side cycle tracks, cyclists are often unable to merge into traffic to turn left due to physical separation. This makes the provision of two-stage left turns critical in ensuring these facilities are functional. The same principles for two-stage turns apply to both bicycle lanes and cycle tracks. While two-stage turns may increase cyclist comfort in many locations, this configuration will typically result in higher average signal delay for cyclists due to the need to receive two separate green signal indications (one for the through street, followed by one for the cross street) before proceeding.

Colored Pavement Treatments

Pavement coloring is useful for a variety of applications in conjunction with bicycle facilities. The primary goal of colored pavements is to differentiate specific portions of the traveled way, but colored pavements can also visibly reduce the perceived width of the street.



Colored bicycle lanes (Credit: Michele Weisbart)

Colored pavements are used to highlight conflict areas between bicycle lanes and turn lanes, especially where bicycle lanes merge across motor vehicle turn lanes. Colored pavements can be used in conjunction with sharrows (shared lane markings) in heavily used commercial corridors where no other provisions for bicycle facilities can be accommodated.

A specific bright green is the preferred color for bicycle facilities of this type, especially in areas where conflicts or shared use is intended. Maintenance of color and surface condition are considerations. Traditional traffic paints and coatings can become slippery. Long life surfaces with good wet skid resistance should be considered.

Colored and buffered bicycle lanes: San Francisco, CA (Credit: San Francisco MTA)

Wayfinding

The ability to navigate through a region is informed by landmarks, natural features, signs and other visual cues. Wayfinding is a cost-effective and highly visible way to improve the bicycling environment by familiarizing users with the bicycle network, helping users identify the best routes to destinations, addressing misperceptions about time and distance and helping overcome a barrier to entry for infrequent cyclists (e.g., "interested but concerned" cyclists).

A bikeway wayfinding system is typically composed of signs indicating direction of travel, location of destinations and travel time/distance to those destinations. Pavement markings indicating to cyclists that they are on a designated route or bicycle boulevard and reminding drivers to drive courteously and maps providing users with information regarding destinations, bicycle facilities and route options.

Wayfinding signs: Seattle, WA (Credit: Ryan Snyder)

Legal Status

As of the writing of this plan, a number of the designs discussed above, including cycle tracks, buffered bicycle lanes next to on-street parking, conflict zone colored bicycle lanes, bicycle boxes and colored treatments of travel lanes with sharrows, have not yet been recognized by the Federal MUTCD, AASHTO, or the California MUTCD and are considered experimental treatments. These devices appear to be promising improvements in bicycle access and safety as they have been widely used in Europe and experimented with in the U.S. Any jurisdiction wishing to use these treatments should follow the appropriate experimental procedures.

Facility Maintenance

Maintenance is a critical part of safe and comfortable bicycle access. Two areas of particular importance to cyclists are pavement quality and drainage grates. Rough surfaces, potholes and imperfections, such as joints, can cause a rider to lose control and fall. Care must be taken to ensure that drainage grates are bicycle-safe. Otherwise a bicycle wheel may fall into the slots of the grate, causing the cyclist to fall. The grate and inlet box must be flush with the adjacent surface. Inlets should be raised after a pavement overlay to the new surface. If this is not possible or practical, the new pavement should taper into drainage inlets so the inlet edge is not abrupt.

The most effective way to avoid drainage-grate problems is to eliminate them entirely with the use of inlets in the curb face. This may require more grates to handle bypass flow, but is the most bicycle-friendly design.

Implementation

Implementation of a bikeway network often requires an implementation plan. Some bikeways, such as paths, bicycle boulevards and other innovative techniques described in this guide, will require a capital improvement project process, including identifying funding, a public and environmental review process and plan preparation. Other bikeway improvements piggyback onto planned construction, such as resurfacing, reconstruction, or utility work.

The majority of bikeway facilities are provided on streets in the form of shared roadways or bicycle lanes. Shared roadways usually require virtually no change to existing roadways, except for some directional signs, occasional markings and minor changes in traffic control devices. Removing unnecessary centerline stripes is a strategy that can be implemented after resurfacing projects. Striped bicycle lanes are implemented on existing roads through use of the strategies below.

Resurfacing

The cost of striping bicycle lanes is negligible when incorporated with resurfacing since this avoids the high cost of stripe removal. The fresh pavement provides a blank slate. Jurisdictions will need to anticipate opportunities and synchronize restriping plans with repaving and reconstruction plans. If new pavement is not anticipated in the near future, grinding out the old lane lines can still provide bicycle lanes.

There are three basic techniques for finding room for bicycle lanes:

Lane Narrowing - Where all existing or planned travel lanes must be retained, travel lanes can be narrowed to provide space for bicycle lanes. Recent studies have indicated that the use of 10 foot travel lanes does not result in decreased safety in comparison with wider lanes for vehicle speeds up to 35 mph. Eleven foot lanes can be used satisfactorily at higher speeds especially where trucks and buses frequently run on

these streets. However, where a choice between a six foot bicycle lane and an 11 foot travel lane must be made, it is usually preferable to have the six foot bicycle lane. Parking lanes can also be narrowed to seven feet to create space for bicycle lanes.

Road Diets (or "Road Optimization") - Reducing the number of travel lanes provides space for bicycle lanes. Many streets have more space for vehicular traffic than necessary. Some streets may require a traffic and/or environmental analysis to determine whether additional needs or impacts may be anticipated. The traditional road diet changes a four-lane undivided street to two travel lanes, a continuous left-turn lane (or median) and bicycle lanes. In other cases, a four-lane street can be reduced to a two-lane street without a center-turn lane if there are few left turns movements. One-way couplets are good lane-reduction candidates if they have more travel lanes in one direction than necessary for the traffic volumes. For example, a four-lane one-way street can be reduced to three lanes and a bicycle lane. Since only one bicycle lane is needed on a one-way street, removing a travel lane can free enough room for other features, such as on-street parking or wider sidewalks. Both legs of a couplet must be treated equally, so there is a bicycle lane in each direction.

Parking Removal - On-street parking is vital on certain streets (such as residential or traditional central business districts with little or no off-street parking), but other streets have allowable parking without a significant visible demand. In these cases, parking prohibition can be used to provide bicycle lanes with minimal public inconvenience.

Fitting bicycle lanes with road diet (Credit: Michele Weisbart)

Utility Work

Utility work often requires reconstructing the street surface to complete restoration work. This provides opportunities to implement bicycle lanes and more complex bikeways such as bicycle boulevards, cycle tracks, or paths. It is necessary to provide plans for proper implementation and design of bikeway facilities prior to the utility work. It is equally necessary to ensure that existing bikeways are replaced where they exist prior to utility construction.

Redevelopment

When streets are slated for reconstruction in conjunction with redevelopment, opportunities exist to integrate bicycle lanes or other facilities into the redevelopment plans.

Paved Shoulders

Adding paved shoulders to existing roads can be quite expensive if done as stand-alone, capital improvement projects, especially if ditch lines have to be moved, or if open drains are changed to enclosed drains. But paved shoulders can be added at little extra cost if they are incorporated into projects that already disturb the area beyond the pavement, such as laying utility lines or drainage work.

Bicycle Parking

Typical inverted-U type racks

Secure bicycle parking at likely destinations is an integral part of a bikeway network. Bicycle thefts are common and lack of secure parking is often cited as a reason people hesitate to ride a bicycle. The same consideration should be given to cyclists as to drivers, who expect convenient and secure parking at all destinations. Bicycle parking should be located in well-lit, secure locations close to the main entrance of a building, no further from the entrance than the closest automobile parking space. Bicycle parking should not interfere with pedestrian movement.

Bicycle racks along sidewalks should support the bicycle well and make it easy to lock a U-shaped lock to the frame of the bicycle and the rack. The samples shown are "inverted–U" racks and an art design rack. All meet these criteria.

Adequate bicycle parking should be incorporated into any new development or redevelopment project. Bicycle parking should be given a balanced level of importance when considering car parking improvements or development. In commercial areas where bicycle traffic is more prevalent, such as downtown San Clemente, El Camino Real, the Pier Bowl and shopping centers, increased bicycle parking is recommended. Increased bicycle parking provides an option for individuals who need to make a short trip to the local store to ride their bicycle rather than drive their car.

Bicycle racks can double as public art: Los Angeles, CA (Credit: Sky Yim)

Increasing and providing secure bicycle parking will help promote and encourage kids to ride their bikes to school if they know their bikes will be safe. Bicycle parking should also be a standard amenity for existing and future parks.

Bicycle rack type plays a major role in the utilization of the bicycle racks. Only racks that support the bicycle at two points and allow convenient locking should be used. Racks that can secure the entire bicycle are preferred and recommended for installation in commercial areas, schools, parks and local businesses.

Custom racks that showcase local businesses may be also encouraged to improve aesthetics as long as the racks provide adequate security and reflect local context. For example, special districts, especially if they are historically themed, may benefit from custom racks whose design aesthetic relates to other street furniture.

A successful bicycle rack design enables proper locking, which means the user must be able to secure a typically sized U-lock around the frame and one wheel to the locking area of the rack. Racks that support the bicycle, but either provide no way to lock the frame or require awkward lifting to enable

locking, are not acceptable unless security is provided by other means, such as a locked enclosure or monitoring by attendants.

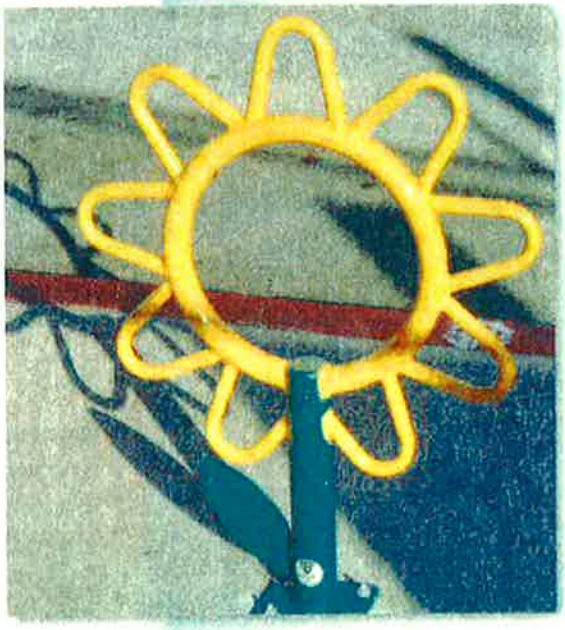
Bicycle racks must be designed so that they:

- Do not bend wheels or damage other bicycle parts
- Accommodate high security U-shaped bicycle locks
- Accommodate securing the frame and both wheels
- Do not trip pedestrians
- Are easily accessed yet protected from motor vehicles
- Are covered where users will leave their bikes for long periods

To provide real security for the bicycle (with its easily removed components) and accessories (lights, pump, tools and bags), either bicycle enclosures, lockers or a check-in service is required. Bicycle parking facilities are generally grouped into two classes:

Long Term - provides complete security and protection from weather. It is intended for situations where the bicycle is left unattended for long periods of time: apartments and condominium complexes, schools, places of employment and transit stops. These are usually lockers, cages or rooms in buildings.

Short Term - provides a means of locking the bicycle frame and both wheels, but does not provide accessory and component security or weather protection unless covered. It is for decentralized parking where bicycles are left for short periods of time and are visible and convenient to the building entrance.



Custom racks: Long Beach, CA (Credit: John Holloway)

To identify the number of bicycle parking at a specific land use, other cities have used various measurement methods such as a percentage of auto parking, unit count, proportion of building square footage and even building occupancy. There is a downside when determining bicycle parking spaces based on a percentage of vehicular parking spaces because when developments reduce the amount of parking spaces to create a more bicycle and pedestrian-friendly environment, this reduction in the amount of vehicular parking also reduces the amount of bicycle parking. This then actually becomes a deterrent to increasing bicycle parking.

Determining bicycle parking demand is more appropriate when using the proportion of square footage or building occupancy. These units of measure are commonly used during plan check and can be easily integrated into the planning process.

The bicycle racks can be customized to incorporate an area's aesthetics, or designed to complement a specific building or business. For example, the City of Long Beach maintains a program funded by the American Recovery and Investment Act to help business owners install bicycle racks. Their program provides a range of rack designs, or business owners can provide their own custom designs.

Bicycle Corrals

Bicycle corrals are vehicle parking stalls converted to bicycle parking. Most have been on-street conversions, but they are now being incorporated into shopping center parking lots as well. Corrals can accommodate up to 20 bicycles per former car parking space. On-street bicycle corrals provide many benefits where bicycle use is high and/or growing:

Movable bicycle corral: Long Beach, CA (Credit: John Holloway)

- Businesses - corrals provide a much higher customer to parking space ratio and advertise "bike-friendliness." They also allow more outdoor seating for restaurants by moving the bicycle parking off the sidewalk. Some cities have instituted programs that allow local businesses to sponsor or adopt a bicycle corral to improve bicycle parking in front of their business.
- Pedestrians - corrals clear the sidewalks and those installed at corners also serve as curb extensions.
- Cyclists - corrals increase the visibility of bicycling and greatly expand bicycle parking options.
- Drivers - corrals improve visibility at intersections by preventing large vehicles from parking at street corners and blocking sight lines.

Especially downtown, where bicycle parking is virtually unavailable, an occasional parking space could be converted into a bicycle corral to increase the attraction of cycling to the commercial district instead of driving there. There is great variety in design including signage, protective barriers, curbs, custom paving or even simply striping. In terms of placement, it is desirable to put bicycle corrals near intersections. Mid-block placement is not recommended because the corral can be hidden by parked motor vehicles, reducing visibility for both drivers and cyclists. Bicycle corral racks can be customized and have been designed and fabricated to complement specific locations, as well as available "off-the-shelf" designs sized to fit within a standard vehicle parking space. Refer to the APBP *Bike Parking Guidelines* for additional information.

5.2 Pedestrian Facility Design

This section describes a number of measures to improve pedestrian crossings, including marked and unmarked crosswalks, raised crossing islands and medians and lighting.

Sidewalks

Sidewalks should provide a comfortable space for pedestrians between the roadway and adjacent land uses. Sidewalks along city streets are the most important component of pedestrian mobility. They provide access to destinations and critical connections between modes of travel, including automobiles, transit and bicycles. General provisions for sidewalks include pathway width, slope, space for street furniture, utilities, trees and landscaping and building ingress/egress.

Routing sidewalks around driveway ramps maintains a flush surface (Credit: Dan Burden)

Sidewalks include four distinct zones: the frontage zone, the pedestrian (aka walking) zone, the furniture zone and the curb zone. The minimum widths of each of these zones vary based on street classifications as well as land uses. The Street Classifications section in this chapter describes these recommendations in more detail as applied to individual cities. The table at the end of this chapter recommends minimum widths for each zone for different street types and land uses.

Frontage Zone

The frontage zone is the portion of the sidewalk located immediately adjacent to buildings and provides shy distance from buildings, walls, fences, or property lines. It includes space for building-related features such as entryways and accessible ramps. It can include landscaping as well as awnings, signs, news racks, benches and outdoor café seating. In single family residential neighborhoods, landscaping typically occupies the frontage zone.

Pedestrian Zone

The pedestrian zone, situated between the frontage zone and the furniture zone, is the area dedicated to walking and should be kept clear of all fixtures and obstructions. Within the pedestrian zone, the Pedestrian Access Route (PAR) is the path that provides continuous connections from the public right-of-way to building and property entry points, parking areas and public transportation. This pathway is required to comply with ADA guidelines and is intended to be a seamless pathway for wheelchair and white cane users. As such, this route should be firm, stable and slip-resistant and should comply with maximum cross slope requirements (two percent grade). The walkway grade shall not exceed the general grade of the adjacent street.

Aesthetic textured pavement materials (e.g., brick and pavers) are best used in the frontage and furniture zones, rather than the PAR. The PAR should be a minimum of four feet, but preferably at least five feet in width to provide adequate space for two pedestrians to comfortably pass or walk side by side. All transitions (e.g., from street to ramp or ramp to landing) must be flush and free of changes in level. The designer or engineer should determine the pedestrian zone width to accommodate the projected volume of users. In no case will this zone be less than the width of the PAR.

Non-compliant driveways often present significant obstacles to wheelchair users. The cross slope on these driveways is often much steeper than the two percent maximum grade. Driveway aprons that extend into the pedestrian zone can render a sidewalk impassable to users of wheelchairs, walkers and crutches. They need a flat plane on which to rest all four supports (two in the case of crutches). To provide a continuous PAR across driveways, aprons should be confined to the furniture and curb zones.

Furniture Zone

The furniture zone is located between the curb line and the pedestrian zone. The furniture zone should contain all fixtures, such as street trees, bus stops and shelters, parking meters, utility poles and boxes, lamp posts, signs, bicycle racks, news racks, benches, waste receptacles, drinking fountains and other street furniture to keep the pedestrian zone free of obstructions. In residential neighborhoods, the furniture zone is often landscaped. Resting areas with benches and space for wheelchairs should be provided in high volume pedestrian districts and along blocks with a steep grade to provide a place to rest for older adults, wheelchair users and others who need to catch their breath.

Curb Zone

The curb zone serves primarily to prevent water and cars from encroaching on the sidewalk. It defines where the area for pedestrians begins and the area for cars ends. It is the area people using assistive devices must traverse to get from the street to the sidewalk, so its design is critical to accessibility.

Other Sidewalk Guidelines

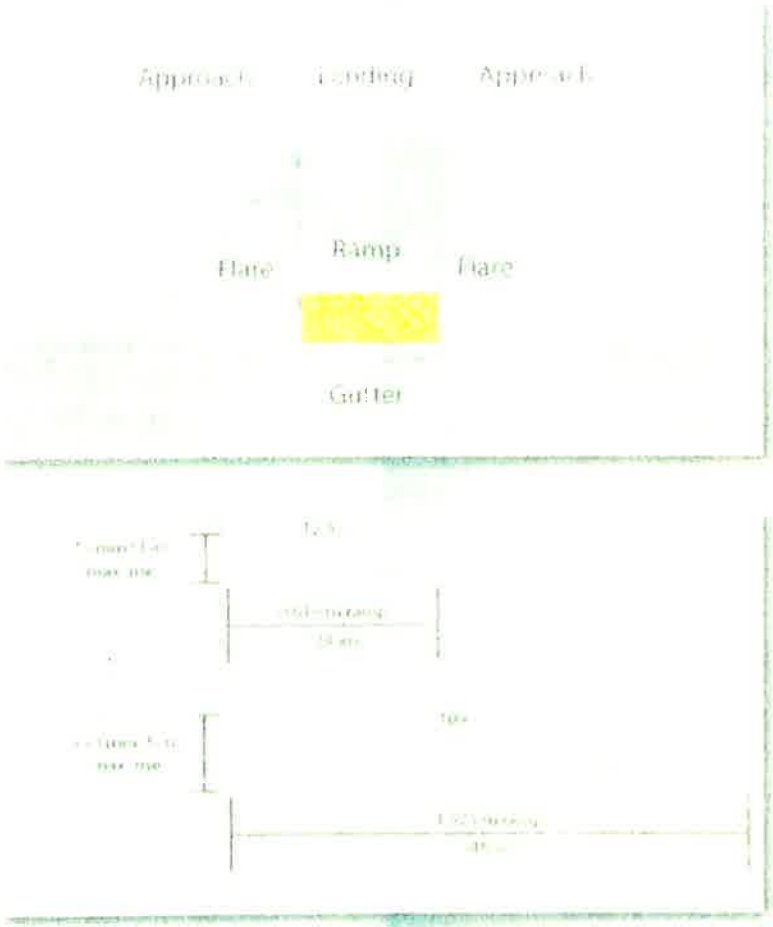
Landscaped buffers or fences should separate sidewalks from off-street parking lots or off-street passenger loading areas.

Pedestrian and driver sight distances should be maintained near driveways. Fencing and foliage near the intersection of sidewalks and driveways should ensure adequate sight distance as vehicles enter or exit.

Where no frontage zone exists, driveway ramps usually violate cross slope requirements. In these situations, sidewalks should be built back from the curb at the driveway.

Curb Ramps

Proper curb ramp design is essential to enable pedestrians using assistive mobility devices (e.g., scooters, walkers and crutches) to transition between the street and the sidewalk. These design guidelines provide a basic overview of curb ramp design. The ADA requires installation of curb ramps in new sidewalks and whenever an alteration is made to an existing sidewalk or street. Roadway resurfacing is considered an alteration and triggers the requirement for curb ramp installations or retrofits to current standards. Curb ramps are typically installed at intersections, mid-block crossings (including trail connections), accessible on-street parking and passenger loading zones and bus stops.



Curb ramp components, and alternate ramp slopes (Credit: Michele Weisbart)

The following define the curb ramp components along with minimum dimensions:

- Landing – the level area at the top of a curb ramp facing the ramp path. Landings allow wheelchairs to enter and exit a curb ramp, as well as travel along the sidewalk without tipping or tilting. This landing must be the width of the ramp and measure at least four feet by four feet. There should also be a level (not exceeding a two percent grade) four foot by four foot bottom landing of clear space outside of vehicle travel lanes.
- Approach – the portion of the sidewalk on either side of the landing. Approaches provide space for wheelchairs to prepare to enter landings.

- Flare – the transition between the curb and sidewalk. Flares provide a sloped transition (10 percent maximum slope) between the sidewalk and curb ramp to help prevent pedestrians from tripping over an abrupt change in level. Flares can be replaced with curb where the furniture zone is landscaped.
- Ramp – the sloped transition between the sidewalk and street where the grade is constant and cross slope at a minimum. Curb ramps are the main pathway between the sidewalk and street.
- Gutter – the trough that runs between the curb or curb ramp and the street. The slope parallel to the curb should not exceed two percent at the curb ramp.
- Detectable Warning – surface with distinct raised areas to alert pedestrians with visual impairments of the sidewalk-to-street transition.

There are several different types of curb ramps. Selection should be based on local conditions. The most common types are diagonal, perpendicular, parallel and blended transition. PROWAG provides additional design guidance and curb ramp examples appropriate for a variety of contextual constraints.

- Diagonal Curb Ramps - single curb ramps at the apex of the corner. These have been commonly installed by many jurisdictions to address the requirements of the ADA, but have since been identified as a non-preferred design type as they introduce dangers to wheelchair users. Diagonal curb ramps send wheelchair users and people with strollers or carts toward the middle of the intersection and make the trip across longer.
- Perpendicular Curb Ramps - placed at a 90 degree angle to the curb. They must include a level landing at the top to allow wheelchair users to turn 90 degrees to access the ramp, or to bypass the ramp if they are proceeding straight. Perpendicular ramps work best where there is a wide sidewalk, curb extension, or planter strip. Perpendicular curb ramps provide a direct, short trip across the intersection.
- Parallel Curb Ramps - oriented parallel to the street. The sidewalk itself ramps down. They are used on narrow sidewalks where there isn't enough room to install perpendicular ramps. Parallel curb ramps require pedestrians who are continuing along the sidewalk to ramp down and up. Where space exists in a planting strip, parallel curb ramps can be designed in combination with perpendicular ramps to reduce the ramping for through pedestrians. Careful attention must be paid to the construction of the bottom landing to limit accumulation of water and/or debris.

Parallel curb ramp
(Credit: Michele Weisbart)

Curb Ramp Placement

One ramp should be provided for each crosswalk, which usually translates to two per corner. This maximizes access by placing ramps in line with the sidewalk and crosswalk and by reducing the distance required to cross the street, compared with a single ramp on the apex.

A single ramp at the apex requires users to take a longer, more circuitous travel path to the other side and causes users to travel towards the center of the intersection where they may be in danger of getting hit by turning cars. Being in the intersection longer exposes the user to greater risk of being hit by vehicles. A single ramp at the apex should be avoided in new construction and may be used only for alterations where a design exception is granted because of existing utilities and other significant barriers. In all cases, reducing the curb radius makes ramp placement easier.

Blended Transitions

Blended transitions are situations where either the entire sidewalk has been brought down to the street or crosswalk level, or the street has been brought up to the sidewalk level. They work well on large radius corners where it is difficult to line up the crosswalks with the curb ramps, but have drawbacks. Children, persons with cognitive impairments and guide dogs may not distinguish the street edge. Turning vehicles may also encroach onto the sidewalk. For these reasons, bollards, planting boxes, or other intermittent barriers should be installed to prevent cars from traveling on the sidewalk. Detectable warnings should also be placed at the edge of the sidewalk to alert pedestrians with visual impairments of the transition to the street. Municipalities should follow the standards and guidelines for curb ramps provided in Table 5.1.

One ramp per crosswalk vs. single apex ramp (Credit: Michele Weisbart)

Table 5.1 Curb Ramp Design Standards and Guidelines

Curb Ramp Type	Characteristic	ADA	PROWAG
Perpendicular	Maximum slope of ramps	8.33%	8.3%
	Maximum cross-slope of ramps	2%	2%
	Maximum slope of flared sides	10%	10%
	Minimum ramp width	36″	48″
	Minimum landing length	36″	48″
	Minimum landing width		48″
	Maximum gutter slope	5%	5%
	Changes in level	Flush	Flush
	Truncated domes	Full depth and width	24″ min.
Diagonal (at apex)	Maximum slope of ramps	8.33%	Alternations only
	Maximum cross-slope of ramps	2%	2%
	Maximum slope of flared sides	10%	2%
	Minimum ramp width	36″	48″
	Minimum landing length	36″	48″
	Minimum landing width		48″
	Maximum gutter slope	5%	2%
	Changes in level	Flush	Flush
	Minimum clear space		48″

Curb Ramp Type	Characteristic	ADA	PROWAG
Parallel and Combination	Maximum slope of ramps	8.33%	8.3%
	Maximum cross-slope of ramps	2%	2%
	Maximum slope of flared sides	10%	
	Minimum ramp width	36″	48″
	Minimum landing length	36″	
	Minimum landing width		48″
	Minimum landing slope		2%
	Maximum gutter slope	5%	5%
	Changes in level	Flush	Flush
	Truncated domes	Full depth and width	24″
Curb Extensions and Built-up	Maximum slope of ramps	8.33%	8.3%
	Maximum cross-slope of ramps	2%	2%

Detectable Warnings

Because a curb ramp removes the curb that visually impaired persons use to identify the location of a street, a detectable warning surface must be placed at the back of the curb. This detectable strip should be as wide as the ramp and a minimum of 24 inches deep. One corner should be located at the back of the curb and the other corner may be up to five feet from the back of the curb. These strips are most effective when adjacent to smooth pavement so the difference is easily detected. Color contrast is needed so partially sighted people can see them. The ADAAG standards for detectable warnings are as follows:

- General - Detectable warnings shall consist of a surface of truncated domes and shall meet standards for size, spacing, contrast and edges
- Base diameter - 0.9 inches minimum, 1.4 inches maximum
- Top diameter - 50 percent of base diameter min. to 65 percent max.
- Height - 0.2 inches
- Center-to-center spacing - 1.6 inches minimum to 2.4 inches maximum
- Base-to-base spacing - 0.65 inches minimum
- Visual contrast - light on dark, or dark on light with adjacent walking surface
- Platform edges - 24 inches wide and extends the full public use area

PROWAG best practices include the following:

- Width - as wide as the ramp and 24 inches deep
- Location - one corner at back of the curb, the other corner up to five feet from back of curb
- Used at:
  - Edge of depressed corners
  - Border of raised crosswalks and intersections
  - Base of curb ramps
  - Border of medians
  - Edge of transit platforms and where railroad tracks cross the sidewalk

Signals

Signalized street crossings require special consideration of people with disabilities. The following text provides guidance to do that.

Crossing Times

In planning for people with disabilities, slower speeds must be considered. This is critical in setting the timing of the walk phase of signalized intersections. The *Manual on Uniform Traffic Control Devices* (MUCTD) requires that transportation agencies use an assumed walking speed of 3.5 feet/second for signal timing. In situations where a large number of older adults or persons with disabilities cross, this may be inadequate to meet their needs. Some cities instead use 2.8 feet/second.

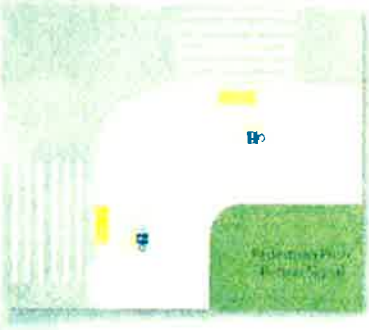
Cities may also use PUFFIN (Pedestrian-User-Friendly-Intelligent) traffic signals to ensure that all pedestrians have adequate time to cross. PUFFIN crossings use infrared monitors to detect the presence of pedestrians in the crosswalk and will hold the signal red for cross traffic until the pedestrian has left the crosswalk. PUFFIN crossings help slower pedestrians, but also help the flow of traffic because they allow the normal pedestrian design speed to be set at a higher level.

Pedestrian-Activated Push Buttons

Pedestrian-activated traffic controls require pedestrians to push a button to activate a walk signal. Pedestrian-activated signals are generally discouraged. The "WALK" signal should automatically come on except under circumstances described in that chapter. Where pedestrian-activated traffic controls exist, they should be located as close as possible to curb ramps without reducing the width of the path. The buttons should be at a level that is easily reached by people in wheelchairs near the top of the ramp. The U.S. Access Board guidelines recommend buttons raised above or flush with their housing and large enough (a minimum of two inches) for people with visual impairments to see them. The buttons should also be easy to push.

Accessible Pedestrian Signals (APS)

Wayfinding for pedestrians with visual impairments is significantly improved with the use of APS at signalized intersections. APS communicate information about pedestrian timing in non-visual formats such as audible tones, verbal messages and/or vibrating surfaces. Verbal messages provide the most informative guidance. These devices should be installed close to the departure location and on the side away from the center of the intersection. Since they are typically only audible six to 12 feet from the push button, 10 feet should separate two APS devices on a corner. If two accessible pedestrian pushbuttons are placed less than 10 feet apart or on the same pole, each accessible pedestrian pushbutton shall be provided with a pushbutton locator tone, a tactile arrow, a speech walk message for the WALKING PERSON (symbolizing WALK) indication, and a speech pushbutton information message. Volumes of the walk indication and push button locator tone shall automatically adjust in response to ambient sound.



Pedestrian push button placement (Credit: Michele Weisbart)

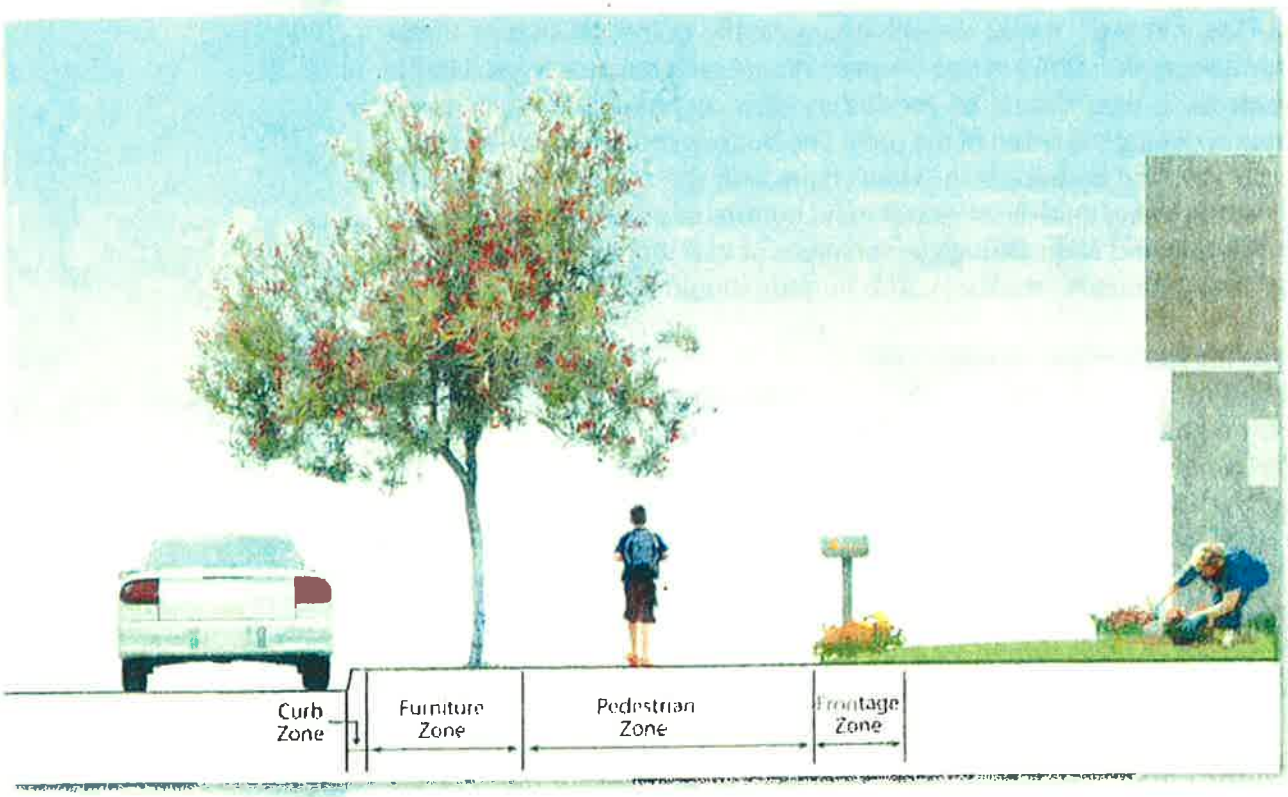
Land Use and Sidewalk Design Guidelines

The sidewalk design guidelines in this chapter integrate design and land use to provide safe and convenient passage for pedestrians. Sidewalks should have adequate walking areas and provide comfortable buffers between pedestrians and traffic. These guidelines will ensure sidewalks in all development and redevelopment provide access for people of all ages and physical abilities.

Sidewalks will vary according to the type of street. A local street with residences will require different sidewalk dimensions than a boulevard with commercial establishments. The descriptions below indicate the type of pedestrian activity expected at each of the specified land uses. The graphics illustrate the minimum widths of the sidewalk zones for each of the contexts. The matrix in the following section provides specific minimum requirements for the four sidewalk zones according to combinations of land use and street classifications.

Low/Medium Density Residential

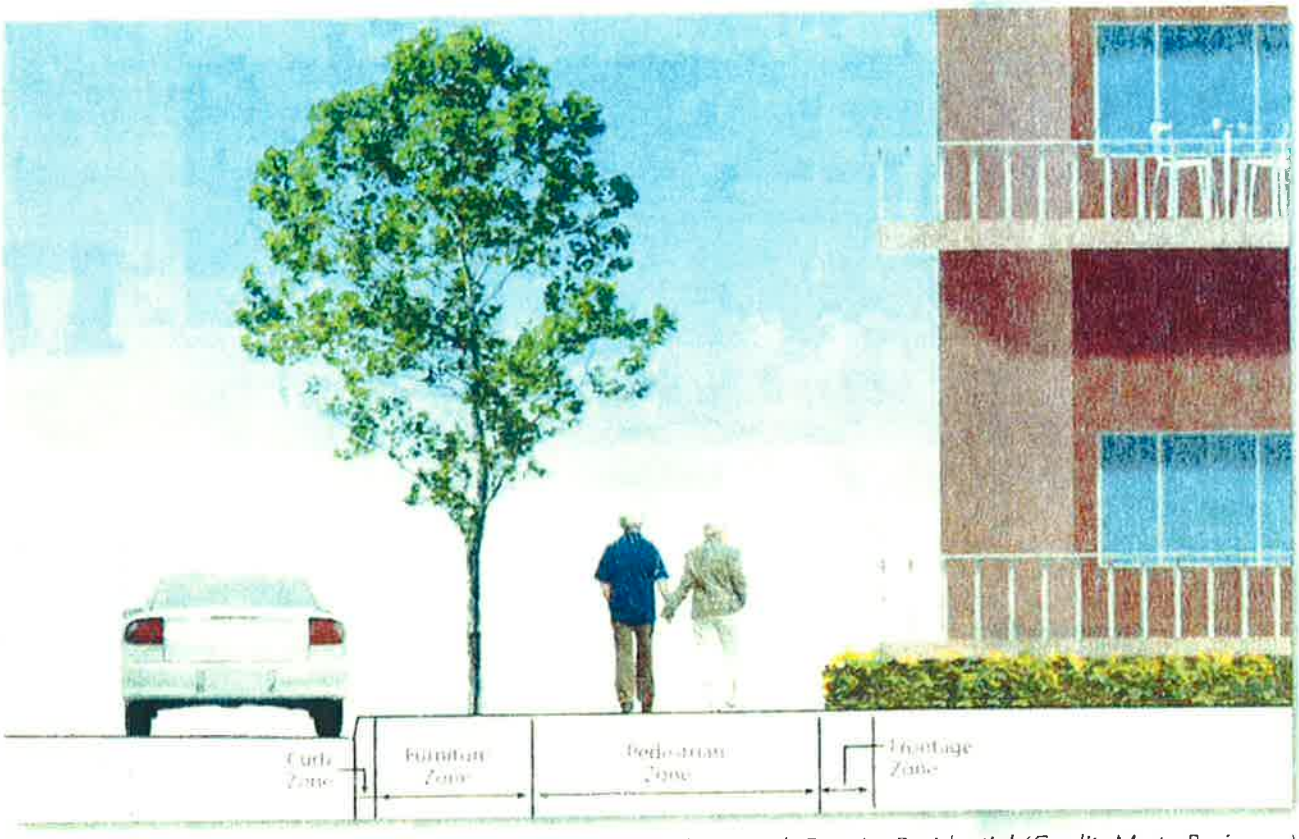
These streets are typically quieter than others and generally do not carry transit vehicles or high volumes of traffic. Pedestrians require a pleasant walking environment within these neighborhoods, as well as to access land uses and transit on nearby streets. Of the four sidewalk zones, the furniture zone is often the widest, to provide room for street trees.



Low/Medium Density Residential (Credit: Marty Bruinsma)

Medium/High Density Residential

These streets support greater volumes of pedestrians. Streets with transit service require good pedestrian links to bus stops. The pedestrian zone should be wider than in low/medium density residential.



Medium/High Density Residential (Credit: Marty Bruinsma)

Neighborhood Commercial

These streets often have grocers, laundromats, drug stores and other neighborhood-serving retail establishments. Sidewalks in neighborhood commercial areas should accommodate pedestrians walking from residences to stores. Of the four sidewalk zones, the pedestrian zone should be the widest, with a generous frontage zone to provide room for features next to buildings such as newspaper boxes, These sidewalks should also be designed with the understanding that cars will cross sidewalks as they enter and exit commercial driveways.

General/Regional Commercial

These streets have retail, office, civic and recreational uses concentrated along boulevards and avenues. Transit service runs along these streets and pedestrians need buffers from traffic. Of the four sidewalk zones, the pedestrian and furniture zones are favored. These sidewalks also should be designed with the understanding that a significant number of cars will cross sidewalks as they enter and exit commercial driveways.

Mixed/Multi-use

The sidewalks along these streets should support significant pedestrian volumes due to their integrated nature and higher densities. Of the four sidewalk zones, the pedestrian and frontage zones will be favored. Transit service runs along these streets and sidewalks will require buffers from traffic.

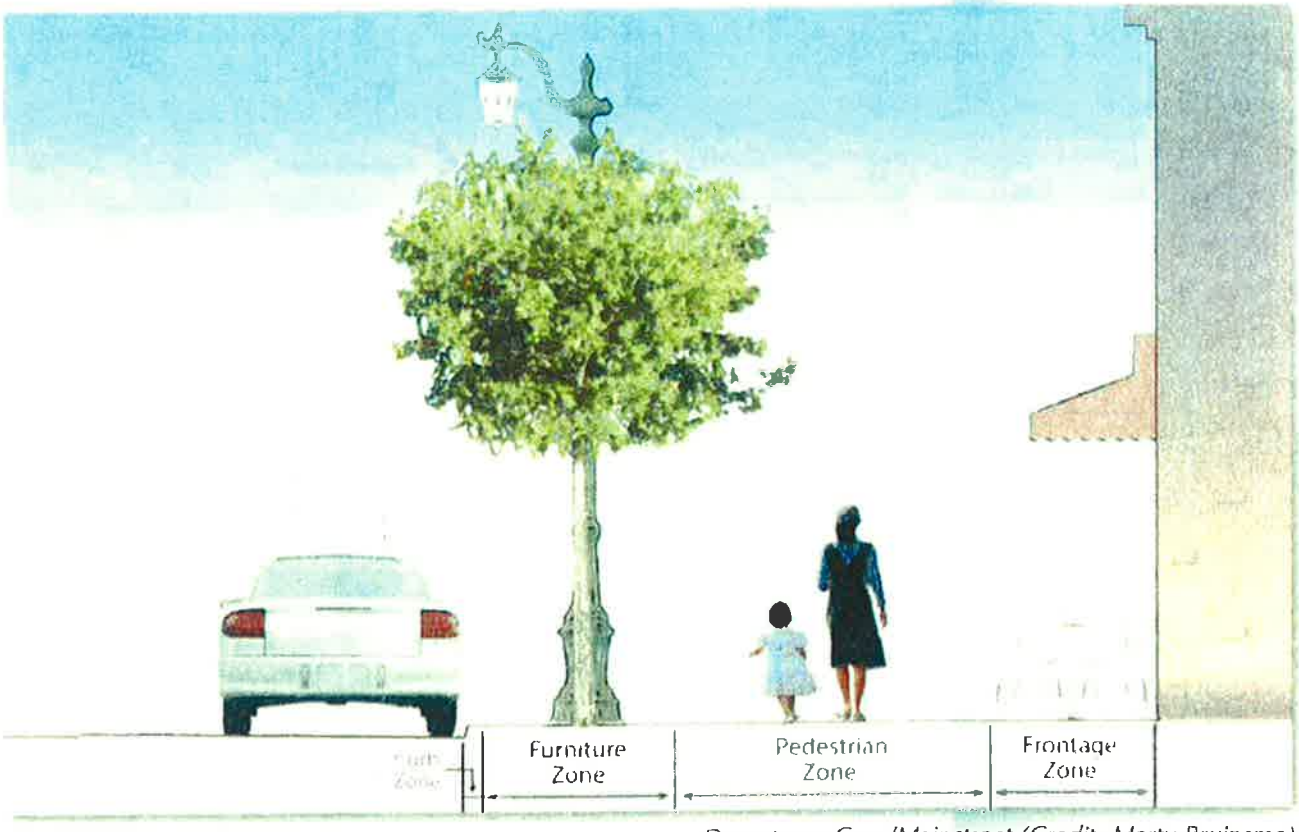
Mixed/Multi-use (Credit: Marty Bruinsma)

Industrial

Industrial streets are zoned for manufacturing, office warehousing and distribution. Pedestrian volumes are likely to be lower here given that these land uses typically employ fewer people per square foot than general commercial areas. Employees will need good sidewalks to get to work.

Downtown Core/Mainstreet

The downtown core or Main Street is a pedestrian-oriented area. This is where the greatest numbers of pedestrians are encouraged and expected. The downtown core serves as the retail, restaurant and entertainment center of a community. This area will need the widest sidewalks, the widest crosswalks, the brightest street lighting, the most furnishings and other features that will enhance the pedestrian environment. Of the four sidewalk zones, the pedestrian and frontage zones will be favored, with a furniture zone wide enough for street trees.



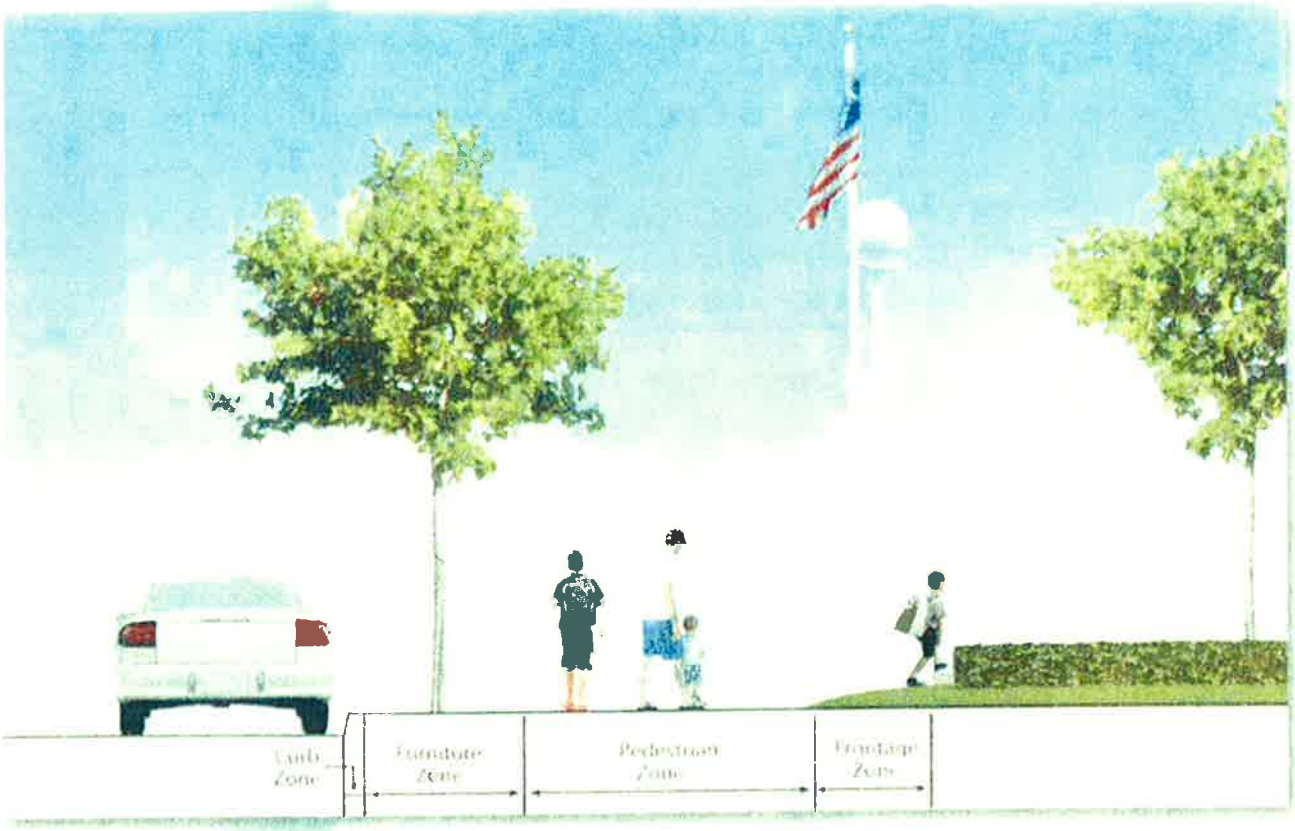
Downtown Core/Mainstreet (Credit: Marty Bruinsma)

Office Park

These streets are home to national and regional offices of financial institutions, government, large companies and other uses. Cities can expect pedestrians during the morning and evening commutes walking to and from their cars. Visitors will use the sidewalks throughout the day and employees will need them during the lunch hour. The furniture zone should provide adequate buffer from parking lots.

Public Facilities

Public facilities streets, particularly streets near schools, libraries and civic centers, require special attention and treatment. High pedestrian volumes are expected during peak times, such as school pick-up and drop-off and during the morning and evening commute hours. Sidewalk design should accommodate these peak travel times and include adequate furniture zones to buffer pedestrians from the street. Public facilities are located in various types of streets ranging from local streets to boulevards with transit service.



Public Facilities (Credit: Marty Bruinsma)

Design Specifications by Roadway Type and Land Use

Table 5.2 lists minimum widths for the frontage, pedestrian, furniture and curb zones, as well as minimum total widths. These minimums should not be considered the design width. In many cases, wider zones will be needed.

The land uses included in the table cover those of most municipalities. For those few areas not covered, the following list provides general guidelines for sidewalks:

- Recommended minimum frontage zone width is 18 inches.
- Recommended minimum pedestrian zone width is five feet.
- Recommended minimum curb zone width is six inches or 18 inches where pedestrian or freight loading is expected and may conflict with obstacles in the furniture zone.
- Recommended minimum furniture zone width is four feet and six feet to eight feet where bus stops exist.

Low curbs (three to four inches high) reduce the division between the traveled way and the sidewalk. They are favored in areas with significant pedestrian traffic. Low curbs also improve the geometry and feasibility of providing two perpendicular curb ramps per corner.

Some judgment may be needed on a case-by-case basis to establish actual widths of each of the four zones.

Table 5.2 Sidewalk Zone Widths for Each Land Use Context

	Boulevard	Avenue	Street
Low/Medium-Low Density Residential	Not applicable	Frontage: 18″ Pedestrian: 5′ Furniture: 4′, 6′-8′ at bus stops and where large trees are desired Curb: 6″ Min. Width: 11′	Frontage: 18″ Pedestrian: 5′ Furniture: 4′ Curb: 6″ Min. Width: 11′
Med/High Density Residential	Frontage: 18″ Pedestrian: 6′ Furniture: 5′, 6′-8′ at bus stops and where large trees are desired Curb: 6″ Min. Width: 13′	Frontage: 18″ Pedestrian: 6′ Furniture: 5′, 6′-8′ at bus stops and where large trees are desired Curb: 6″ Min. Width: 13′	Frontage: 18″ Pedestrian: 6′ Furniture: 4′, 6′-8′ at bus stops and where large trees are desired Curb: 6″ Min. Width: 12′
Neighborhood Commercial	Not applicable	Frontage: 18″ Pedestrian: 6′ Furniture: 5′, 6′-8′ at bus stops and where large trees are desired Curb: 6″ Min. Width: 13′	Frontage: 18″ Pedestrian: 6′ Furniture: 4′, 6′-8′ at bus stops and where large trees are desired Curb: 6″ Min. Width: 12′
General Commercial	Frontage: 18″ Pedestrian: 6′ Furniture: 5′, 6′-8′ at bus stops and where large trees are desired Curb: 6″ Min. Width: 13′	Frontage: 18″ Pedestrian: 6′ Furniture: 5′, 6′-8′ at bus stops and where large trees are desired Curb: 6″ Min. Width: 13′	Not applicable
Mixed/Multi-use	Frontage: 30″, 8′ with cafe seating Pedestrian: 6′ Furniture: 5′, 6′-8′ at bus stops and where large trees are desired Curb: 6″ Min. Width: 14′	Frontage: 30″, 8′ with cafe seating Pedestrian: 6′ Furniture: 4′, 6′-8′ at bus stops and where large trees are desired Curb: 6″ Min. Width: 13′	Frontage: 18″ Pedestrian: 6′ Furniture: 4′ Curb: 6″ Min. Width: 12′

	Boulevard	Avenue	Street
Industrial	Frontage: 18″ Pedestrian: 5′ Furniture: 5′ Curb: 18″ Min. Width: 13′	Frontage: 18″ Pedestrian: 5′ Furniture: 4′ Curb: 18″ Min. Width: 12′	Frontage: 18″ Pedestrian: 5′ Furniture: 4′ Curb: 18″ Min. Width: 12′
Downtown Core/ Main Street	Frontage: 30″, 8′ with cafe seating Pedestrian: 6′ Furniture: 5′, 6′-8′ at bus stops and where large trees are desired Curb: 6″ Min. Width: 14′	Frontage: 30″, 8′ with cafe seating Pedestrian: 6′ Furniture: 5′, 6′-8′ at bus stops and where large trees are desired Curb: 6″ Min. Width: 14′	Frontage: 30″, 8′ with cafe seating Pedestrian: 6′ Furniture: 5′ Curb: 6″ Min. Width: 14′
Transit-Oriented Districts	Frontage: 30″ Pedestrian: 8′ Furniture: 5′, 6′-8′ at bus stops and where large trees are desired Curb: 6″ Min. Width: 16′	Frontage: 30″ Pedestrian: 8′ Furniture: 5′, 6′-8′ at bus stops and where large trees are desired Curb: 6″ Min. Width: 16′	Frontage: 18″ Pedestrian: 6′ Furniture: 5′, 6′-8′ at bus stops and where large trees are desired Curb: 6″ Min. Width: 13′
Office Park	Frontage: 18″ Pedestrian: 5′ Furniture: 5′ Curb: 6″ Min. Width: 12′	Frontage: 18″ Pedestrian: 5′ Furniture: 5′ Curb: 6″ Min. Width: 12′	Not applicable
Public Facilities	Frontage: 30″ Pedestrian: 8′ Furniture: 5′, 6′-8′ at bus stops and where large trees are desired Curb: 6″ Min. Width: 16′	Frontage: 30″ Pedestrian: 8′ Furniture: 5′, 6′-8′ at bus stops and where large trees are desired Curb: 6″ Min. Width: 16′	Frontage: 18″ Pedestrian: 6′ Furniture: 5′, 6′-8′ at bus stops and where large trees are desired Curb: 6″ Min. Width: 13′

5.3 Street Crossings

Walking requires two important features in the built environment: people must walk along streets and they must get across streets. Crossing a street should be easy, safe, convenient and comfortable. While pedestrian behavior and intersection or crossing design affect the street crossing experience, driver behavior (whether and how drivers stop for pedestrians) is the most significant factor in pedestrian safety.

Crossings are a necessary part of the pedestrian experience (Credit: Sky Yim)

A number of tools exist to improve pedestrian safety and to make crossing streets easier. Effective traffic management can address concerns about traffic speed and volume. A driver driving more slowly has more time to see, react and stop for a pedestrian. The number of pedestrians also influences drivers, In general, drivers are more aware of pedestrians when more people walk. Most tools to address crossing challenges are engineering treatments, but tools from the enforcement, education and planning toolboxes are also important.

Providing marked crosswalks is only one of the many possible engineering measures. When considering how to provide safer crossings for pedestrians, the question should not be: *"Should I provide a marked crosswalk?"* Instead, the question should be: *"What are the most effective measures that can be used to help pedestrians safely cross the street?"* Deciding whether to mark or not mark crosswalks is only one consideration in creating safe and convenient pedestrian crossings.

Pedestrian Crossing Principles

The following principles should be incorporated into every pedestrian crossing improvement:

Curb extensions and medians make crossing multi-lane streets safer and more manageable (Credit: Dan Burden)

- Pedestrians must be able to cross roads safely. Cities have an obligation to provide safe and convenient crossing opportunities.
- The safety of all street users, particularly more vulnerable groups, such as children, the elderly and those with disabilities and more vulnerable modes, such as walking and bicycling, must be considered when designing streets.
- Pedestrian crossings must meet accessibility standards and guidelines.

- Real and perceived safety must be considered when designing crosswalks. Crossing must be "comfortable." A "safe" crossing that no one uses serves no purpose.
- Crossing treatments that have the highest crash reduction factors (CRFs) should be used when designing crossings.
- Safety should not be compromised to accommodate traffic flow.
- Good crossings begin with appropriate speed. In general, urban arterials should be designed to a maximum of 30 mph or 35 mph (Note: 30 mph is the optimal speed for moving motor vehicle traffic efficiently).
- Every crossing is different and treatments should be selected and improvements designed to fit its unique environment.

The following issues should also be considered when planning and designing crossings:

- Ideally, uncontrolled crossing distances should be no more than 21 feet, which allows for one 11 foot lane and one 10 foot lane. Ideally, streets wider than 40 feet should be divided (effectively creating two streets) by installing a median or two crossing islands.
- The number of lanes should be limited to a maximum of three lanes per direction on all roads (plus a median or center turn lane).
- There must be a safe, convenient crossing at every transit stop.
- Double (or triple) left or right turns concurrent (permissive) with pedestrian crossings at signalized intersections must never be allowed.
- Avoid concurrent movements of motor vehicles and people at signalized intersections.
- People should never have to wait more than 90 seconds to cross at signalized intersections.
- Pedestrian signals should be provided at all signalized crossings where pedestrians are allowed.

Lively streets with many pedestrians indicate a walkable neighborhood: Hong Kong (Credit: Ryan Snyder)

Performance Measures

Performance measures establish how well a crossing is performing. In all cases, baseline data should be collected to allow for before and after analysis. Performance measures for pedestrian crossings include the following:

- The number of pedestrians crossing at a particular crossing location goes up.
- The pedestrian crash rates go down (for an accurate determination, entire corridors should be analyzed since crashes at any one location may be infrequent).
- Pedestrian fatalities and serious injuries should decrease.
- The numbers of children, seniors and people with disabilities crossing the street should reflect their percentage in the larger population.
- The speed of drivers either turning at an intersection or traveling at a mid-block crossing goes down.
- Drivers do not block intersections (including crosswalks).
- At uncontrolled intersections, the percentage of drivers who stop for pedestrians goes up (measure compliance with stop or yield requirement in local vehicle code).

Pedestrian Crossing Toolbox

Many engineering measures may be used at a pedestrian crossing, depending on site conditions and potential users. Marked crosswalks are commonly used at intersections and sometimes at mid-block locations. Marked crosswalks are often the first measure in the toolbox followed by a series of other measures used to enhance and improve marked crosswalks. The decision to mark a crosswalk should not be considered in isolation, but rather in conjunction with other measures to increase awareness of pedestrians. Without additional measures, marked crosswalks alone may not increase pedestrian safety, particularly on multi-lane streets.

Marked Crosswalks

Crosswalks are present by law at all intersections, whether marked or unmarked, unless the pedestrian crossing is specifically prohibited. At mid-block locations, crosswalks only exist where marked. At these non-intersection locations, the crosswalk markings legally establish the crosswalk. Crosswalks should be considered at mid-block locations where there is strong evidence that pedestrians want to cross there, due to origins and destinations across from each other and an overly long walking distance to the nearest controlled crossing. Marked crosswalks alert drivers to expect crossing pedestrians and direct pedestrians to desirable crossing locations. Although many drivers are unaware of their precise legal obligations at crosswalks, the California Vehicle Code requires drivers to yield to pedestrians in any crosswalk, whether marked or unmarked. Marking crosswalks at every intersection is not necessary or desirable.

Crosswalk Markings

According to the MUTCD, the minimum crosswalk marking is solid white lines not less than six inches or greater than 24 inches in width.

Placement

The best locations to install marked crosswalks are:

- All signalized intersections
- Crossings near transit locations
- Trail crossings
- High land use generators
- School walking routes
- When there is a preferred crossing location due to sight distance
- Where needed to enable comfortable crossings of multi-lane streets between controlled crossings spaced at convenient distances

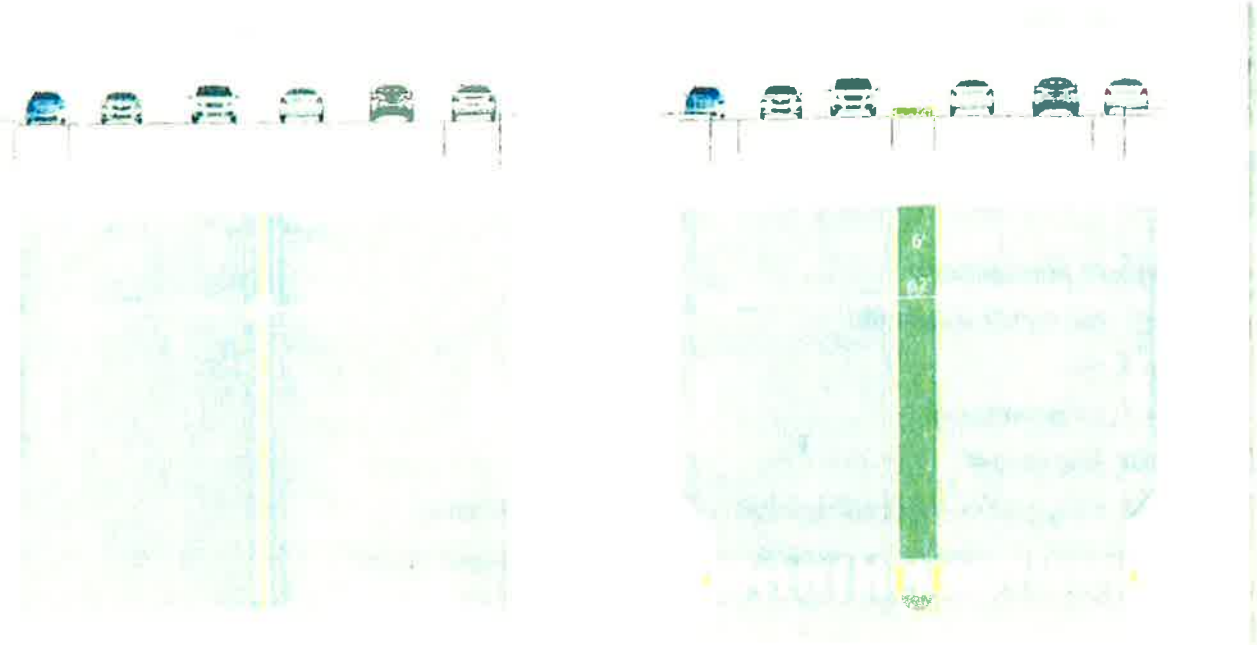
Controlled Intersections

Intersections can be controlled by traffic signals or STOP signs. Marked crosswalks should be provided on all intersection legs controlled by traffic signals, unless the pedestrian crossing is specifically prohibited. Marked crosswalks may be considered at STOP-controlled intersections. Factors to be considered include high pedestrian volumes, high vehicle volumes, school zone location, high volume of elderly or disabled users, or other safety related criteria.

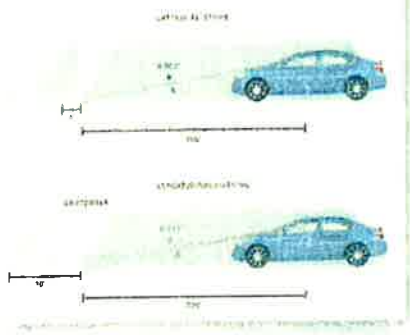
Uncontrolled Intersections and Mid-block Crosswalks

Intersections without traffic signals or STOP signs are considered uncontrolled intersections. The decision to mark a crosswalk at an uncontrolled location should be guided by an engineering study. Factors considered in the study should include vehicular volumes and speeds, roadway width and number of lanes, stopping sight distance and triangles, distance to the next controlled crossing, night time visibility, grade, origin-destination of trips, left turning conflicts and pedestrian volumes. The engineering study should be based on the FHWA study, *Safety Effects of Marked Versus Unmarked Crosswalks at Uncontrolled Locations*. The following list provides some of the key recommendations from the study:

- It is permissible to mark crosswalks on two-lane roadways.
- Raised medians can be used to reduce risk.
- Signals or other treatments should be considered where there are many young and/or elderly pedestrians.



Uncontrolled crossings of four-lane streets are more difficult to cross without special treatments like medians and curb extensions (Credit: Michele Weisbart)



Longitudinal crosswalk markings are more visible than lateral crosswalk markings (Credit: Michele Weisbart)

- On multi-lane roadways, marked crosswalks alone are not recommended under the following conditions, but the other tools listed in this section can be considered to enhance the crosswalk:

  ADT > 12,000 w/o median

  ADT > 15,000 w/ median

  Speeds greater than 40 mph

Frequency of Marked Crosswalks at Uncontrolled Locations

Marked crosswalks should be spaced so people can cross at preferred locations. If people are routinely crossing streets at non-preferred locations, consideration should be given to installing a new crossing. Pedestrians need crossings with appropriate devices (islands, curb extensions, advanced yield lines, etc.) of multi-lane streets where there are strong desire lines. Along urban streets, a well-designed crossing should be provided at least every 1/8 mile.

Typical crosswalk markings: Continental, ladder, staggered continental (Credit: Michele Weisbart)

High-Visibility Crosswalks

Because of the low approach angle at which pavement markings are viewed by drivers, the use of longitudinal stripes in addition to or in place of transverse markings can significantly increase the visibility of a crosswalk to oncoming traffic. While research has not shown a direct link between increased crosswalk visibility and increased pedestrian safety, high-visibility crosswalks have been shown to increase driver yielding and channelization of pedestrians, leading the Federal Highway Administration to conclude that high-visibility pedestrian crosswalks have a positive effect on pedestrian and driver behavior.

Colored and stamped crosswalks should only be used at controlled locations. Staggered longitudinal markings reduce maintenance since they avoid vehicle wheel paths.

Example of staggered continental crosswalk (Credit: Michael Ronkin)

Crosswalks and Accessibility

Longitudinal crosswalk markings provide the best visibility for pedestrians with limited vision. Decorative crosswalk pavement materials should be chosen with care to ensure that smooth surface conditions and high contrast with surrounding pavement are provided. Textured materials within the crosswalk are not recommended. Without reflective materials, these treatments are not visible to drivers at night. Decorative pavement materials often deteriorate over time and become a maintenance problem while creating uneven pavement. The use of color or material to delineate the crosswalks as a replacement of retro-reflective pavement marking should not be used, except in slow speed districts where intersecting streets are designed for speeds of 20 mph or less.

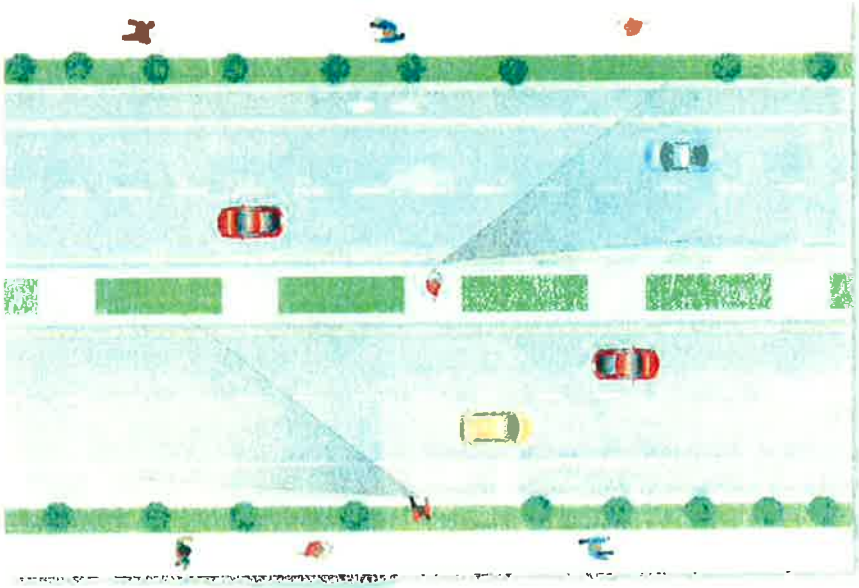
Decorative crosswalk treatments made of distinctive materials can become uneven over time (Credit: Ryan Snyder)

Raised Crossing Islands/Medians

Raised islands and medians are the most important, safest and most adaptable engineering tool for improving street crossings. Note on terminology: a median is a continuous raised area separating opposite flows of traffic. A crossing island is shorter and located just where a pedestrian crossing is needed. Raised medians and crossing islands are commonly used between intersections when blocks are long (500 feet or more in downtowns) and in the following situations:

- Speeds are higher than desired
- Streets are wide
- Traffic volumes are high
- Sight distances are poor

Staggered median crossing (Credit: Marcel Schmaedick)



Medians and crossing islands allow pedestrians to complete the crossing in two stages (Credit: Michele Weisbart)

Raised islands have nearly universal applications and should be placed where there is a need for people to cross the street. They are also used to slow traffic. Their use changes a complex task, crossing a wide street with traffic coming from two opposing directions all at once, into two simpler and smaller tasks. With their use, conflicts occur in only one direction at a time and exposure time can be reduced from more than 20 seconds to just a few seconds.

On streets with traffic speeds higher than 30 mph, it may be unsafe to cross without a median island. At 30 mph, drivers travel 44 feet each second, placing them 880 feet out when a pedestrian starts crossing an 80 foot wide multi-lane road. In this situation, this pedestrian may still be in the last travel lane when the car arrives there. That car was not within view at the time he or she started crossing. With an island on multi-lane roadways, people would cross two or three lanes at a time instead of four or six. Having to wait for a gap in only one direction of travel at a time significantly reduces the wait time to cross. Medians and crossing islands have been shown to reduce crashes by 40 percent (Federal Highway Administration, *Designing for Pedestrian Safety Course*).

Angled median crossing (Credit: Paul Zykofsky)

As a general rule, crossing islands are preferable to signal-controlled crossings due to their lower installation and maintenance cost, reduced waiting times and their safety benefits. Crossing islands are also used with road diets, taking four-lane undivided, high-speed roads down to better performing three-lane roadways (two travel lanes and a center turn lane). Portions of the center turn lane can be dedicated to crossing islands. Crossing islands can also be used with signals. Angled pedestrian crossings through pedestrian refuges force pedestrians to look for oncoming vehicles.

Where to Place Crossing Islands

Crossing islands are often used for trails, high pedestrian flow zones, transit stations, schools, work centers and shopping districts.

Multiple tools can be employed to improve uncontrolled crossings (Credit: Dan Burden)

Design Detail

Crossing islands, like most traffic-calming features, perform best with both tall trees and low ground cover. This greatly increases their visibility, reduces surprise and reduces the need for many signs. When curves or hill crests complicate crossing locations, median islands are often extended over a crest or around a curve to where drivers have a clear (six second or longer) sight line of the downstream change in conditions. Lighting of median islands is essential. The suggested minimum width of a crossing island is six feet. When used on higher speed roads and where there is space available, inserting a 45 degree bend to the right helps orient pedestrians to the risk they encounter from drivers during the second half of their crossing.

Crossing islands: Berkeley, CA (Credit: Ryan Snyder)

Raised Crosswalks

Raised crosswalks slow traffic and put pedestrians in a more visible position. They are trapezoidal in shape on both sides and have a flat top where the pedestrians cross. The level crosswalk area must be paved with smooth materials. Any texture or special pavements used for aesthetics should be placed on the beveled slopes, where they will be seen by approaching drivers. They are most appropriate in areas with significant pedestrian traffic and where motor vehicle traffic should move slowly, such as near schools, on college campuses, in Main Street retail environments and in other similar places. They are especially effective near elementary schools where they raise small children by a few inches and make them more visible.

Raised crosswalk: University of North Carolina, Chapel Hill, NC (Credit: Ryan Snyder)

Curb Extensions

Curb extensions (or "bulbouts") extend the sidewalk or curb line out into the parking lane, which reduces the effective street width. Curb extensions significantly improve pedestrian crossings by reducing the pedestrian crossing distance, visually and physically narrowing the roadway, improving the ability of pedestrians and drivers to see each other and reducing the time that pedestrians are in the street. Reducing street widths improves signal timing since pedestrians need less time to cross.

Curb extensions (Credit: Michele Weisbart)

Example of curb extensions (Credit: Marcel Schmaedick)

Drivers typically travel more slowly at intersections or mid-block locations with curb extensions since the restricted street width sends a visual cue to slow down. Turning speeds are lower at intersections with curb extensions (curb radii should be as tight as is practicable). Curb extensions also prevent drivers from parking too close to the intersection.

Curb extensions also provide additional space for two curb ramps and for level sidewalks where existing space is limited, increase the pedestrian waiting space and provide additional space for pedestrian push button poles, street furnishings, plantings, bicycle parking and other amenities. A benefit for drivers is that extensions allow for better placement of signs (e.g., stop signs and signals).

Curb extensions are generally only appropriate where there is an on-street parking lane. Where street width permits, a gently tapered curb extension can reduce crossing distance at an intersection along streets without on-street parking, without creating a hazard. Curb extensions must not extend into travel lanes or bicycle lanes.

Curb extensions can impact other aspects of roadway design and operation as follows:

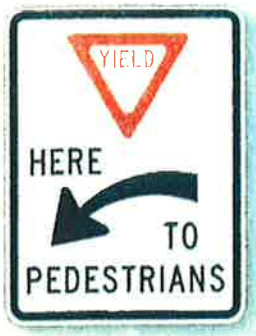
- May impact street drainage and require catch basin relocation
- May impact underground utilities
- May require loss of curbside parking, though careful planning often mitigates this potential loss, for example, by relocating curbside fire hydrants, where no parking is allowed, to a curb extension
- May complicate delivery access and garbage removal
- May impact street sweepers
- May affect the turning movements of larger vehicles such as school buses and large fire trucks

Pedestrian 'Scrambles'

Exclusive pedestrian phases (i.e. pedestrian 'scrambles') may be used where turning vehicles conflict with very high pedestrian volumes and pedestrian crossing distances are short. Although pedestrians can cross in any direction during the pedestrian phase, pedestrians typically have to wait for both vehicle phases before they get the walk signal again. This creates delay for pedestrians travelling straight, but can be mitigated by allowing pedestrians continuing along the same direction to get a WALK signal during the green signal phase and while turns are prohibited for traffic.

Pedestrian scramble (Credit: Dan Burden)

R1-5 Sign (MUTCD)



R1-5a Sign (MUTCD)

R1-6 Sign (MUTCD)


Advanced yield markings (Credit: Sky Yim)

Signs

Signs can provide important information to improve road safety by letting people know what to expect, so they can react and behave appropriately. Sign use and placement should be done judiciously, as overuse breeds noncompliance and disrespect. Too many signs create visual clutter.

Regulatory signs, such as STOP, YIELD, or turn restrictions, require driver actions and can be enforced. Warning signs provide information, especially to drivers and pedestrians unfamiliar with an area.

Advance pedestrian warning signs should be used where pedestrian crossings may not be expected by drivers, especially if there are many drivers who are unfamiliar with the area. The fluorescent yellow/green color is designated specifically for pedestrian, bicycle and school warning signs (Section 2A.10 of the 2009 MUTCD) and should be used for all new and replacement installations. This bright color attracts the attention of drivers because it is unique.

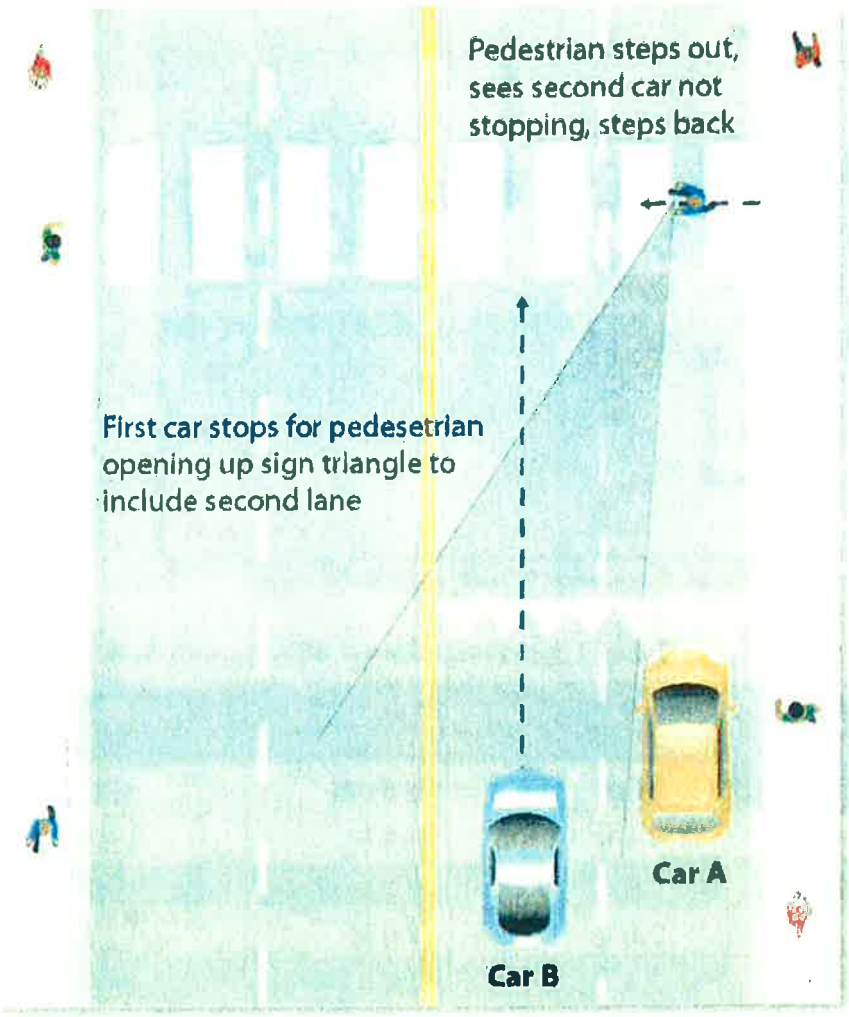
Sign R1-5 should be used in conjunction with advance yield lines, as described below. Sign R1-6 may be used on median islands, where they will be more visible to drivers than signs placed on the side of the street, especially where there is on-street parking. Since California is a "yield" state, cities should use R1-5, R1-5a and R1-6 signs. All signs should be periodically checked to make sure that they are in good condition, free from graffiti, reflective at night and continue to serve a purpose.

All sign installations need to comply with the provisions of the MUTCD.

Advanced Yield/Stop Lines

Stop lines are solid white lines 12 to 24 inches wide, extending across all approach lanes to indicate where vehicles must stop in compliance with a stop sign or signal. Advance stop lines reduce vehicle encroachment into the crosswalk and improve drivers' view of pedestrians. At signalized intersections a stop line is typically set back between four and six feet.

At uncontrolled crossings of multi-lane roads, advance yield lines can be an effective tool for preventing multiple threat vehicle and pedestrian collisions. Section 3B.16 of the MUTCD specifies placing advanced yield markings 20 to 50 feet in advance of crosswalks, depending upon location-specific variables such as vehicle speeds, traffic control, street width, on-street parking, potential for visual confusion, nearby land uses with vulnerable populations and demand for queuing space. Thirty feet is the preferred setback for effectiveness at many locations. This setback allows a pedestrian to see if a car in the second (or third) lane is stopping after a driver in the first lane has stopped.



Advanced yield markings (Credit: Michele Weisbart)

Lighting

Lighting is important to include at all pedestrian crossing locations for the comfort and safety of the road users. Lighting should be present at all marked crossing locations. Lighting provides cues to drivers to expect pedestrians earlier.

FHWA HT-08-053, *The Information Report on Lighting Design for Mid-block Crosswalks*, found that a vertical illumination of 20 lux in front of the crosswalk, measured at a height of five feet from the road surface, provided adequate detection distances in most circumstances. Although the research was constrained to mid-block placements of crosswalks, the report includes a brief discussion of considerations in lighting crosswalks co-located with intersections. The same principle applies at intersections. Illumination just in front of crosswalks creates optimal visibility of pedestrians.

Proper placement of crosswalk illumination (Credit: Michele Weisbart)

Table 5.3 Recommended Illumination by Street Type

Functional Classification	Average Maintained Illumination at Pavement by Pedestrian Area Classification [FC]		
	High	Medium	Low
Major/Major (Boulevard)	3.4 fc	2.6 fc	1.8 fc
Major/Collector (Boulevard/Avenue)	2.9 fc	2.2 fc	1.5 fc
Major/Local (Avenue)	2.6 fc	2.0 fc	1.3 fc
Collector/Collector (Avenue)	2.4 fc	1.8 fc	1.2 fc
Collector/Local (Street)	2.1 fc	1.6 fc	1.0 fc
Local/Local (Street)	1.8 fc	1.4 fc	0.8 fc

FC stands for "foot candle" and is defined as the amount of illuminance on a one square foot surface of which there is uniformly distributed flux of one lumen. ANSI-IESNA RP-8-00, "Roadway Lighting."

Other good guidance on crosswalk lighting levels comes from the Illuminating Engineering Society of North America (IESNA) intersection guidance to illuminate pedestrians in the crosswalk to vehicles (see the adjacent image). Crosswalk lighting should provide color contrast from standard roadway lighting.

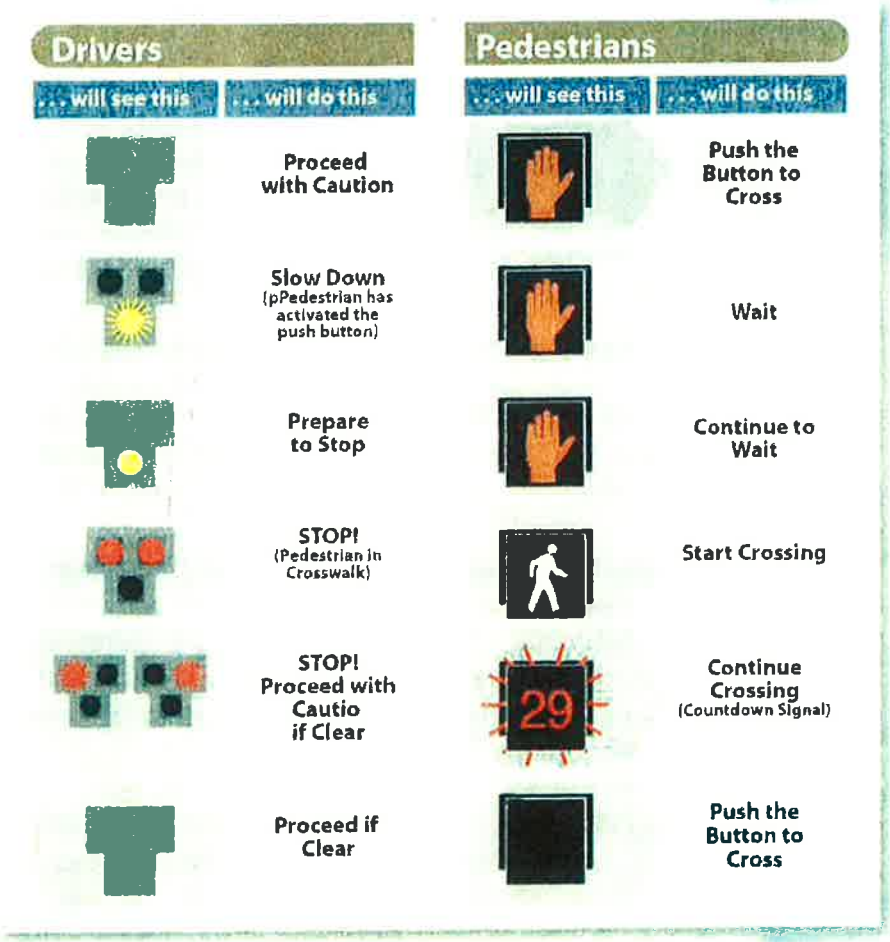
Pedestrian Hybrid Beacon

A pedestrian hybrid beacon is used to warn and control traffic at an unsignalized location so as to help pedestrians cross a street or highway at a marked crosswalk.

A pedestrian hybrid beacon can be used at a location that does not meet traffic signal warrants or at a location that meets traffic signal warrants but a decision has been made to not install a traffic control signal. A minimum number of 20 pedestrians per hour is needed to warrant installation. This is substantially less than the 93 minimum needed for a signal installation.

If beacons are used, they should be placed in conjunction with signs, crosswalks and advanced yield lines to warn and control traffic at locations where pedestrians enter or cross a street or highway. A pedestrian hybrid beacon should only be installed at a marked crosswalk.

Installations should be done according to the MUTCD Chapter 4F, *Pedestrian Hybrid Beacons*. The California MUTCD has not yet approved the beacons for use. Cities should follow the formal experimental process to use these.



Pedestrian hybrid beacon phases (Credit: Michele Weisbart)

Rectangular Rapid Flash Beacon (RRFB)

The RRFB uses rectangular-shaped high-intensity LED-based indications, flashes rapidly in a wig-wag "flickering" flash pattern and is mounted immediately between the crossing sign and the sign's supplemental arrow plaque. The Office of Transportation Operations has reviewed available data and considers the RRFB to be highly successful for the applications tested (uncontrolled crosswalks).

Rectangular rapid-flash beacon (Credit: SPOT Devices)

The RRFB offers significant potential safety and cost benefits because it achieves very high rates of compliance at a very low cost compared to other more restrictive devices such as full mid-block signalization. RRFB components are not proprietary and can be assembled by any jurisdiction with off-the-shelf hardware. The FHWA believes that the RRFB has a low risk of safety or operational concerns. However, because proliferation of RRFBs in the roadway environment to the point that they become ubiquitous could decrease their effectiveness, use of RRFBs should be limited to locations with the most critical safety concerns, such as pedestrian and school crosswalks at uncontrolled locations, as tested in the experimentation.

At a recent meeting of the National Committee on Uniform Traffic Control Devices, the Signals Technical Committee voted to endorse the future inclusion of the RRFB for uncontrolled crosswalks into the MUTCD and the FHWA has issued an Interim Approval. This allows agencies to install this type of flashing beacon, pending official MUTCD rulemaking.

Pedestrian Toolbox for Railroad Crossings

Pedestrian crossings of railroad tracks apply a special set of tools. In California, the California Public Utilities Commission should approve the design before application. The primary tools to apply are pedestrian gates, channelization through gates and across tracks, warning flashers, signs and audible signals

More details can be found in *Pedestrian Rail Crossings in California*, Richard Clark, California Public Utilities Commission, May 2008.

5.4 Universal Access

Following the specific requirements of federal and state legislation for accessibility is a focal point of this section. However, all improvements to the walking environment these regulations require have many benefits for making the walking environment better for all users, with or without physical access challenges.

A relatively new set of guidelines has recently been developed for all users of public facilities. Known as "Universal Access," it is defined as the ability of all citizens to reach every destination served by the public circulation network. These principles dictate that when designing for pedestrians and disabled persons, if an access point is provided for motor vehicle traffic, reasonably safe accommodation must also be provided for pedestrians and cyclists, including disabled and senior pedestrians, who may require additional treatments.

It is important to understand that the design of pedestrian facilities takes into account the disabilities and abilities of all pedestrians. While mobility impairment is most often considered when referring to a disabled individual, sensory and cognitive disabilities must also be considered.

Throughout San Clemente, hilly topography makes compliance with the *American Disabilities Act* (ADA) challenging. While recognizing this, planned improvements will comply with federal and state laws. With that in mind, the City embraces ADA and its objective to provide infrastructure accessible to those with and without physical challenges.

Sidewalks constructed without adequate design guidelines (Credit: Chanda Singh)

Nowhere is the concept of universal access more important than in the design of the pedestrian environment. While perhaps not obvious at first glance, this is the realm of streets with the greatest variation in user capabilities, and therefore where attention to design detail is essential to effectively balance user needs. This is also the realm where signs and street furniture are located and where transitions are made between modes (e.g., driver or passenger to pedestrian via parking, bus stop/train station, or bicycle rack). The pedestrian environment includes sidewalks, curb ramps, crosswalks, bus stops, signs and street furniture.

Without design guidelines, sidewalks are often too narrow, utility poles obstruct travel, steep driveway ramps are impassable to wheelchair users and bus stops become blocked by the disorderly placement of shelters, poles, trash receptacles and bicycle racks.

With well-defined guidelines, sidewalks are built to accommodate pedestrians of all ages and physical abilities and become inviting pedestrian environments as the adjacent picture shows.

Designing the pedestrian realm for universal access enables persons with disabilities to live independently and lead full, enriched lives. They can go to work and to school, to shop and to otherwise engage in normal activities. Moreover, walking environments that accommodate people with disabilities improve walking conditions for everyone. People with strollers and rolling suitcases can make their way about with ease. Children can mature by learning to navigate through their neighborhoods with independence. Inaccessible pedestrian networks, on the other hand, can lead to people becoming housebound and socially isolated, which in turn can lead to a decline in well-being and a host of associated negative health outcomes such as depression.

Wheelchair users need accessible sidewalks (Credit: Dan Burden)

Universal Pedestrian Access Principles

The following design principles inform the recommendations made in this chapter and should be incorporated into every pedestrian improvement:

- The walking environment should be safe, inviting and accessible to people of all ages and physical abilities.
- The walking environment should be easy to use and understand.
- The walking environment should seamlessly connect people to places. It should be continuous, with complete sidewalks, well-designed curb ramps and well-designed street crossings

Legal Framework

Under Title II of the *Americans with Disabilities Act* (ADA) of 1990, state and local governments and public transit authorities must ensure that all of their programs, services and activities are accessible to and usable by individuals with disabilities. They must ensure that new construction and altered facilities are designed and constructed to be accessible to persons with disabilities. State and local governments must also keep the accessible features of facilities in operable working condition through maintenance measures including sidewalk repair, landscape trimming, work zone accessibility and snow removal.

Under the ADA, the U.S. Access Board is responsible for developing the minimum accessibility guidelines needed to measure compliance with ADA obligations when new construction and alterations projects are planned and engineered. These guidelines for public rights-of-way are found in draft form in the *Public Rights-of-Way Accessibility Guidelines* (draft PROWAG). The U.S. Department of Transportation has recognized this document as current best practices in pedestrian design and has indicated its intent to adopt the final PROWAG.

In addition to the PROWAG guidelines, Title II of the ADA also requires states and localities to develop ADA Transition Plans that remove barriers to disabled travel. These plans must:

- Inventory physical obstacles and their location
- Provide adequate opportunity for residents with disabilities to provide input into the plan
- Describe in detail the methods the entity will use to make the facilities accessible
- Provide a yearly schedule for making modifications
- Name an official/position responsible for implementing the plan
- Set aside an implementation budget

Obstructions can make passage difficult or impossible for wheelchair users (Credit: Michael Ronkin)

ADA Transition Plans are intended to ensure that existing inaccessible facilities are not neglected indefinitely and that the community has a detailed plan in place to provide a continuous pedestrian environment for all residents.

Steep cross slopes create difficulties for wheelchair users (Credit: Michael Ronkin)

Users and Needs

To fully accommodate everybody, designers must consider the widely varying needs and capabilities of the people in the community. People walk at different speeds. Some are able to endure long treks, while others can only go short distances. Some use wheelchairs and are particularly sensitive to uneven pavement and surface materials. Others have limited sight and rely on a cane. People's strengths, sizes and judgmental capabilities differ significantly. The needs of one group of users may be at odds with those of another group of users. For instance, gradual ramps and smooth transitions to the street help people in wheelchairs, but present challenges for the sight-impaired when they can't easily find the end of the sidewalk and beginning of the street.

The text below identifies the unique constraints individuals with different types of disabilities and limitations face as pedestrians. Understanding their needs will help ensure more universal design of the sidewalk network.

People with Mobility Impairments

People with mobility impairments range from those who use assistive devices, such as wheelchairs, crutches, canes, orthotics and prosthetic devices, to those who use no such devices but face constraints walking long distances on non-level surfaces or on steep grades. Wheelchair and scooter users are most affected by the following:

- Uneven surfaces that hinder movement
- Rough surfaces that make rolling difficult and can cause pain, especially for people with back injuries
- Steep uphill slopes that slow the user
- Steep downhill slopes that cause a loss of control
- Cross slopes that make the assistive device unstable
- Narrow sidewalks that impede the ability of users to turn or to cross paths with others
- Devices that are hard to reach, such as push buttons for walk signals and doors
- The lack of time to cross the street

Walking-aid users need clear sidewalks (Credit: Dan Burden)

Prosthesis users often move slowly and have difficulty with steep grades or cross slopes. Walking-aid users are most affected by the following:

- Steep uphill slopes that make movement slow or impossible
- Steep downhill slopes that are difficult to negotiate
- Cross slopes that cause the walker to lose stability
- Uneven surfaces that cause these users to trip or lose balance

- Long distances
- Situations that require fast reaction time
- The lack of time to cross the street

People with Visual Impairments

People with visual impairments include those who are partially or fully blind, as well as those who are colorblind. Visually impaired people face the following difficulties:

- Limited or no visual perception of the path ahead
- Limited or no visual information about their surroundings, especially in a new place
- Changing environments where they rely on memory
- Lack of non-visual information
- Inability to react quickly
- Unpredictable situations, such as complex intersections not at 90 degrees
- Inability to distinguish the edge of the sidewalk from the street
- Compromised ability to detect the proper time to cross a street
- Compromised ability to cross a street along the correct path
- Need for more time to cross the street

Sight-impaired pedestrians need additional sensory cues (Credit: Dan Burden)

People with Cognitive Impairments

People with cognitive impairments encounter difficulties in thinking, learning and responding, or in performing coordinated motor skills. Cognitive disabilities can cause some to become lost or have difficulty finding their way. They may also not understand standard street signs and traffic signals. Some may not be able to read and benefit from signs with symbols and colors.

Children and Older Adults

Children and many older adults do not fall under specific categories for disabilities, but must be taken into account in pedestrian planning. Small children are simply more difficult to see than adults. Children are less mentally and physically developed and have the following characteristics:

- Less peripheral vision
- Limited ability to judge speed and distance
- Difficulty locating sounds
- Limited or no reading ability so do not understand text signs
- Occasional impulsive or unpredictable behavior
- Little familiarity with traffic
- Difficulty in carrying packages

The natural aging process generally results in at least some decline in sensory and physical capability. As a result, many older adults experience the following:

- Declining vision, especially at night
- Decreased ability to hear sounds and detect where they come from
- Less strength to walk up hills and less endurance overall
- Reduced balance, especially on uneven or sloped sidewalks
- Slowed reaction times to dangerous situations
- Slowed walking speed
- Increased fragility and frailty: their bodies are more likely to be seriously injured in a fall or vehicular crash and their recovery becomes longer and more tenuous. This makes older pedestrians the most vulnerable pedestrians.

To provide a seamless path of travel throughout the community that is accessible to all, designers should consider five important elements: sidewalks, curb ramps, crosswalks, signals and bus stops.

Additional Resources

- National Association of City Transportation Officials, *Urban Bikeway Design Guide*, 2011
- Caltrans, *Complete Intersections: A Guide to Restructuring Intersections and Interchanges for Bicyclists and Pedestrians*, 2010
- California *Highway Design Manual* Chapter 1000
- AASHTO *Guide for the Development of Bicycle Facilities*
- ADAAG/PROWAG
- MUTCD
- AASHTO "Green Book"
- FHWA's *Designing Sidewalks and Trails for Access*
- NCHRP Project 20-7 (232) *ADA Transition Plans: Guide to Best Management Practices*
- NCHRP Project 3-62, *Guidelines for Accessible Pedestrian Signals*

6 Safe Routes to School

6.1 Safe Routes to School Objectives

With today's environmental and obesity issues, there is a need to provide options that allow all children, including those with disabilities, to walk and bicycle to school safely. Many communities struggle with traffic congestion around schools, motor vehicle emissions, personal safety issues and development not conducive to walking and bicycling. At the same time, children in general engage in less physical activity, which contributes to the growing epidemic of obesity. These problems may seem to be separate issues, but Safe Routes to School (SRTS) programs can address all these challenges through a coordinated action plan.

SRTS programs use components called the "5 Es" to create, implement and evaluate their actions. These are a variety of education, engineering and enforcement strategies that help make routes safer for children to walk and bicycle to school, encourage more children to walk and bicycle and evaluate the effectiveness of the methods for use with that particular school. These methods have grown popular in response to problems created by an expanding built environment, a growing reliance on motor vehicles for student transportation and in response to the availability of federal and state funding for SRTS programs.

Each school starts from a unique situation and with different circumstances. This is obvious with the City of San Clemente. Schools west of Interstate 5 are situated in older neighborhoods well connected by a system of gridded streets much more so than that east of Interstate 5. The street layout east of Interstate 5 is indicative of urban sprawl seen throughout southern California. Neighborhood streets are connected to collector streets, which are connected to a few high volume arterial streets presenting a hierarchy, which often is not suitable for bicycle and pedestrian use. Some of these arterial streets lack bicycle and pedestrian facilities, which can disconnect local schools from adjacent neighborhoods. In many instances, children are forced to cross high volume streets to get to school.

In some cases, schools have good routes for walking and cycling, but few students are taking advantage of them. In other communities, children walk and cycle to school in unsafe conditions or along poorly maintained routes, while some communities do not have children walking or cycling to school at all. Successful SRTS programs involve the whole community. Parents, children, neighborhood groups, schools, law enforcement officers, community leaders and transportation and public health professionals help identify the issues and solutions. Successful SRTS programs benefit all children, including children with physical and cognitive disabilities.

The five Es are components of the SRTS education program established to teach kids, parents and school administrators about the importance of walking to school and to involve an array of community leaders to help promote lasting change.

Education
Interactive meetings with parents and school staff to learn about the importance of walking to our health and barriers that make it unsafe or difficult to walk. A series of walk audits in this phase is to discover, identify and map dangerous walking conditions within a 1/4 to ½ mile vicinity of the school.

Encouragement
Helps kids learn that walking to school is fun, safe and healthy. Strategies to engage children in learning such as logo design contests, identification of local school champions, competition between schools and the use of creative promotional materials.

Engineering
City traffic engineers are an important piece of the puzzle as they can implement the change desired by the school. It is important to provide a connection between residents and students to local traffic engineers to share walk audit results and maps of problem areas through a prioritized list to request improvements. In many cases, improvements are already being developed and feedback from the residents and students may provide positive improvements to initial designs.

Enforcement
Local law enforcement is also important to the success of Safe Routes to School. Their involvement helps parents and students learn about laws that protect us as cyclists and pedestrians. It also helps remind police officers of pedestrian and cyclist rights. Student safety patrols are a great resource to learn this message and spread it around.

Evaluation
Evaluations answer the question: Is the program successful over time? With cities in each state across the country completing evaluations, the City will know what works best with the program to get more kids and parents out of their cars and onto their feet.

Several principles guide this discussion of SRTS engineering solutions, as well as the design of a built environment that provides safe routes for children as they walk and bicycle to school. The following list developed by the *Safe Routes to School Guide* states and briefly describes some of the principles:

Infrastructure Within the School Zone and Beyond

The physical environment often determines whether many children walk or bicycle to school. To safely walk or bicycle to school along a street or separate path, or to cross a street along the way, children need well-designed, well-built, well-maintained and accessible facilities.

SRTS programs address infrastructure needs at schools as well as along a child's route to school. Children walk and bicycle to school from locations outside the immediate school zone and often from beyond the school's designated walk zone. The federal transportation legislation *Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users* (SAFETEA-LU) provides funding for SRTS activities within approximately a two mile radius of a school.

Accessibility

SAFETEA-LU specifies that a key purpose of the Safe Routes to School program is "to enable and encourage children, including those with disabilities, to walk and bicycle to school." An important aspect of enabling children with disabilities to walk and bicycle to school is provision of accessible infrastructure. Guidelines for making schools sites and routes to school accessible for children with disabilities can be found in the *Americans with Disabilities Act Accessibility Guidelines* (ADAAG) and the *Public Rights-of-Way Accessibility Guidelines* (PROWAG). Throughout this guide, the term "pedestrian" should be understood to include students using assistive devices such as wheelchairs.

Relationships

The relationship of school buildings to sidewalks and street crossings can determine the level of comfort and safety a pedestrian or cyclist experiences. All elements are interconnected. The street is connected to the sidewalk and the sidewalk is connected to the building and getting this relationship right is critical. The most important point is to not put motor vehicles routes between sidewalks and adjacent schools. Such obstructions add a conflict point on a child's walking route. Another relationship to consider is the school's location relative to its students' homes. A child's route to school should have a minimal number of busy street crossings and school attendance boundaries should be drawn with this principle in mind.

Easy-to implement and low-cost solutions are focused on first, while longer-term improvement needs are identified and the implementation process is begun. Crosswalks, for example, are an effective, low-cost and easy to implement engineering treatment. It is important, however, to be aware of guidelines for appropriate placement and use of crosswalks.

Effective improvements do not always require substantial funds. For example, signs and paint are relatively inexpensive and can make a big difference. Completion of these projects can build momentum and community interest in making other improvements. Easy-to-implement, low-cost, small projects done concurrently with larger, more expensive projects will keep products on the street and build continuous interest and support from the community.

Some engineering improvements will require substantial time and financial commitment. Projects such as new sidewalks and bridges or the reconstruction of a street crossing should be identified early and advanced through the various stages required to complete them. As these longer-term improvements are developed, smaller projects, such as installing ADA-compliant curb ramps, can be implemented to build momentum and maintain community interest in creating safe routes to school.

Engineering Treatments are Matched to the Type of Problem
As communities consider improvements for the routes to school, care should be taken to identify problems or obstacles and to provide appropriate solutions to alleviate these specific problems.

Collectively, these principles guide the decisions that local professionals and members of the school community make as they begin to address issues that will improve the built environment for children to safely walk and bicycle to school. These principles will help guide decisions as communities:

- Create school walking and bicycling route maps using a variety of assessment tools and exercises.
- Identify and regulate the school zone.
- Provide and maintain bicycle and pedestrian facilities along the school route including sidewalks, on-street bicycle facilities, paths, curb ramps and accessible pedestrian signals.
- Provide safe street crossings for cyclists and pedestrians.
- Slow down traffic.

6.2 Selecting Safe Routes To School

Choosing a safe bicycle route to school is different from choosing a safe walking route because cyclists and pedestrians have different needs for maximum safety. The higher speed of cyclists increases the need for visibility, smooth surfaces and predictable interaction with other road users.

Note also that bicycle skills vary among students more than walking skills do and they are usually acquired at a later age. Younger children have less skill at estimating closing speed for automobiles and have less ability to process peripheral vision. Younger children should therefore cycle mainly on less complicated streets, where they can focus on one hazard at a time.

Older students will cycle faster and so they need to have longer sight lines. Routes suitable for high school age students may be unsuitable for elementary school students and vice versa.

Publishing recommended routes to school is not sufficient for encouraging bicycling to school. Other measures are also needed, including bicycle education, safe bicycle parking, rewards for cycling (such as bike-to-school days), bike-to-school groups lead by an adult and so forth.

When choosing safe bicycle routes to school, look for:

- **The safest, most direct route** - Detours to avoid hazards should not add significantly to the length of the ride, or they will be ignored.
- **On-street routes** - Children riding on the sidewalk have an increased risk of collision with an automobile 2.5 times over riding on the street. A "bicycle path" that parallels a road is the same as a sidewalk. Riding a bicycle on sidewalks is prohibited in most jurisdictions in California, at least in business districts.

Use off-street routes only when they have no intersections with streets or driveways, or when they provide a substantial short cut. The faster the cyclists, the more important it is to avoid sidewalks.

Cyclists should ride on the right side of the street with traffic for maximum safety (wrong way sidewalk riding has the highest risk). When the road is so narrow and so busy that young cyclists cannot ride on it safely, they should walk their bikes on the sidewalk. Generally, this is only feasible to require near intersections with crossing guards.

Where uphill slopes are so steep that the cyclists cannot maintain a straight line (about percent slope equal to age up to 12 years old), students should get off and walk on their bikes on the sidewalk. Similarly steep downgrades require well-maintained brakes and training in braking on hills. Students without that training should walk their bikes down the hills.

- **Adequate width of curb lane and good maintenance of road edge** - For safe sharing of the curb lane by drivers and cyclists, it should be at least 14 feet wide, with no on-street parking—wider is better, particularly for younger cyclists who cannot hold as straight a line. Broken pavement and accumulated debris on the side of the road can narrow the effective width substantially. If there is a bicycle lane, its width can be added to the rightmost travel lane to determine if width is adequate. On very quiet residential roads with low traffic speeds and good sight lines, even young children can safely take a lane and wide curb lanes are not needed.

Also watch out for drain grates, potholes, obstructed visibility, dogs off-leash and other obvious hazards. It is best to scout out the routes by bicycle and consult with cyclists who regularly cycle in the area.

- **Right turns, not left turns** - It is much easier for a cyclist (particularly a beginning cyclist) to turn right than to turn left. This means that the best route away from school may differ from the best route to school.

There are two ways to safely make left-turns. The first is merging into the left-turn lane and the second is crossing, stopping, turning the bicycle in place and crossing again. The merge-left technique can be learned by students as young as nine years old (later for multi-lane streets), but younger students should cross to the far right corner and then cross over to the left.

When left-turns are necessary, it is best if they can be done from low-traffic streets onto low-traffic streets, with all-way stops or traffic signals. T-intersections make left turns even easier, since there are fewer potential conflict points with motor vehicle movements.

- **No right-turn only lanes where cyclists go straight** - Right-turn-only lanes require cyclists to merge across a lane of traffic to continue straight. This skill can be learned by middle-school students, but only with proper bicycle instruction.

Where right-turn-only lanes are unavoidable, younger cyclists should probably be directed to walk their bikes on the sidewalk.

- **Few stop signs** - Stopping requires significant extra effort to regain loss momentum, tempting students to run stop signs illegally. It is safer for them to ride on a slightly busier street with fewer stops and the protection of having the right-of-way, than to risk running stop signs.
- **Only traffic signals that sense cyclists and give sufficient green time** - For a cyclist to use intersections with traffic signals safely, the traffic signals should detect the bicycle and make sure there is enough green time for the cyclist to clear the intersection. Traffic signals that do not meet this standard should have their sensors adjusted and be re-timed. Younger children may need to dismount and become pedestrians, using the pedestrian push-button and walking their bikes in the crosswalk.
- **Few curb cuts** - The turning traffic at commercial driveways is a serious hazard to cyclists (even more so if they are riding on the sidewalk).
- **Low traffic volume and low speeds** - Although this criterion is often the first one people think of, it is actually the least important because most collisions involve turning traffic, not passing traffic. Streets with few intersections or curb cuts are safer, even if motor vehicle volumes and speeds are higher.

6.3 Methodology

The methodology used in conducting the initial analysis follows the education and engineering aspects of the five Es. For the City of San Clemente, only initial outreach and evaluation was conducted for this Plan. The outreach consisted of a public workshop and walk audit by the consultant team while PEDal, San Clemente's non-motorized volunteer advocacy organization was tasked to continue the outreach with the other schools. Surveys were conducted from April through June of 2011 at all schools. On the following pages are sample audit maps produced for each school highlighting map-corrected quarter and half mile walk zones, as well as existing walking and bicycle facilities around each school.

Marblehead Elementary was the location of the first public workshop and walk audit. Concerned parents met with City staff and the consultant team to discuss issues and possible solutions. Materials including large aerial maps, handouts and surveys were provided to continue the outreach to the other schools. Surveys were provided at each school for parents to fill out. An on-line survey was also available. Because of the lack of surveys returned, PEDal went to each of the schools to conduct face-to-face interviews with parents waiting to pick up their children from school. All but one school allowed PEDal to conduct their surveys on campus. Generally, principals did not allow surveys to be conducted with kids while on school property so primarily parents were interviewed.

In general, motor vehicle speed and driver behavior, such as not yielding to pedestrians, seemed to be the largest concern for parents not allowing their children to walk or ride their bicycle to school. The City does utilize crossing guards at almost all their schools and generally parents requested more at intersections leading to the schools. Many complaints centered around drivers routinely parking in bicycle lanes, blocking crosswalks and disregarding stop signs.

6.4 Candidate Improvements

The feedback was used to develop initial recommendations for each school. The maps, observations and recommendations on the following pages represent participating parental audit results for each school. Although these forms include preliminary recommendations, a more comprehensive SRTS program implementing the five Es is recommended to further develop guidelines and improvements for school children in San Clemente.

Figure 6.1 Candidate SRTS Project Locations

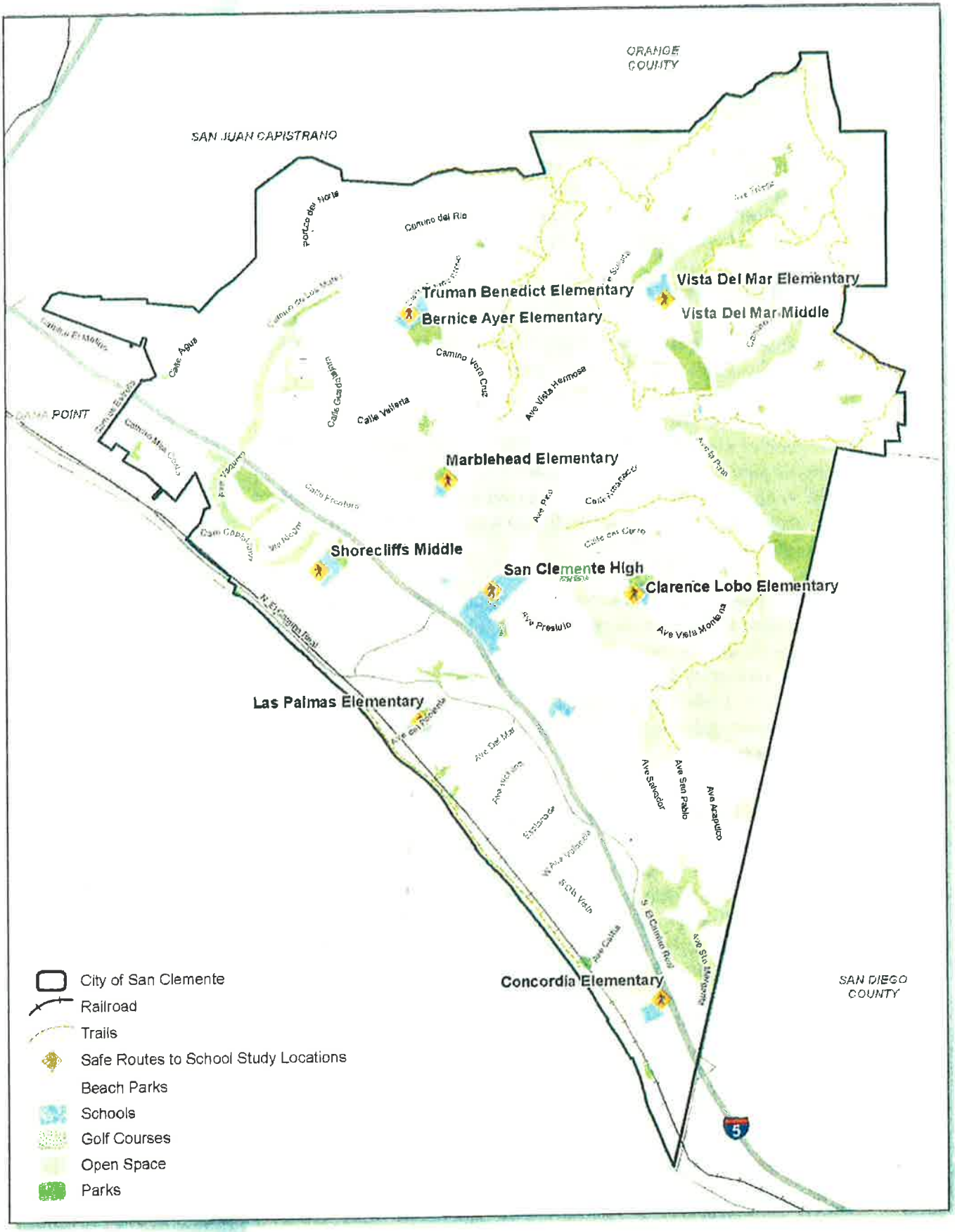


Figure 6.2: Sample Audit Form Map Instructions

To help you think of possible obstacles to walking and biking to school, use this list of common obstacles This is just a list for ideas, your school may or may not have some of these challenges.

Pedestrian Issues

P1) No sidewalks, paths or shoulders
P2) Sidewalks or paths that is not continuous
P3) Sidewalks or paths that are blocked with poles, signs, shrubbery, etc
P4) Not enough room for two people to walk on the sidewalk
P5) Sidewalks/street uneven, cracked or broken
P6) Missing curb ramps
P7) Sidewalk adjacent to busy street without pedestrian buffer
P8) Too many driveways to cross
P9) Road is too wide to cross safely
P10) Not enough time to cross before the walk signal change
P11) Blocked view of traffic - parked cars, utility poles, trees or plants
P12) Traffic lights without pedestrian crossing signals
P13) No marked pedestrian crosswalks
P14) Personal safety issues (dogs, unfriendly people)
P15) Dirty, lots of litter or trash
P16) Students cross street between parked cars

Bicycle Issues

B1) No bicycle facilities (bike path, bike lanes or signed bike routes)
B2) No Share the Road signs
B3) Cars parked in the bike lane

Vehicular Issues

V1) Cars or trucks park on sidewalks
V2) Too much traffic along the road
V3) Cars seem to be going too fast
V4) Drivers don't stop at stop signs
V5) Drivers don't yield to pedestrians
V6) Drivers back out of driveways without looking
V7) Drivers turn into people crossing the street

Figure 6.3: Sample Audit Form

Marblehead Elementary School

Neighborhood Walk and Bike Audit

How walkable and bikable are your child's routes to school?

The following survey will help create a snapshot of the conditions that bicyclists and pedestrians face when walking or bicycling to your school. Your audit information will be critical for making recommendations for improvements around your school.

Read through this Audit Form

This front page contains instructions on how to complete this audit form. On the reverse side is a map of the streets where children walk and bike within a half mile of your school. To the right of the map is a list of alphanumeric identifiers to be used on the map. On the back is space for writing in additional comments and recommendations. Some photo samples are also included.

Take a Walk

On the reverse side, there is a map that shows streets that are within a half mile walk of your school. Your group will be assigned a portion of that walking area. One or more volunteers should walk both sides of all streets within your assigned area.

Please walk the route, just like a student would. If you drive down the street, you'll miss the small but important details.

Note the Existing Conditions on the Map

As you walk, make notes about the exiting conditions that you find. Please mark the map using the symbols that are listed to the left of the map.

List High Priority Problems

During and after your walk, list the top five problem issues, intersections, or other locations.

Return this Audit Form

After you have completed your audit, return your audit form to the City contact below. Your audit information will be combined with that of other volunteers and incorporated into the Safe Routes to School Plan.

Materials Needed

This audit form and a pencil or pen. A clipboard or other portable hard surface.

City of San Clemente Contact:

Cliff Jones, Associate Planner
910 Calle Negocio, Suite 100
San Clemente, CA 92673
p: 949-361-6186 e: JonesC@san-clemente.org

For further information on Safe Routes to School visit www.saferoutesinfo.org

High Priority Problem Issues/Locations

List and explain what you believe are the top five problem issues or locations in your assigned audit area. If the issue has a particular intersection or location, note the location on the map on the reverse side with the corresponding number.

1.

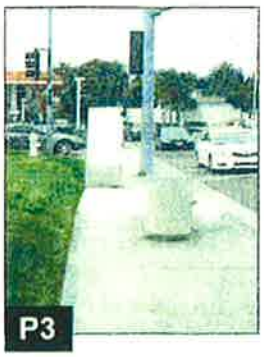
2.

3.

4.

5.

Examples of Problems/Issues

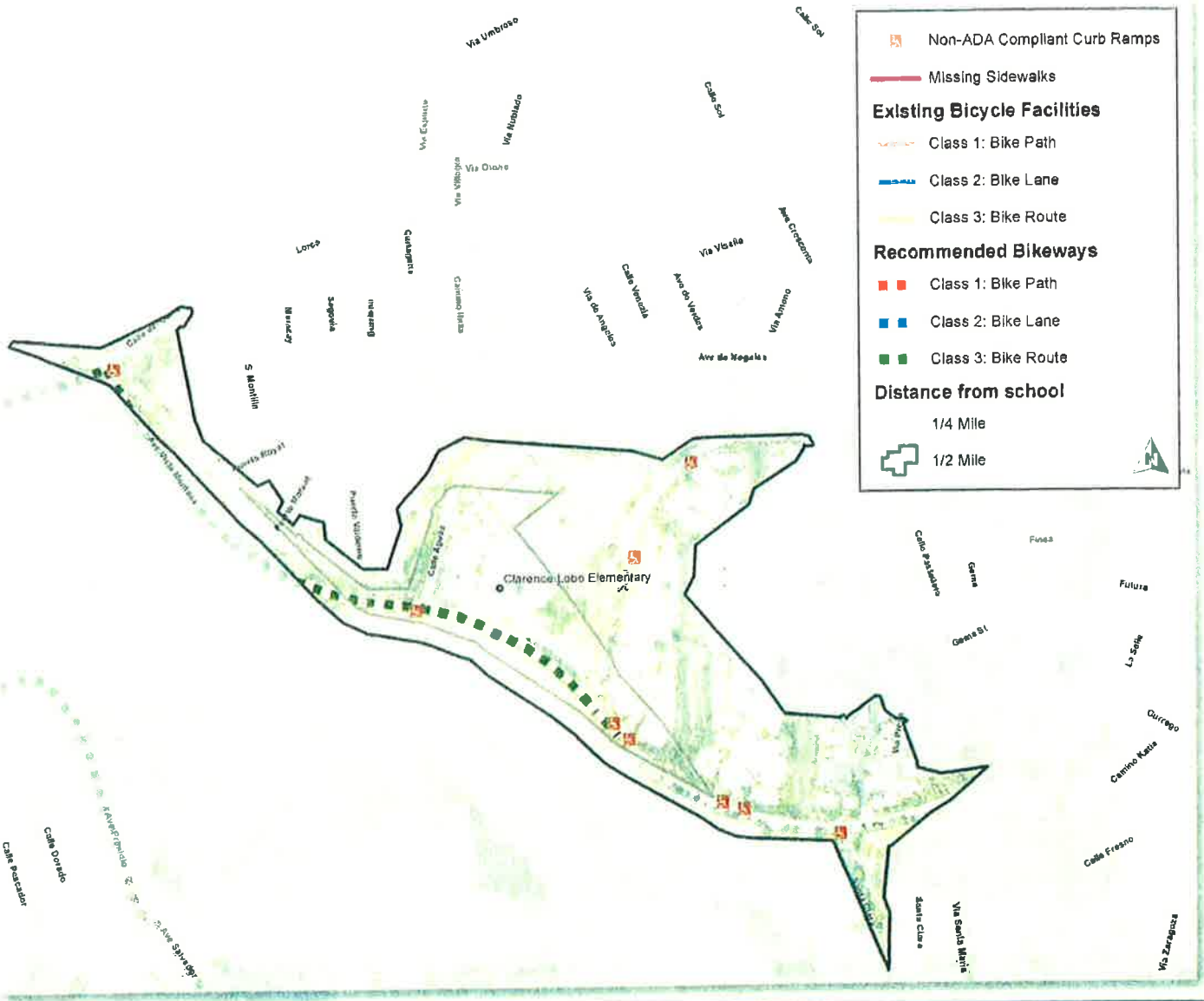


Clarence Lobo Elementary School

- Implement bicycle route project on Calle Del Cerro and Avenida Vista Montaña.
- Investigate incentives to increase cycling as a means of transportation such as the Boltage program. (Ridership is very low at Clarence Lobo.)

Missing sidewalks within ½ mile: None
Non-ADA-compliant curb ramps within ½ mile: 9

Figure 6.4: Clarence Lobo Elementary School



Concordia Elementary School

- Police enforcement needed along Avenida Del Presidente due to drivers speeding, parking in the bicycle lane and not stopping at stop signs.
- Fill in sidewalk gaps within the ½ mile walking distance from the school.
- Investigate the need for crossing guards at Avenida Del Presidente at San Luis Rey and at the school entrance. Drivers tend to block the crosswalks and do not pay attention to crossing cyclists and pedestrians.
- Implement bicycle lane project on El Camino Real.
- Implement bicycle route project on San Luis Rey and Avenida Santa Margarita.

Missing sidewalks within ½ mile: 13,400 feet (2.5 miles)
Non-ADA-compliant curb ramps within ½ mile: 32

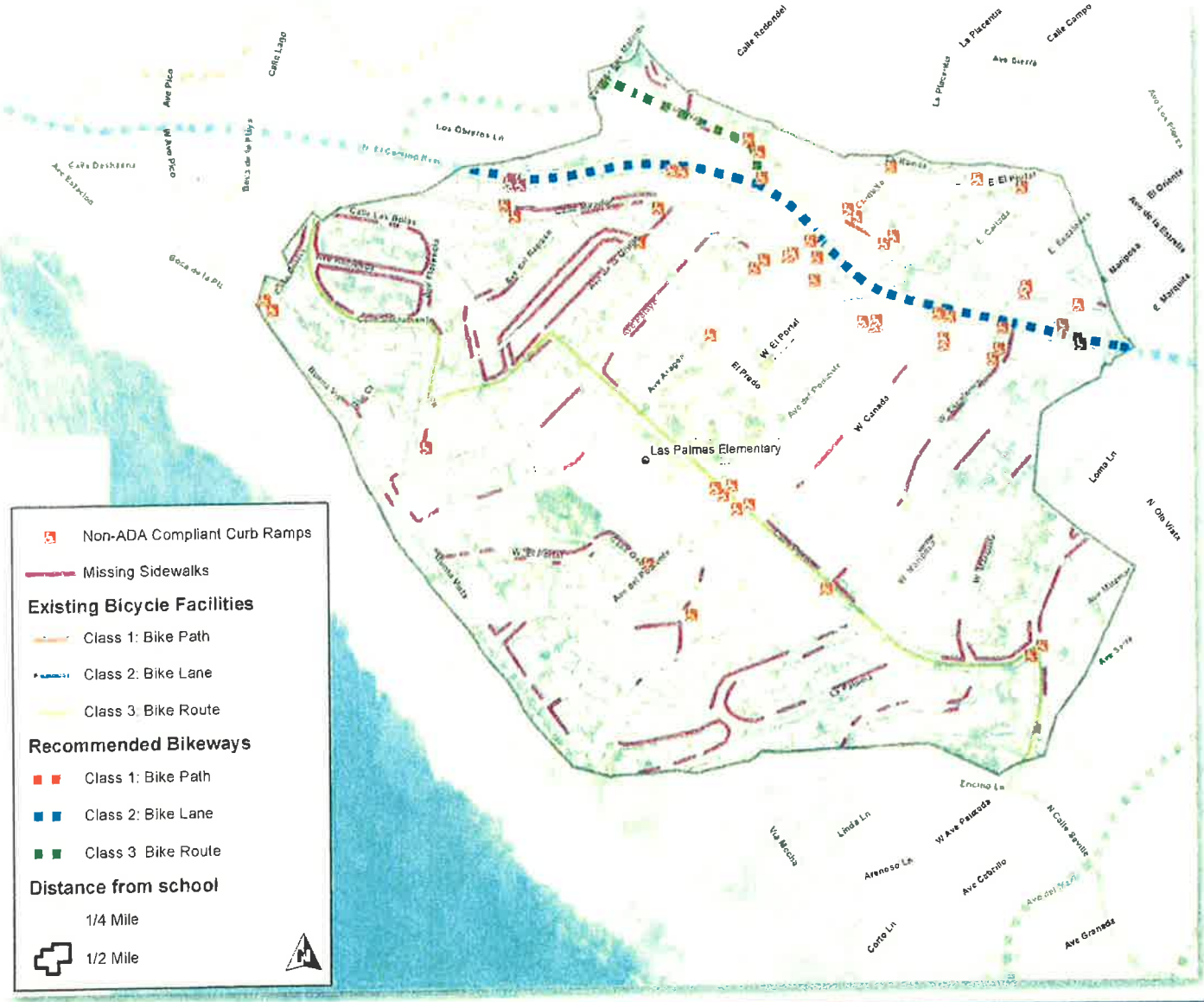
Figure 6.5: Concordia Elementary School

Las Palmas Elementary School

- Implement bicycle lane/enhanced route option along El Camino Real.
- Implement bicycle lanes/Class 1 bicycle path along Avenida Pico.
- Implement Ola Vista Bicycle Route enhancements with shared-lane marking and additional signage near the school.
- Install more crosswalks in the adjacent neighborhoods.
- Fill in sidewalk gaps within the ½ mile walking distance from the school.
- Consider opening the elevated beach path to allow children to ride their bikes on it between school hours only.

Missing sidewalks within ½ mile: 18,276 feet (3.5 miles)
Non-ADA-compliant curb ramps within ½ mile: 54

Figure 6.6: Las Palmas Elementary School



Marblehead Elementary School

- As requested by parents, continue bicycle path to Camino Faro.
- Investigate the need for crossing guards on Ave Vista Hermosa at Via Turqueza, Camino Faro and Calle Frontera.
- Police enforcement needed along Avenida Vista Hermosa due to drivers speeding, parking in bicycle lane and blocking turn into Via Turqueza.
- Extend the 25 mph zone further south to Camino Faro and add additional signage to warn drivers of the upcoming school or install radar speed displays to slow down drivers while in use.
- Increase bicycle parking due to reaching maximum capacity.
- Fill in sidewalk gaps within the ½ walking distance from the school.

Missing sidewalks within ½ mile: 2,291 feet (0.4 miles)
Non-ADA-compliant curb ramps within ½ mile: 3

Figure 6.7: Marblehead Elementary School

Truman Benedict Elementary/Bernice Ayer Middle School

- Implement bicycle lane project on Calle Sarmentoso.
- Implement bicycle route project on Camino Costado and Costero Risco.
- Increase police enforcement at Forster Ranch Community Park. (Parents concerned about gang activity.)
- Increased police enforcement needed along Calle Sarmentoso and Calle Verá Cruz due to drivers speeding and not yielding to pedestrians.

Missing sidewalks within ½ mile: None
Non-ADA-compliant curb ramps within ½ mile: 27

Figure 6.8: Truman Benedict Elementary/Bernice Ayer Middle School

Vista Del Mar Elementary and Middle School

- Due to extremely high vehicular and pedestrian traffic volume, investigate the need for a second crossing guard at the southwest corner of Ave Talega and Calle Portofino.
- Install a stop bar before the crosswalk on eastbound Calle Portofino.
- Crossing guard states that motor vehicles encroach upon the crosswalk without stopping.

Missing sidewalks within ½ mile: None
Non-ADA-compliant curb ramps within ½ mile: 2

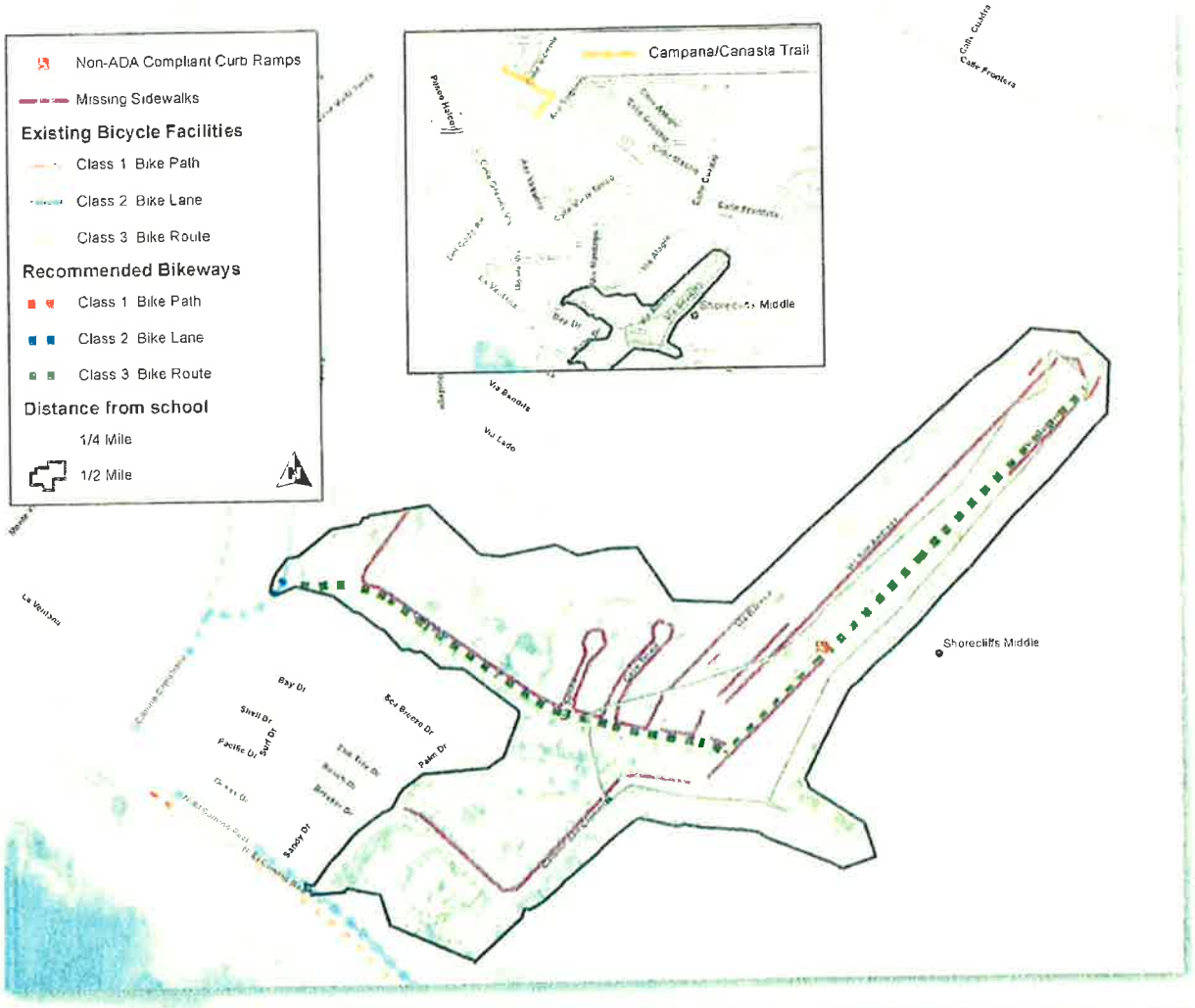
Figure 6.9: Vista Del Mar Elementary and Middle School

Shorecliffs Middle School

- Increase Interstate 5 crossing safety by adding sidewalks on north/west side of Avenida Vista Hermosa between Interstate 5 northbound ramp and parking lot entrance.
- Widen sidewalks on south side of Avenida Vista Hermosa between Interstate 5 and Calle Frontera where. A large retaining wall abuts the sidewalk.
- Implement bicycle route project on Avenida Vista Hermosa over Interstate 5 to connect to the existing bicycle lanes north of Calle Frontera.
- Implement the bicycle route project on Via Cascadita and Via Socorro
- Investigate the need for increased pedestrian awareness with Rectangular Rapid Flashing Beacon (RRFB) on the on-off ramp crosswalks. *(Note: FHWA interim approval granted 10 August 2011)*
- Investigate the Campaña/Canasta Trail for possible use as a connection to Shorecliffs. Students use this undercrossing to get to school.
- Install more crosswalks in adjacent neighborhoods.

Missing sidewalks within ½ mile: 8,753 feet (1.7 miles)
Non-ADA-compliant curb ramps within ½ mile: 1

Figure 6.10: Shorecliffs Middle School

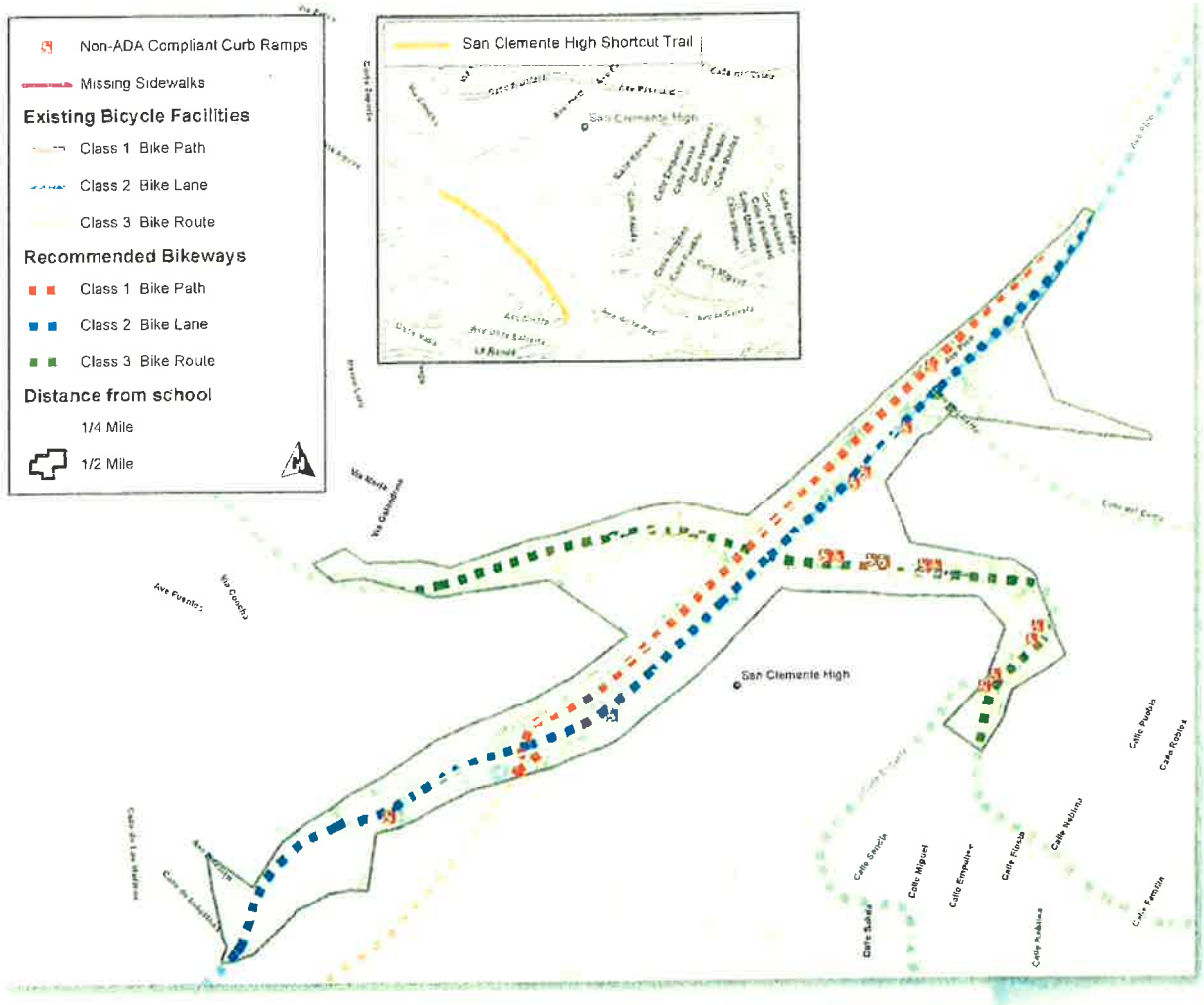


San Clemente High School

- Investigate the use of an adjacent trail west of Interstate 5 between Avenida Pico and Avenida Los Flores. This trail has been used by students between home and school as a link between the neighborhoods around the Boys and Girls Club and San Clemente High School.
- Implement bicycle lanes/Class 1 bicycle path along Avenida Pico.
- Implement bicycle route project on Calle Frontera and Avenida Presidio.

Missing sidewalks within ½ mile: None
Non-ADA-compliant curb ramps within ½ mile: 16

Figure 6.11: San Clemente High School



7 Complete Streets

7.1 Complete Streets Overview

A "complete street" is one that enables safe and viable transportation access for all types of roadway users, including cyclists, pedestrians, seniors, transit riders and individuals with disabilities, to move through a roadway. Complete streets addresses the safety and mobility needs of non-vehicular users while balancing efficiency of vehicular traffic.

Roadway segments are different, so complete street design treatments will be unique as well. Adjacent land uses, transportation infrastructure and demographics play a key role in the design of a complete street. Typical amenities can include bicycle lanes, paved and hard surface paths, wide sidewalks, parkway strip, special bus lanes, pedestrian curb extensions, accessible pedestrian and bicycle signals and median islands.

Complete streets offer many benefits for the surrounding community:

- Wide, attractive sidewalks and well defined bicycle routes encourage healthy and active lifestyles among residents of all ages.
- Opportunities for children to reach nearby destinations in a safe and supportive environment.
- Transportation options allow everyone, particularly people with disabilities and older adults, to be mobile and stay connected to the community.
- Multi-modal transportation networks help communities provide alternatives to sitting in traffic.
- Integration of land use and transportation creates an attractive combination of buildings, houses, offices, shops and street designs.
- Improved pedestrian facilities including sidewalks, raised medians, convenient bus stop placement, traffic-calming measures and treatments for travelers with disabilities can all increase the convenience and safety of users.
- Preserving resources through livable and walkable communities can also help reduce carbon emissions and are an important part of a climate change strategy.
- Reductions in transportation costs and travel time as well as lower public investment in infrastructure can allow for increased spending in other areas and can result in economic revitalization.
- Integrating sidewalks, bicycle lanes, transit amenities and safe crossings into the initial design of a project can lower the expense of retrofits later.

7.2 Complete Streets Standards

Due to the uniqueness of each roadway and the different amenities that make a complete street, the following sections describe the different street types and their use zones that can assist in the development of a complete street. The intention of each use zone is to provide guidance to accomplish the overall objective of providing safe, functional, multimodal streets that serve all users and abilities.

While the sections in this chapter describe how to utilize the various street types within the City, any given street may traverse several land uses and therefore require different treatments along its route. This section should be used merely as a guide to assist City staff when opportunities to develop a complete street present itself.

The street types that will be used in this section are arterial, collectors and local streets, as described in the Street Classification section. The derivatives of each road type have been combined since the classifications are similar. Due to San Clemente's often challenging right-of-way and topographic environment, the information in these sections is detailed, but not entirely prescriptive. They give general treatment methods based on national, state, OCTA, SCAG and local policies and measures.

Block Length

Block length is a critical component of the street network. In general, the shorter the block length, the denser the street network. Defining typical and maximum lengths for blocks does not always imply a grid network. However, it does allow the possibility of different block and lot configurations. Varying block geometry adds flexibility for mixing housing and lot sizes and developing constrained or oddly shaped parcels. A dense street network provides:

- Capacity for vehicle traffic
- Multiple route options
- Shorter trip options
- Future development flexibility
- More dispersed traffic flows
- More opportunities for traffic-calming

Block length also affects pedestrian safety. For example, by reducing the likelihood of jaywalking. It decreases the motivation for jaywalking by limiting the out of direction movement caused by widely dispersed intersection crossings. A shorter block length also increases the opportunities for safe crossings at intersections by providing more intersections per square mile.

A pattern of short blocks provides pedestrians a choice of which block to utilize. Shorter blocks create connectivity to help ensure that vehicular traffic does not become focused on only one or two streets. Shorter blocks also create a better walking environment, by providing numerous direct and indirect routes throughout neighborhoods and between land uses. In the local street network, frequently spaced intersections created by shorter blocks can also serve as a form of traffic-calming.

Complete Streets at Intersections
A number of improvements can be implemented to make intersections safer for bicycles and pedestrians. Some solutions are discussed in Chapter 5: Design. The following are some additional solutions.

Street Furniture
Street furniture includes benches, mailboxes, trash and recycling receptacles, bicycle racks, newspaper boxes, kiosks, parking meters, artwork, signs and other items used by pedestrians. Street furniture should be placed in a prescribed furniture zone as a buffer between the sidewalk and adjacent motor vehicle travel lanes. This adds a frame of reference to the roadway and encourage drivers to proceed at appropriate speeds. Furniture zone width will vary due to available right-of-way, but it should not impede universal access along the adjacent walkway.

Median Refuges
Median refuges are located in crosswalks in the middle of roadways to provide a safe waiting area for pedestrians. They may include curbs, truncated domes and bollards to help ensure the safety of waiting pedestrians. By allowing pedestrians to cross only half of the street and then wait, the refuge island increases the number of gaps in traffic safe for crossing. The median refuge area should be in line with the crosswalk and as wide as the crosswalk so that persons with disabilities are able to pass through without obstruction. In some cases, pedestrian actuation can be installed in these refuges to activate the crosswalk signals.

Wide Sidewalks and Pavement Treatments
Sidewalks are the framework of the pedestrian environment and are an essential component of most complete streets. Newer suburban street design can take a minimalistic approach to sidewalks, which can result in sidewalks of four or five feet in width. These may have little or no buffer from adjacent travel lanes, obstacles such as sign posts and no or poorly designed and located ramps or even, in some areas, no sidewalks at all.

Wider sidewalks separate pedestrians and adjacent travel lanes and create more space for people to walk and to congregate. They also allow the placement of street furnishings such as trees, lighting and seating. In areas of high pedestrian traffic, or where building facades and other elements are at

the edge of the sidewalk, or if the adjacent street supports high volumes or speeds, extra design considerations should be taken to make the sidewalk as wide as reasonably possible. For streets that do not have sidewalks, it may not be feasible from a cost standpoint to install sidewalks for the entire length. When cost is an issue, the focus should be on connecting the most critical links first and filling in the rest of the sidewalk network over time as funding becomes available, or as new development can provide the facilities.

Sidewalk paving can bring an aesthetic element to a street. It provides a unique setting and can provide valuable wayfinding cues for people with visual impairments. Paving materials should be consistent, durable, smooth enough for passage, but not slippery. Concrete paving is generally recommended for arterial, collector and local sidewalks. The concrete can be textured for safety and designed to match existing patterns. In areas of high pedestrian activity, painted curbs should be textured to ensure traction. Special paving can be installed at neighborhood commercial areas, schools and parks to give them a distinctive identity. Typical materials include brick or concrete pavers, stained or scored concrete, decorative tile, rubberized sidewalk coatings, stone, slate and granite if they provide a consistently smooth travel surface and good traction. Special sidewalk paving ("Ole Hanson" pavers) exists in downtown San Clemente in the "T-Zone," pedestrian-oriented commercial areas of Avenida Del Mar and El Camino Real.

Bicycle Lanes

Bicycle facilities provide safe, comfortable mobility opportunities for a range of users and are considered an integral part of a complete street. Other legally recognized modes, such as wheelchairs and mobility scooters, may utilize bikeway facilities. Additionally, facilities such as bicycle lanes contribute to buffering between motor vehicle travel lanes and the adjacent sidewalk. The installation of bicycle lanes depends on the available street width, existing on-street parking, motor vehicle traffic volumes and speeds and bicycle volumes. On wide two-lane streets, bicycle lanes act as a traffic-calming measure by narrowing with vehicle lane and providing space to cyclists. Whenever possible, wider bicycle lanes (five to six feet with two feet of diagonally striped buffer) are recommended to allow cyclists to ride far enough to the left to avoid unexpectedly opening car doors.

Bicycle lanes adjacent to head-in angled parking are generally discouraged because of the lack of visibility between cyclists and drivers backing out of spaces. Converting from angled to parallel parking provides width for bicycle lanes. Where possible on one-way streets or two lane streets, head-in angled parking can be modified to a reverse (back-in) angled parking, which improves driver visibility of cyclists.

Bicycle travel on sidewalks should be generally discouraged, even if the sidewalk width meets the width requirements of a shared multi-use or bicycle path. Cyclists on sidewalks tend to travel at higher speeds than pedestrians, creating safety conflicts. Cyclists may collide with sidewalk obstacles such as street furniture, trees, sign posts, etc. Additionally, drivers do not expect cyclists on sidewalks, creating conflicts at intersections and driveways. Therefore, it is important to provide convenient alternatives that will limit the attractiveness of sidewalk riding. While on-street facilities that meet requirements are preferred, bicycle routes on parallel streets or even appropriate alleys, or a separated off-street multi-use path, may be an alternative.

Other innovative treatments for bicycles at intersections such as bicycle boxes, colored bicycle lanes, bicycle boulevards, green-striped shared lane and bicycle signals are in use across the country. Many of these treatments have special requirements and are under study in the California. See Chapter 5: Design, for further discussion of these and other treatments.

On-Street Vehicular Parking

On-street parking can be an important element of a complete street. It provides an additional buffer between the sidewalk and adjacent travel lanes and encourages lower motor vehicle speed. The preferred width of a parallel on-street parking lane is eight feet on commercial streets or where there is high parking turnover and seven feet wide on residential streets. These dimensions are inclusive of the gutter pan.

Where sufficient curb-to-curb width is available on low-volume, low-speed streets in commercial areas, is available angled parking may be appropriate. Angled parking can create sight distance problems associated with vehicles backing out of parking spaces. The use of reverse (back-in) angled parking is desirable since it overcomes these sight distance concerns and is considered safer for cyclists traveling adjacent to angled parking.

The following are additional guidelines for on-street parking:

- On-street parking should conform to local and state accessibility requirements and provide an appropriate number of accessible spaces.
- On-street parking should be located based on the characteristics of the street, needs of the adjacent land uses, applicable local policies and plans for parking management.
- On-street parking should be primarily parallel parking on higher volume urban arterial streets. Angled parking may be used on low-speed and low-volume collector streets with ground floor commercial or those serving as main streets.

- Signed or allowed on-street parking should generally be prohibited on streets with speeds greater than 35 mph due to hazards such as door openings and maneuvering in and out of spaces. (Note that implementation would impact several existing roadways, including sections of El Camino Real, Ola Vista, etc.)
- Whenever appropriate, metered or time-restricted parking should be used to provide short-term parking for retail customers and visitors, while discouraging long-term parking.
- In developing and redeveloping areas, provide the amount of on-street parking for planned, rather than existing, land-use densities. If more parking is needed, consider public or shared parking structures, or integrate the design of parking facilities with adjacent land uses.
- A minimum 1.5 foot wide offset should be provided between the face of curb and edge of potential obstructions such as trees and street signs. This will allow car doors to open free of obstruction.
- Reverse (back-in) angled parking requires a wider roadside due to the longer overhang at the rear of most vehicles. This extra width can be compensated by the narrower travel lane needed for maneuvering and less depth for the parking stall since the longer overhang is over the curb.

8 Streetscape Ecosystem

The street is a system: a transportation system, an ecosystem and a system of social and economic interactions. The idea of a streetscape ecosystem is to mimic nature, building reciprocal relationships within an interconnected system to sustainably enhance the local environment, its resources, the community and the local economy. To do this, the tools addressed in this chapter should be integrated with those of the other chapters from the *Los Angeles County Model Design Manual for Living Streets*.

This chapter's first section addresses street trees and landscaping, providing guidance on how to design streets to include site-appropriate vegetation that maximizes environmental and social benefits. Canopy trees provide summer shade that cools the streets and the hardscapes from which the streetwater is harvested. These sheltered micro-climates create ideal locations for people to gather, walk and bike.

To help the City of San Clemente achieve street designs that create great places fostering community, sections of this chapter address street furnishings, utilities and lighting. The sections recommend that these elements (e.g., sheltered benches, bicycle racks and bus shelters) should be placed where people can utilize them well. These sections also provide guidance as to the placement of utilities and how placement coordinates with other components of the streetscape. The elements described can help attract pedestrians to a street and thereby make the street safer, more dynamic and more vibrant economically.

8.1 Urban Forestry

The urban forest includes all trees, shrubs and other understory plantings on both public and private lands. Street trees and landscaping are essential parts of the urban forest, as they contribute positively to the urban environment—to climate control, stormwater collection and the comfort and safety of people who live or travel along the street. A street lined with trees and other plantings looks and feels narrower and more enclosed, which encourages drivers to slow down and to pay more attention to their surroundings. Trees provide a physical and a psychological barrier between pedestrians and motorized traffic, increasing safety as well as making walking more enjoyable.

A healthy urban forest is also a powerful streetwater management tool. Leaves and branches catch and slow rain as it falls, helping it to soak into the ground. The plants themselves take up and store large quantities of water that would otherwise contribute to surface runoff. Part of this moisture is then returned to the air through evaporation to further cool the city.

As an important element along sidewalks, street trees must be provided with conditions that allow them to thrive, including adequate uncompacted soil, water and air. This section provides guidance for appropriate conditions and selecting, planting and caring for street trees, as well as for other landscaping along streets.

Street Trees

Goals and Benefits of Street Trees

The goal of adding street trees is to increase the canopy cover of the street, the percentage of its surface either covered by or shaded by vegetation, not simply to increase the overall number of trees. The selection, placement and management of all elements in the street should enhance the longevity of a city's street trees and healthy, mature plantings should be retained and protected whenever possible.

A large tree will yield $48 to $62 in average annual net benefits over 40 years with costs factored in (McPherson, G. et al, "*Tree Guidelines for San Joaquin Valley Communities*," Western Center for Urban Forest Research and Education, USDA Forest Service, 1999). Adding street trees:

- Creates shade to lower temperatures in a city, reduces energy use and makes the street a more pleasant place in which to walk and spend time
- Slows and captures rainwater, helping it soak into the ground to restore local hydrologic functions and aquifers
- Improves air quality by cooling air, producing oxygen and absorbing and storing carbon in woody plant tissues
- Increases property values and sales revenues for existing businesses
- Enhances local neighborhood and cultural identity through specific plant forms and materials, the act of planting and sharing food crops, or by creating sheltering spaces for social interaction
- Enhances safety and personal security on a street by calming traffic and by fostering a denser and more consistent human presence, also referred to as eyes on the street
- Provides cover, food and nesting sites for indigenous wildlife as well as facilitates habitat connectivity

Street Trees Principles

The following principles influence the selection of street trees and landscaping design:

- Seek out and reclaim space for trees. Streets have a surprising number of residual or left-over spaces between areas required for travel lanes and parking, once they are examined from this perspective. Traffic circles, medians, channelization islands and curb extensions can provide space for trees and landscaping.
- Create optimum conditions for growth. Space for roots and above ground growth is the main constraint to the urban forest achieving its highest potential. Typically a six to eight foot wide, continuous sidewalk furniture zone must be provided, with uncompacted soil to a minimum of a three foot depth. If space for trees is constrained, provisions should be made to connect these smaller areas below the surface to form larger effective areas for the movement of air, root systems and water through the soil.
- Select the right tree for the space. In choosing a street tree, consider what canopy, form and height will maximize benefits over the course of its life. Provide necessary clearances below overhead high-intensity electrical transmission lines and prevent limbs from overhanging potentially sensitive structures such as flat roofs. In commercial areas where the visibility of façade-mounted signs is a concern, choose species whose mature canopy allows for visibility, with the lowest branches at a height of 12 to 14 feet or more above the ground. Select trees with non-aggressive root systems to avoid damaging paving and sidewalks.
- Start with good nursery stock and train it well. When installing plant material, choose plants that have complete single leaders and are in good "form," and check that boxed trees are not root bound. Proper watering and pruning every three to four years will allow trees to mature and thrive for many years of service.
- Do not subject plants to concentrated levels of pollutants. Trees and other plants should be integrated within streetwater management practices whenever possible, but filtering of pollutants from "first flush" rain falls and street runoff will extend the life of trees and prevent toxic buildup of street pollutants in tree wells.

Climate and Soil

Selecting trees adapted to a site's climate and local rain cycles can create a more sustainable urban forest. The urban environment is harsh for many plants. Often plants native to an area are best adapted to that area's climate. Select plants that can tolerate the environmental elements, such as radiant heat from the sidewalk or street surface or 50 to 60 mph winds from passing traffic.

Urban soils have became highly compacted through construction activities and the passage of vehicle and even foot traffic. Compaction reduces the soil's capacity to hold and absorb water. Plants need healthy soil, air and water to thrive.

To add biomass and canopy cover, both the volume and quality of soil at planting sites should be increased. But even when the soil in confined tree pits has been amended, something of a planter-like condition exists at the bottom and sides where the prepared area meets the surrounding compacted soils. Covering the soil surface with mulch can help, as the added shade, cooling and retained moisture help support the biological activities close to the soil's surface. These activities open and help keep open the pore structure of the soil and cushion the impact of foot traffic. The process works better if the mulch material is organic rather than stone. Those with limited resources for soil preparation should invest in an extensive covering of mulch.

The generalized soil types map for a city can be used as a starting point when planning projects, but then the basic soil classifications should be identified on-site, especially when confronted by planting sites at the extreme ends of the spectrum: very fast-draining, nutrient-poor sands and dense, often nutrient-rich but oxygen-starved poorly drained clays.

Planting Sites

Traditionally, trees have been squeezed into whatever limited space is easily found, but this does not work well for either the tree or the street. The following guidelines provide recommended planting areas:

Establish and maintain six to eight foot wide sidewalk furniture zones where possible. Many large trees need up to 12 feet in width and are not suitable for placement in narrower furniture zones. In residential areas, sidewalk furniture zones within the root zone should be unpaved and planted/surfaced with low groundcover, mulch, or stabilized decomposed granite where these can be maintained. Where maintenance of such extensive sidewalk furniture zones is not feasible, provide 12-foot long tree wells with true permeable pavers (standard interlocking pavers are not permeable).

If the above conditions are not feasible, provide for the tree's root system an adequate volume of uncompacted soil or structural or gap-graded soil (angular rock with soil-filled gaps) to a depth of 3 feet under the entire sidewalk (in the furniture, frontage and pedestrian sidewalk zones).

Spacing between trees will vary with species and site conditions. The spacing should be 10 percent less than the mature canopy spread. Closer spacing of large canopy trees is encouraged to create a lacing of canopy, as trees in groups or groves can create a more favorable microclimate for tree growth than is experienced by isolated trees exposed to heat and desiccation from all sides. On residential streets where lots are 40 or 50 feet wide, plant one tree minimum per lot between driveways. Where constraints prevent an even spacing of trees, it is preferable to place a tree slightly off the desired rhythm than to leave a gap in the pattern.

Planting sites should be graded, but not overly compacted, so that the soil surface slopes downward toward the center, forming a shallow swale to collect water. The crown of the tree should remain two inches above finished grade and not be in the center of a swale, but off to the side. The finished soil elevation after planting is held below that of the surrounding paving so two to three inches of mulch can be added. The mulch layer must be replenished as needed to maintain a nearly continuous level surface adjacent to paving.

Generally, tree grates and guards are best used along streets with heavy pedestrian traffic. Along streets without heavy foot traffic and in less urban environments, use mulch in lieu of tree grates.

Species Selection

Select trees with non-aggressive root systems to avoid damaging paving and sidewalks.

In general, street trees should be species that will achieve a height and spread of 50 feet on residential streets and 40 feet on commercial streets within 10 years of planting to provide reasonable benefits. Typically, trees on commercial streets will not achieve the same scale as they will on residential streets where greater effective root zone volumes may be achieved. On commercial streets with existing multi-story buildings and narrow sidewalks, select trees with a narrower canopy than can be accommodated on the limited sidewalk width.

Cities should establish a list of recommended tree species for use in the public street rights-of-way. In the Los Angeles basin, drought-tolerant native trees with large canopies include Coast Live Oaks (*Quercus agrifolia*) and Sycamores (*Platanus racemosa*). (Note that dry weather runoff should not be directed to oaks and other trees not tolerant of dry season irrigation.) On commercial streets with ground-floor retail, deciduous trees with a strong central leader, such as Ginkos and London Planes, are desirable since they grow rapidly above the ground floor business signs. A city's list of recommended tree species should specify minimum planting site widths for each and which trees may be planted below utility lines. Where there are overhead power lines less than 50 feet above grade, braided insulated electrical wire should be used so that trees do not have to be pruned to avoid the electrical lines. If braided insulated electrical wire cannot be provided, appropriate trees that will not grow tall enough to reach the power lines should be specified and planted.

Trees that are part of streetwater management practices must be species that respond well to the extremes of periodic inundation and dry conditions found in water catchment areas. Design of all planting areas should include provisions for improved streetwater detention and infiltration.

Consistent use of a single species helps reinforce the character of a street or district, but a diversity of species may help the urban canopy resist disease or insect infestations. New plantings added to streets with existing trees should be selected with the aim of meeting the same watering requirements and creating visual harmony with existing trees and plantings. Native species should be considered for inclusion whenever possible, but consideration should be first given to a species' adaptability to urban conditions.

Consider evergreen species where it is desirable to maintain foliage through the winter months, such as to slow streetwater through the rainy season.

Consider deciduous species where their ability to allow sunlight to penetrate into otherwise shaded areas (such as south facing windows of adjoining buildings) during the winter months will be a plus.

Tree Spacing and Other Considerations

Most jurisdictions have spacing requirements between trees and street lights (typically about 30 feet high), which typically vary from 10 to 20 feet. The smaller setback provides greater flexibility in tree spacing and allows for a more complete tree canopy.

Pedestrian lights, which are about 12 feet tall, generally do not conflict with the tree canopy, so spacing is less rigid. Some jurisdictions still require wide clearance for their convenience in maintaining the lights, but this wide spacing greatly reduces tree canopy and is therefore discouraged. Spacing of 10 feet away from trees is generally adequate.

An eight foot minimum clearance must be maintained between accessible parking spaces and trees.

Trees may be planted as close as 6 feet from bus shelters, where they provide welcoming shade at transit stops.

Adequate clear space should be provided between trees and awnings, canopies, balconies and signs so they will not come into conflict through normal growth or require excessive pruning to remediate such conflicts.

Trees may be planted in medians four feet or wider, but must have an adequate clear height between the surface of the median and the lowest branches so that pedestrians can be seen. Where trees hang over the street, the clear height should be 14 feet.

Understory Landscaping

Understory landscaping refers to landscape elements beneath the tree canopy in areas within the public right-of-way not required for vehicular or pedestrian movement, including medians, curb extensions and furniture and frontage zones. Understory landscaping:

- Complements and supports street trees, in particular by providing uncompacted, permeable areas that accommodate roots and provide air, water and nutrients, as well as by physically protecting their trunks
- Reduces impervious area and surface runoff
- Treats stormwater, improving water quality
- Provides infiltration and groundwater recharge
- Provides habitat
- Reduces the perceived width of the street by breaking up wide expanses of paving, particularly when the understory is in medians and sidewalk furniture zones
- Contributes to traffic-calming
- Provides a buffer between the walkway zone and the street, contributing to pedestrian comfort
- Improves the curb appeal of properties along the street, potentially increasing their value
- Enhances the visual quality of the community

Principles

Trees take precedence: the understory landscape should support them. It should not compete with them.

- Only pave where necessary. Keep as much of the right-of-way unpaved and planted as possible to maximize benefits
- Design understory areas to infiltrate water
- The entire understory area does not have to be covered with plants—composted mulch is a good groundcover (top of mulch should be below adjoining hardscape so that runoff will flow into planning areas).
- Make the understory sustainable: use drought-tolerant plants
- Replenish the soil with compost
- Design the understory to contribute to the sense of place

Soil

Provide good quality, uncompacted, permeable soil. Soil analyses should address the concentration of elements that may affect plant growth, such as pH, salinity, infiltration rate, etc. Remove and replace or amend soil as needed. Good preparation saves money in the long run because it reduces the need to replace plants, lowers water consumption and reduces fertilizer applications.

Design

Generally, understory landscaped areas should be as wide as possible where there are trees: when feasible, at least 6 to 9 feet wide for parkways and eight to 12 feet wide for medians. However, many existing parkways and medians are less wide. Narrower parkways can support understory plants and some tree species. A path or multiple paths should be added as needed across a parkway as a means of access from the curb to the sidewalk. For example, where there are striped curbside parking spaces, a path across the parkway should be provided at every one or two parking spaces. Plant with species that:

- Do not require mowing more frequently than once every few months
- Are drought-tolerant and can survive with minimal irrigation once established
- Do not exceed a height of two feet within five feet of a driveway/curb cut and within 20 feet of a crosswalk and, excluding trees, three feet elsewhere
- Do not have thorns or sharp edges adjacent to any walkway or curb
- Are located at least four feet from any tree trunk

8.2 Street Furniture

Street furnishings in the street environment add vitality to the pedestrian experience and recognize the importance of the pedestrian to the fabric of a vibrant urban environment. Street furnishings encourage use of the street by pedestrians and provide a more comfortable environment for non-motorized travel. They provide a functional service to the user and provide uniformity to the urban design. Street furnishings include benches and seating, bollards, flower stands, kiosks, news racks, public art, sidewalk restrooms, signs, refuse receptacles, parking meters and other elements. Street furnishings achieve improved vitality in many ways:

- They make walking, bicycling and public transit more inviting.
- They improve the street economy and common city prosperity.
- They enhance public space and create a place for social interaction.

Placement of street furnishings should be provided:

- At concentrations of pedestrian activity (nodes, gathering areas)
- On streets with pedestrian-oriented destinations. Pedestrians may gather or linger and enjoy the public space.

Street furnishings are secondary to the layout of street trees and light standards since street trees and light standards develop a street rhythm and pattern. Site furnishing should be placed in relation to these elements sensitive to the vehicular flow and pedestrian use of these elements. Careful consideration to the placement provides ease of recognition and use.

In addition to the guidelines provided for each element, placement should adhere to the minimum spacing. Site furnishing installed within the appropriate zone will be spaced not less than as shown below:

- Face of Curb 18″
- Driveway 24″
- Wheelchair Ramp 24″
- Ramp Landing 48″
- Fire Hydrant 60″
- Stand Pipe 24″
- Transit Shelter 48″

All site furnishing must be accessible per Public Rights-of-Way Accessibility Guidelines (PROWAG) and other city regulations.

Cities should strive to include sustainable materials for street furnishings.

Benches and Seating

Public seating provides a comfortable, utilitarian and active environment where people can rest, socialize, or read in a public space. The proper placement of a bench is a simple gesture creating a sense of place for the immediate area. Seating arrangements should be located and configured according to the following guidelines:

- Seating should be located in a shaded area under trees.
- Seating should be oriented toward points of interest; this can be the adjacent building, an open space, or the street itself if it's lively. Where sidewalk width permits, seating can also be oriented perpendicular to the curb.
- Informal seating opportunities, incorporated into the adjacent building architecture, may be used as an alternative to free-standing benches. Low planter walls can be used as informal seating areas.
- Benches and seating should be made of durable high-quality materials. The seating design should complement and visually reinforce the design of the streetscape. Seating opportunities should be integrated with other streetscape elements.

Bollards

Bollards are primarily safety elements to separate pedestrians or other non-motorized traffic from vehicles. Thoughtful design and/or location of bollards can add interest, visually strengthen street character and define pedestrian spaces.

Bollards are used to prevent vehicle access on sidewalks, or on other areas closed to motor vehicles. Removable bollards should be placed at entrances to permanent or temporary street closures.

Bollards should have articulated sides and tops to provide distinct design details. The details should be coordinated with other street elements of similar architectural character.

Removable bollards should be designed with a sturdy pipe projecting from the bottom of the exposed bollard. Removable bollards should appear permanent. Electrically controlled mechanisms retract the bollard into a void below the surrounding finish surface. This allows emergency vehicle access to closed streets.

Street Vendor Stands

Street vendor stands, such as flower, magazine and food vendor stands, rely on regular pedestrian traffic to sustain their business. To maximize efficiency, the stands operate during daytime work hours and cater to those commuting to/from employment areas. In areas with a vibrant evening environment, stands may have evening hours to benefit from the extended period of exposure to pedestrian traffic.

Generally, street vendor stands should either be located outside the street right-of-way or in the sidewalk, furniture, or frontage zones.

The design of the street vendor stands should have details and features coordinated with other street elements. These details should be of a similar architectural character. The stands should allow a minimum of 6 feet of clear pedestrian passage between the edge of the display area and other elements.

Informational Kiosks

Kiosks in public areas provide valuable information, such as maps, bulletin boards and community announcements. Kiosks can often be combined with gateway signs and are an attractive and useful street feature. Kiosks may be located in any of the following areas:

- Sidewalk, furniture, or frontage zones
- Curb extensions
- Where parking is not allowed
- Close to, but not within transit stops
- Kiosks should not block scenic views.

Kiosks should be designed to the following guidelines:

- Kiosks should include bulletin boards or an enclosed case for information display.
- As a gateway element, the kiosk should include the neighborhood, commercial district, street, or park name; a map; or other information.
- Kiosks should have details and features coordinated with other street elements and should have a similar architectural character.

News Racks

News rack placement is subject to municipal guidelines. In addition, the following guidelines should be considered:

- News racks located within the furniture or frontage zones should not reduce the minimum width of the sidewalk pedestrian zone with news rack doors open.
- News racks should be placed no closer than two feet from adjacent street signs and four feet from bicycle racks.
- News racks should visually blend with their surroundings and complement the architectural character. Multiple news racks should be consolidated into a standard decorative stand.

Parking Meters

Parking meters can be either traditional single-space meters or consolidated multi-space meters (parking stations). Parking meters should be placed in the sidewalk furniture zone. Single-space meters should be placed at the front end of the individual stalls.

Multi-space meters are preferred over single-space meters. Multi-space meters should be placed every eight to 10 parking spaces and spaced approximately 150 to 200 feet apart. Signs should clearly direct patrons to the meter. The signs should be spaced at approximately 100 feet on-center.

Municipalities should encourage the conversion of single-space meters to multi-space units to reduce visual clutter from the urban landscape. The multi-space units should be selected to minimize their impact on the pedestrian zone.

Signs

Streetscape signs provide information specific to direction, destination, or location. The sign plans should be developed individually for each neighborhood or district. Streetscape signs are most appropriate for downtown, commercial, or tourist-oriented locations or around large institutions. Streetscape signs include parking, directional and wayfinding signs.

Streetscape signs should be kept to a minimum and placed strategically. They should align with the existing street furnishings and be placed in the sidewalk furniture zone. The sign design should be attractively clean and simple and complement the architectural character of other street furnishings.

Refuse Receptacles

Refuse receptacles should accept both trash and recyclables. Where there is a demand, different receptacles should be provided for different recyclable materials. There should be a maximum of one refuse receptacle every 200 feet along commercial streets and a maximum of four refuse receptacles at an intersection (one per corner). Refuse receptacles should be located:

- Near activity generators such as major civic and commercial destinations
- At transit stops
- Near street corners but outside of the sidewalk pedestrian zone

Public Art

On a large scale, public art can unify a district with a theme or identify a neighborhood gateway. At a pedestrian scale, public art adds visual interest to the street experience. Public art can be situated in a variety of areas and locations, including streets, public spaces with concentrations of pedestrians, or areas of little pedestrian traffic, to create a unique space for discovery.

Public art should be considered during the planning and design phase of development to more closely integrate art with other streetscape elements, taking into account the following:

- Public art is a pedestrian amenity and should be presented in an area suited for pedestrian viewing. The piece should be placed as a focal element in a park or plaza, or situated along a pedestrian path and discovered by the traveler.
- Public art can be incorporated into standard street elements (light standards, benches, trash receptacles, utility boxes).
- Public art can provide information (maps, signs) or educational information (history, culture). All installations do not need to have an educational mission; art can be playful.
- Public art should be accessible to persons with disabilities and placement must not compromise the sidewalk pedestrian zone.

Sidewalk Dining

Outdoor café and restaurant seating adjacent to the sidewalk activates the street environment and encourages economic development. Tables and chairs are to be placed on the sidewalk directly at the front of the restaurant and allowed in the frontage zone or furniture zone of the sidewalk where sufficient width is available.

Placement of tables and chairs must include diverters (barriers) at the end of the dining area to guide pedestrians away from the accepted area of sidewalk. Since the public purpose of allowing restaurants to have dining on the sidewalk is to stimulate activity on the street, municipalities should prohibit restaurants from fully enclosing the dining area.

Other Streetscape Features

Other features that enhance the pedestrian experience include clocks, towers and fountains, which strengthen the sense of place and invite pedestrians to come enjoy.

Lighting

Lighting provides essential nighttime illumination to support pedestrian activity and safety as well as vehicle safety. Well-designed street lighting enhances the public realm while providing safety and security on roadways, bicycle paths and lanes as well as pedestrian paths including sidewalks, paths, alleys and stairways.

Historically significant street light poles and fixtures should be maintained and upgraded where appropriate.

Pedestrian lighting should be coordinated with building and property owners to provide lighting attached to buildings for sidewalks, alleys, pedestrian paths and stairways where separate lighting poles are not feasible or appropriate.

Location and Spacing

- Street and pedestrian lighting should be installed in the sidewalk furniture zone.
- Light fixtures should not be located next to tree canopies that may block the light.
- Where pedestrian lighting is not provided on the street light pole, special pedestrian lamps should be located between street light poles.

Light Color

All light sources should provide a warm white (yellow, not blue) color light

Light Poles and Fixtures

Design should relate and be coordinated with the design of other streetscape elements and recognize the history and distinction of the neighborhoods where the light poles are located.

Dark Sky-Compliant Lighting

As appropriate, dark sky-compliant lighting should be selected to minimize light pollution cast into the sky while maximizing light cast onto the ground.

Energy Efficiency

Solar light fixtures should be utilized where possible for new installations or for retrofit projects. Where solar light fixtures are not appropriate or possible, LED or a future more energy-efficient technology should be used.

Pedestrian Lighting

Retrofits of existing street lights and new installations should provide lighting on pedestrian paths. Pedestrian lighting should be added to existing street light poles where feasible unless spacing between street light poles does not support adequate pedestrian lighting, in which case pedestrian lighting may need to be provided between existing street light poles.

Light Levels and Uniformity

All optic systems should be cut off with no light trespass into the windows of residential units. Cities should develop a set of standards for pedestrian lighting levels.

Note: Light levels are measured in foot candles (fc). Suggested light levels are consistent with ANSI/IES RP-8-00 *American National Standard Practice for Roadway Lighting*.

Utilities

The location of underground and aboveground utilities must be considered when planning new landscaped areas in the right-of-way. Each jurisdiction should establish guidelines to organize and standardize utility location and to minimize conflicts between landscaping and utilities based on input from all affected departments and agencies.

The majority of underground utilities, including sanitary sewers and storm drains and water, gas and electrical mains, are typically located under the roadway. Sanitary sewers are often in the center of the street directly under the potential location of a landscaped median. They are usually relatively deep. In general, if they have at least four or five feet of cover, they should not be affected by the introduction of a landscaped median. The other utilities within the roadway are typically located closer to the curbs.

Telecommunications, street lighting conduit, traffic signal conduit and fiber optic conduit are often located under the sidewalk. Lateral lines extend from the utility mains in the public rights-of-way to serve adjacent properties. Benefits of well-organized utility design/placement include:

- Reduced clutter in the streetscape
- Increased opportunity for planting areas and for soil volume to support tree growth and stormwater infiltration
- Reduced maintenance conflicts
- Improved pedestrian safety and visual quality

Utilities should be placed to minimize disruption to pedestrian travel and to avoid ideal locations for directing streetwater, planting trees and other vegetation and siting street furniture, while maintaining necessary access to the utilities for maintenance and emergencies.

Utilities within 10 feet of where a landscaped median may be located should have at least five feet of cover.

Utility main lines that run laterally under the sidewalk should be located in a predetermined zone to minimize conflicts with tree roots and planting areas. The ideal location to minimize conflicts with trees would be under the pedestrian or frontage zones, although the more practical location is often under the furniture zone. Stacking dry utilities (telephone, CATV, electric, etc.) in the pedestrian or frontage zones will further reduce conflicts with the landscaped area.

Roadway/Parking Lane

Large utility vaults and conduits running the length of a city block may be located in the roadway or parking lane where access requirements allow. Vaults in the parking lane may be located in short-term parking zones or in front of driveways to facilitate access. Each jurisdiction typically has specific design standards for vaults and utilities based on expected use and vehicle type. They can also be placed in midblock curb extensions.

Furniture Zone

Small utility vaults, such as residential water vaults, residential water meters, gas valves, gas vaults, or street lighting access, should be located in the sidewalk furniture zone at the back of the curb wherever possible to minimize conflicts with existing or potential tree locations and landscaped areas. Vaults should be aligned or clustered wherever possible.

Generally, utility boxes are sited in the direction of the pipe. Utility boxes parallel with the curb should be located in the sidewalk furniture zone when possible. Vaults perpendicular to the curb should be located between existing or potential street trees or sidewalk landscape locations (for example, in walkways through the sidewalk furniture zone to parked cars.)

Utility laterals should not run directly under landscaped areas in the furniture zone, but instead under driveways and walkways wherever possible.

Sidewalk Pedestrian Zone
Flush utility vaults and conduits running the length of the city block may be located in the pedestrian zone. Vaults in the pedestrian zone should have slip-resistant covers.

Large flush utility vaults should be placed at least three feet from the building and four feet from the curb where sidewalk widths allow.

Surface-mounted utilities should not be located in the pedestrian zone.

Sidewalk Frontage Zone
Utility vaults and valves may be placed in the frontage zone. Placement of utility structures in this zone is preferred only when incorporating utility vaults into the furniture zone is not feasible.

Utility vaults in the frontage zone should not be located directly in front of building entrances.

Curb Extensions
Utility vaults and valves should be minimized in curb extensions where plantings or street furnishings are planned.

Surface-mounted utilities may be located in curb extensions outside of crossings and curb ramp areas to create greater pedestrian through width.

Utility mains located in the parking lane and laterals accessing properties may pass under curb extensions. With curb extensions or sidewalk widenings, utilities such as water mains, meters and sewer vents may remain in place as they can be cost prohibitive to move.

Driveways
Utility boxes may be located in driveways if the sponsor provides a vehicle-rated box; however, this is not a preferred solution due to access difficulties.

Pedestrian Crossings and Curb Ramps

New utility structures should not be placed within street crossing and curb ramp areas.

Existing vaults located in the center accessible portion of a ramp should be moved or modified to meet accessibility requirements, as feasible, as part of utility upgrades.

Catch basins and surface flow lines associated with storm drainage systems should be located away from the crosswalk or between curb ramps. Catch basins should be located upstream of curb ramps to prevent ponding at the bottom of the ramp.

Consolidation

Utilities should be consolidated for efficiencies and to minimize disruption to the streetscape:

- Dry utility lines and conduits (telephone, CATV, electric, gas, etc.) should be initially aligned, rearranged, or vertically stacked to minimize utility zones.
- Wherever possible, utility conduits, valves and vaults (e.g., electrical, street lighting and traffic signals) should be consolidated if multiple lines exist within a single street or sidewalk section.
- Dry utilities (gas, telephone, CATV, primary and secondary electric, streetlights) may use shared vaults wherever possible. San Francisco has proposed shared vaults with predetermined color coded conduits per predetermined city standards.
- Street lighting, traffic signal and light rail or streetcar catenary poles should share poles wherever possible. When retrofitting existing streets or creating new streets, pursue opportunities to combine these poles.

Other Design Guidelines

Street design and new development should consider the overall pattern of plantings, lighting and furnishings when placing new utilities in the street and locate utility lines so as to minimize disruption to the prevailing streetscape rhythms.

Utilities should be located underground wherever possible, as opposed to overhead or surface-mounted. Overhead utilities should be located in alleys where possible.

New utilities should use durable pipe materials resistant to damage by tree roots and have minimal joints.

Trenchless technologies, such as moling and tunneling, should be used wherever possible to avoid excavation and disruption of streetscape elements.

New infrastructure projects should use resource-efficient utility materials. Re-used or recyclable materials should be incorporated wherever possible.

Utility boxes may be painted as part of a public art program.

Tree removal should be avoided and minimized during the routing of large-scale utility undergrounding projects.

Any utility-related roadway or sidewalk work should replace paving material in kind (e.g., brick for brick) where removed during maintenance, or replace with upgraded paving materials.

New Development and Major Redevelopment

Alleys for vehicle, utility and service access should be incorporated to enable a more consistent streetscape and minimize above-ground utilities.

New utilities should be located to minimize disruption to streetscape elements per guidelines in this section.

Abandonment

Abandoned dry conduits should be reused or consolidated if duplicate lines are discovered during street improvement projects. Utilities should be contacted for rerouting or consolidation. Where it is not possible to reuse abandoned mains, conduits, manholes, laterals, valves, etc., they should be removed per agency recommendations when possible to minimize future conflicts. Abandoned water and sewer lines may be retrofitted as dry utility conduits where available or if possible to minimize the need for future conduit installations.

Process

Utility installation and repair should be coordinated with planned street reconstruction or major streetscape improvements.

New development should submit utility plans with initial development proposals so that utilities may be sited to minimize interference with potential locations for streetscape elements.

Utility work also offers opportunities to make other changes to the street after the work is completed and should be coordinated with planned improvements to avoid duplication of efforts or making new cuts in new pavement. Examples of improvements to streets that can be done at low cost after utility work include restriping for bicycle lanes if utility work requires total street repaving, as well as building sidewalks in conjunction with utility work occurring outside the traveled way.

Additional Resources

- Lancaster, B. Rainwater *Harvesting for Drylands and Beyond, http://www.harvestingrainwater.com/*
- Landscape Architecture Foundation's *Landscape Performance Series, www.lafoundation.org/lps*

9 Related Transportation Modes

Public transit serves a vital transportation function for many people. It is their access to jobs, school, shopping, recreation, visitation, worship and other daily functions. Except for subways and rail lines on exclusive rights-of-way, most transit uses streets. For transit to provide optimal service, streets must accommodate transit vehicles as well as access to stops. Transit connects passengers to destinations and is an integral component of shaping future growth into a more sustainable form. Transit design should also support placemaking.

This chapter provides design guidance for both transit stops and transit operating in the streets, including bus stop layout and placement and the use of bus bulbs and transit lanes.

9.1 Designing Streets for Transit

Public transit should be planned and designed as part of the street system. It should interface seamlessly with other modes, recognizing that successful transit depends on customers getting to the service via walking, bicycling, car, taxi or paratransit. Transit should be planned following these principles:

- Transit has a high priority on city streets. On some streets, transit vehicles should have higher priority than private vehicles.
- The busiest transit lines should have designated bus lanes.
- Where ridership justifies, some streets, called transit malls, may permit only buses or trains in the travelled way. These often also allow bicycles.
- Technology should be applied to increase average speeds of transit vehicles where appropriate.
- Transit stops should be easily accessible, with safe and convenient crossing opportunities.
- Transit stops should be active and attractive public spaces that attract people on a regular basis, at various times of day and all days of the week.
- Transit stops function as community destinations. The largest stops and stations should be designed to facilitate programming for a range of community activities and events.
- Transit stops should include amenities for passengers waiting to board.
- Transit stops should provide space for a variety of amenities in commercial areas, to serve residents, shoppers and commuters alike.

- Transit stops should be attractive and visible from a distance.
- Transit stop placement and design influences accessibility to transit and network operations and influences travel behavior/mode choice.

Zoning codes, local land use ordinances and design guidelines around transit stations should encourage walking and a mix of land uses. Streets that connect neighborhoods to transit facilities should be especially attractive, comfortable and safe and inviting for pedestrians and cyclists.

Access to Transit

Transit depends primarily on walking to function well. Most transit users walk to and from transit stops. Sidewalks on streets served by transit and on the streets that lead to transit corridors provide basic access. Bicycle-friendly streets do the same for those who access transit by bicycle.

Every transit trip also requires a safe and convenient street crossing at the transit stop. A disproportionally high number of pedestrian crossing crashes occur at transit stops. Every transit stop should be evaluated for its crossing opportunities. If the crossing is deemed unsafe, mitigation can occur in two ways: a crossing should be provided at the existing stop, or the stop can be moved to a location with a safer crossing. Simply stated, there should not be transit stops without means to safely and conveniently cross the street.

Bus stops should be designed for passengers (Credit: Sky Yim)

But simply moving a stop is not always a service to transit users who may have to walk further to access their stop. Convenient access by passengers must remain at the forefront of all transit stop planning: eliminating stops because they are perceived as unsafe will not be satisfactory to riders who cannot walk very far. But eliminating or consolidating stops can be beneficial to transit operations and users by reducing the number of times a bus, streetcar, or light rail train has to stop. The trade-offs are added walking time for users but reduced transit operator delay, resulting in a shorter journey overall. For example, this might mean a two to three minute longer walk for some passengers, but an eight to 10 minute shorter bus ride for all.

Bus Stops

The following sections provide guidance for designing bus stops.

Layout

A well placed and configured transit stop offers the following characteristics:

- Clearly defines the stop as a special place
- Provides a visual cue on where to wait for a transit vehicle
- Does not block the path of travel on the adjacent sidewalk
- Allows for ease of access between the sidewalk, the transit stop and the transit vehicle

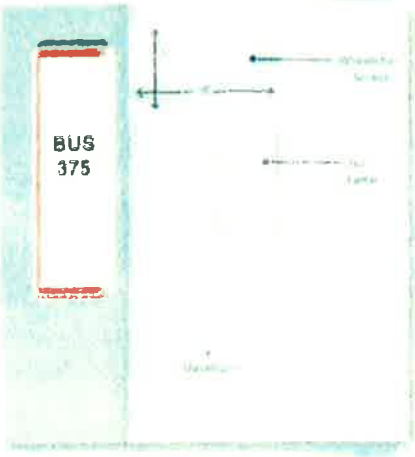
Bus stops are centers of activity (Credit: Ryan Snyder)

Layout guidelines include the following:

- Consolidate streetscape elements to create a clear waiting space and minimize obstructions between the sidewalk, waiting area and boarding area
- Consider the use of special paving treatments or curb extensions (where there is on-street parking) to distinguish transit stops from the adjacent sidewalks
- Integrate transit stops with adjacent activity centers whenever possible to create active and safe places
- Avoid locating bus stops adjacent to driveways, curb cuts and land uses that generate a large number of automobile trips (gas stations, drive-thru restaurants, etc.)

Transit stops are required by the *Americans with Disabilities Act* (ADA) to be accessible. Specifically, ADA requires a clear loading area (minimum five feet by eight feet) perpendicular to the curb with a maximum two percent cross-slope to allow a transit vehicle to extend its lift to allow people with disabilities to board. The loading area should be located where the transit vehicle has its lift and be accessible directly from a transit shelter. The stop must also provide 30 by 40 inches of clear space within a shelter to accommodate wheelchairs. The greater use of low-floor transit vehicles may make this requirement moot, but it will still be necessary to provide enough room so wheelchair users can access all doors.

Examples of bus stop amenities (Credit: Sky Yim)



ADA-compliant bus stop (Credit: Michele Weisbart)

Transit-specific Streetscape Elements

The essential streetscape elements for transit include signs, shelters and benches:

- Flag signs indicate where people are to wait and board a transit vehicle. The signs should clearly identify the transit operator, route number and schedule.
- Maps showing the transit lines servicing that stop, local destinations and additional transfer transit lines should also be provided. Flag signs should be located towards the front of the stop
- Benches should be provided at transit stops with headways longer than five minutes.

Shelters keep waiting passengers out of the rain and sun and provide increased comfort and security. Shelters vary in size and design. Standard shelters are three to seven feet wide and six to 16 feet long. They include covered seating and sign panels that can be used for transit information. Shelters should:

- Be provided at transit stops with headways longer than 10 minutes
- Have electrical connections to power lighting and/or real-time transit information, or accommodate solar power
- Be set back from the front of the bus stop to allow for the bus to merge into travel lanes when the stop is located at the far side of an intersection or at a mid-block location. This setback is not required when the stop is located at the near side of the intersection or at a bus bulb.

Bus stop shelter (Credit: Sky Yim)

Shelters should be located in a sidewalk's furniture zone so they do not conflict with the pedestrian zone. Shelters may be placed in the sidewalk's frontage zone provided that they do not block building entrances or the pedestrian zone.

Transit stops should also provide other amenities to make waiting for the next bus comfortable:

- Trash/recycling receptacles should be provided and maintained at most stops.
- Depending on headways and the number of passengers boarding and alighting, electronic "next bus" readouts can be used to inform passengers when to expect the next bus.
- Very busy bus stops and transit stations should include space for vendors to sell newspapers, magazines, flowers and other goods to keep the stops lively.
- Rapid bus lines can include facilities that allow passengers to pay their fare before boarding the bus. Along with wide doors on buses, this allows buses to reduce their travel time by reducing dwell time at stops.

Pre-board fare payment system: Guangzhou, China (Credit: Ryan Snyder)

Bus Stop Placement

A bus stop's optimal placement depends on the operational characteristics of both the roadway and the transit system. The placement of bus stops at the far side of signalized intersections is generally considered to be preferable to near side or mid-block locations. However, each location has its advantages and disadvantages.

In general, bus stops should be located at the far side of a signalized intersection in order to enhance the effectiveness of traffic signal synchronization or bus signal priority projects. Near-side bus stops are appropriate for stop sign-controlled intersections. But in all cases priority should be given to the location that best serves the passengers.

Signal prioritization is a component of technology-based "intelligent transportation systems" (ITS). These systems are often used by road authorities in conjunction with transit agencies to help improve a roadway system's overall operations in the following ways:

- Reduce traffic signal delays for transit vehicles
- Improve an intersection's person throughput
- Reduce the need for transit vehicles to stop for traffic at intersections
- Help reduce transit vehicles' travel time
- Help improve transit system reliability and reduce waiting time for people at transit stops

See Table 9.1 for more information.

Table 9.1 Bus Stop Placement Considerations

Location	Advantage	Disadvantage
Near Side	• Minimizes interference when traffic is heavy on the far side of an intersection • Provides an area for a bus to pull away from the curb and merge with traffic • Minimizes the number of stops for buses • Allows passengers to board and alight while the bus is stopped at a red light • Allows passengers to board and alight without crossing the street if their destination is on the same side of the street. This is most important where one side of the street has an important destination, such as a school, shopping center, or employment center that generates more passenger demand than the far side.	• Increases conflicts with right-turning vehicles • Stopped buses may obscure curb-side traffic control devices and crossing pedestrians • Obscures sight distances for vehicles crossing the intersection that are stopped to the right of the buses • Decreases roadway capacity during peak periods due to buses queuing in through lanes near bus stops • Decreases sight distance of on-coming traffic for pedestrians crossing intersections • Can delay buses that arrive during the green signal phase and finish boarding during the red phase • Less safe for passengers crossing in front of the bus
Far Side	• Minimizes conflicts between right-turning vehicles and buses • Optimal location for traffic signal synchronized corridors • Provides additional right-turn capacity by allowing traffic to use the right lane • Improves sight distance for buses approaching intersections • Requires shorter deceleration distances for buses • Signalized intersections create traffic gaps for buses to reenter traffic lanes • Improves pedestrian safety as passengers cross in back of the bus	• Queuing buses may block the intersection during peak periods • Sight distance may be obstructed for vehicles approaching intersections • May increase the number of rear-end accidents if drivers do not expect a bus to stop after crossing an intersection • Stopping both at a signalized intersection and a far-side stop may interfere with bus operations
Mid-Block	• Minimizes sight distance problems for pedestrians and vehicles • Boarding areas experience less congestion and conflicts with pedestrian travel paths • Can be located adjacent to or directly across from a major transit midblock use generator	• Decreases on-street parking supply (unless mitigated with a curb extension) • Requires a mid-block pedestrian crossing • Increases walking distance to intersections • Stopping buses and mid-block pedestrian crossings may disrupt mid-block traffic flow

Signal Prioritization

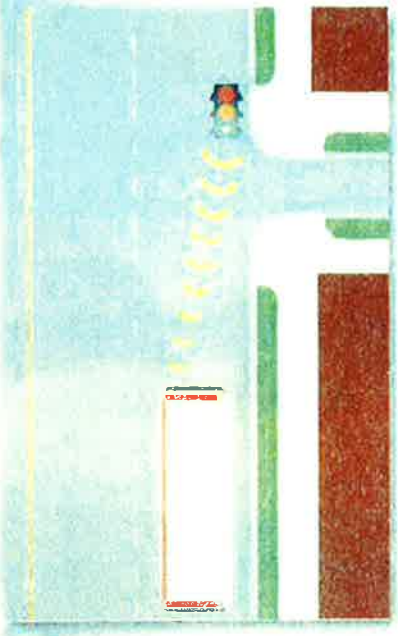
Signal prioritization projects include signal timing or phasing projects and transit signal priority projects.

Signal timing projects optimize the traffic signals along a corridor to make better use of available green time capacity by favoring a peak directional traffic flow. These passive systems give priority to roadways with significant transit use within a district-wide traffic signal timing scheme. Transit signal prioritization can also be achieved by timing a corridor's traffic signals based on a bus's average operating speed instead of an automobile's average speed.

Transit signal-priority projects alter a traffic signal's phasing as a transit vehicle approaches an intersection. This active system requires the installation of specialized equipment at an intersection's traffic signal controller and on the transit vehicle. It can either give an early green signal or hold a green signal that is already being displayed in order to allow buses that are operating behind schedule to get back on schedule. Signal-priority projects also help improve a transit system's schedule adherence, operating time, and reliability.

Although they may use similar equipment, signal-priority and pre-emption are two different processes. Signal-priority modifies the normal signal operation process to better accommodate transit vehicles, while signal pre-emption interrupts the normal signal to favor transit or emergency vehicles.

The placement of a bus stop at the far side of a signalized intersection increases the effectiveness of transit signal-priority projects. Signal treatments should be used along streets with significant bus service.

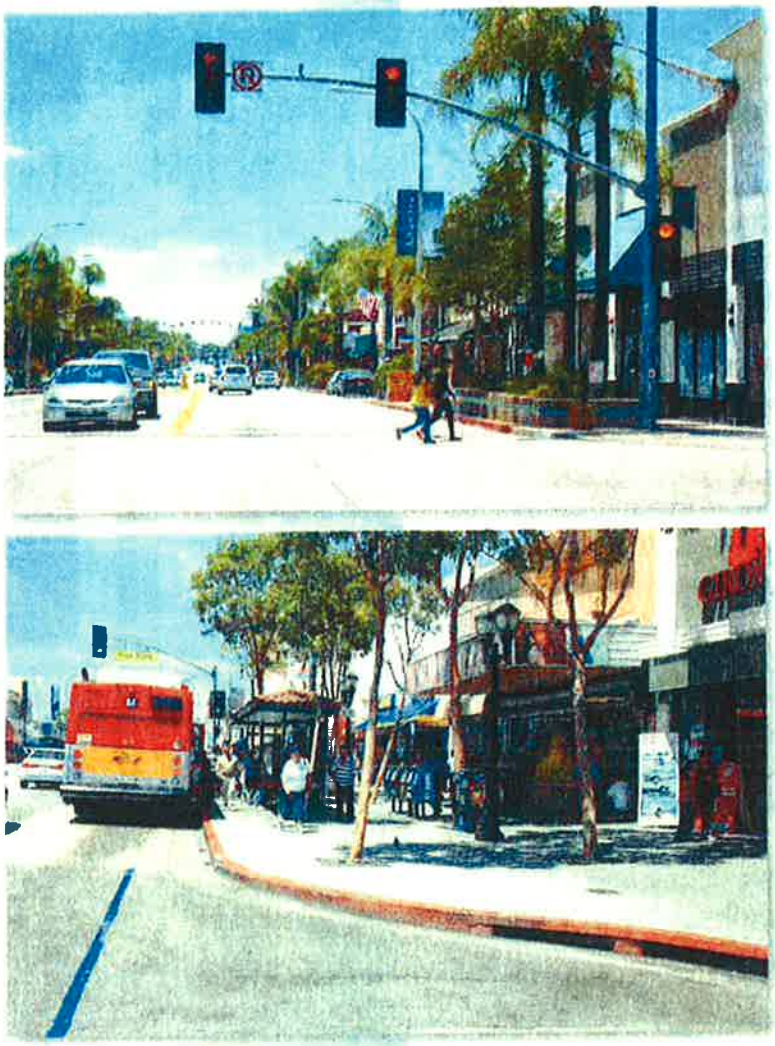


Prioritization can reduce delays (Credit: Michele Weisbart)

Bus Bulbs

Bus bulbs are curb extensions that extend the length of the transit stop on streets with on-street parking. They improve transit performance by eliminating the need for buses to merge into mixed traffic after every stop. They also facilitate passenger boarding by allowing the bus to align directly with the curb. Waiting passengers can enter the bus immediately after it has stopped. They improve pedestrian conditions by providing additional space for people to wait for transit and by allowing the placement of bus shelters where they do not conflict with a sidewalk's pedestrian zone. Bus bulbs also reduce the crossing distance of a street for pedestrians if they are located at a crossing. In most situations, buses picking up passengers at bus bulbs block the curbside travel lane, but this is mitigated by the reduced dwell time, since it takes less time for the bus driver to position the bus correctly and less time for passengers to board.

One major advantage of bus bulbs over pulling over to the curb is that they require less parking removal. Typically only two on-street parking spots need to be removed for a bus bulb instead of four for a bus pull-out.



Bus bulbs: Huntington Park and Alhambra, CA (Credit: Sky Yim)

The following conditions should be given priority for the placement of transit bus bulbs:

- Where transit performance is significantly slowed by the transit vehicle's merging into a mixed-flow travel lane
- Roadways served by express or Bus Rapid Transit (BRT) lines
- Stops that serve as major transfer points
- Areas with heavy transit and pedestrian activity and where narrow sidewalks do not allow for the placement of a bus shelter without conflicting with the pedestrian zone
- Bus bulbs should not be considered for stops with any of the following:
- A queue-jumping lane provided for buses
- On-street parking prohibited during peak travel periods
- Near-side stops located at intersections with heavy right-turn movements, except along streets with a "transit-first" policy

At a minimum, bus bulbs should be long enough to accommodate all doors of a transit vehicle to allow for the boarding and alighting of all passengers, or be long enough to accommodate two or more buses (with a five foot clearance between buses and a 10 foot clearance behind a bus) where there is frequent service such as with BRT or other express lines. Bus bulbs located on the far side of a signalized intersection should be long enough to accommodate the complete length of a bus so that the rear of the bus does not intrude into the intersection.

Table 9.2 Standard Transit Vehicle and Transit Bus Bulb Dimensions

Vehicle	Length (feet)	Number of buses at Stop	Platform Length (feet) Near Side	Far Side
Standard bus	40	1	35	45
		2	55	65
Articulated bus	60	1	80	90
		2	120	130

9.2 Urban Design

Bus stops and amenities vary in complexity and design from standardized off-the-shelf signs and furniture to specially designed elements. The design of the bus stop elements, location of the bus stop in relation to adjacent land uses or activities and the quality of the roadway's pedestrian environment contribute to a bus stop's placemaking. Transit operators like a branded look to their stops so they are easily identified, but often there is room for customized designs to fit in with the neighborhood, with at least some of the features and amenities.

Bus stops should be integrated with their surroundings: Glendale, CA (Credit: Ryan Snyder)

Bicycle Connections

Connecting bicycle facilities to transit stations helps extend the trip length for cyclists and reduces automobile travel. Secure bicycle parking must be provided at or within close proximity to a bus stop, preferably sheltered. At a minimum, the accommodations can be bicycle racks or lockers. Bicycle stations and automated bicycle parking can be located at areas with high levels of transit and bicycle use.

Bicycle facilities at transit stations encourage intermodal travel: Los Angeles, CA (Credit: Ryan Snyder)

Bus Lanes

Bus lanes provide exclusive or semi-exclusive use for transit vehicles to improve the transit system's travel time and operating efficiency by separating transit from congested travel lanes. They can be located in an exclusive right-of-way or share a roadway right-of-way. They can be physically separated from other travel lanes or differentiated by lane markings and signs.

Bus lanes can be located within a roadway median or along a curb-side lane and are identified by lane markings and signs. They should generally be at least 11 feet wide, but where bicycles share the lane with buses, 13 to 15 feet wide is preferred. When creating bus lanes, cities should consider the following:

Bus-only lane: Santa Monica, CA (Credit: Sky Yim)

- Exclusive transit use may be limited to peak travel periods or shared with high-occupancy vehicles.
- On-street parking may be allowed depending on roadway design, especially with bus lanes located in the center of the street.
- A mixed-flow lane or on-street parking may be displaced. This is preferable to adding a lane to an already wide roadway, which increases the crossing distance for pedestrians and creates other problems discussed in other chapters.
- Within a mixed-flow lane, the roadway can be delineated by striping and signs.
- High-occupancy vehicles and/or bicycles may be permitted to use bus lanes.

Existing Bus Transit

Three Orange County Transportation Authority (OCTA) bus routes serve San Clemente. All OCTA busses are equipped with racks that hold two bikes, available on a first-come, first-served basis. If the rack is full, bikes are not permitted inside buses, except for the last trip of the day.

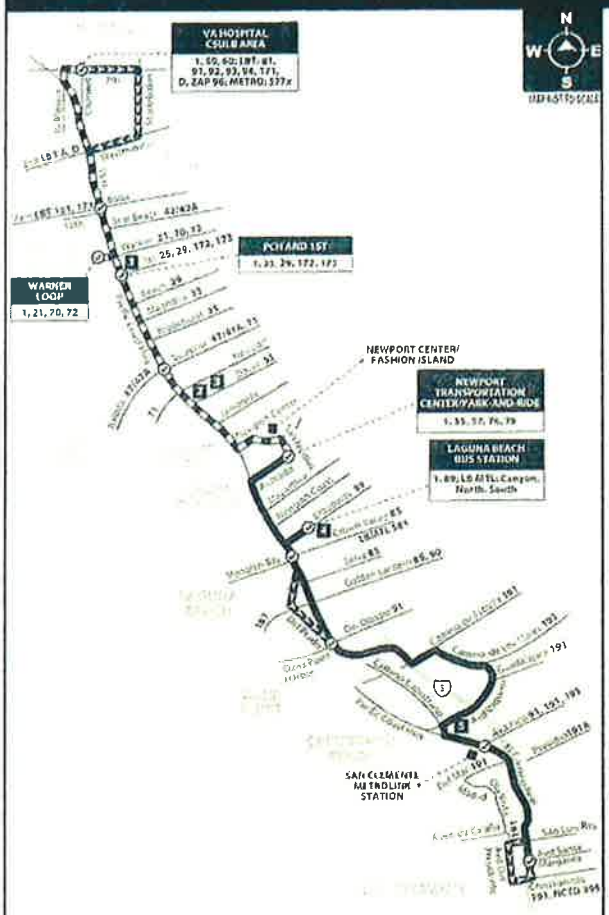
Route 1 connects San Clemente with Long Beach and travels the entire length of the City, primarily on El Camino Real and turning around at Cristianitos Road. It does provide an intermodal connection with the San Clemente Metrolink Station at North Beach.

Route 91 connects the City with Laguna Hills, but only enters the City as far south as Calle De Los Molinos. This is its turnaround point, which allows the route to provide an intermodal connection with the San Clemente Metrolink Station.

Route 191 connects San Clemente with Mission Viejo. It serves the coastal portion of the City including the San Clemente Pier Station and the San Clemente Metrolink Station. It turns inland via Avenida Pico to provide service for the inland employment center bounded by Calle Del Cerro, Avenida Vista Montana, Avenida La Pata and Avenida Pico. This route utilizes mid-size or small busses.

Route 1

Long Beach to San Clemente
via Pacific Coast Hwy



SERVICE TO / SERVICIO A

Long Beach
- VA Hospital
- Cal State Long Beach

Seal Beach
- Seal Beach City Hall

Sunset Beach

Huntington Beach
1 - Ethel Dwyer Middle School
- Huntington Beach Pier

Newport Beach
2 - Horace Ensign Intermediate School
3 - Newport Harbor High School
- Newport Center/Fashion Island
- Newport Transportation Center

Corona del Mar
- Emerald Bay

Laguna Beach
4 - Laguna Beach High School
- Laguna Beach Bus Station
- Laguna Beach Civic Center
- Monarch Bay
- South Coast Medical Center

Dana Point
- Salt Creek Beach

Capistrano Beach

San Clemente
5 - Shorecliffs Middle School
- San Clemente (Metrolink Station)

LEGEND / LEYENDA

- Scheduled Departure
- Regular Routing
- Southbound Only
- No Service On Some Trips
- 1 Middle or High School

LBT = Long Beach Transit
NCTD = North County Transit District (San Diego)
LB MTL = Laguna Beach Municipal Transit Lines
METRO = Los Angeles MTA

Numbers on streets indicate transfers
Números en la calle indican trasbordos

Route 001/042010

MONDAY - FRIDAY: Northbound
TO: Newport Transportation Center or Long Beach

El Camino Real & Avd Santa Margarita	El Camino Real & Avd Pico	Pacific Coast Hwy & Del Obispo	Pacific Coast Hwy & Crown Valley	Laguna Beach Bus Station	Newport Transportation Center	Pacific Coast Hwy & Superior	Pacific Coast Hwy & 1st	Warner & Pacific Coast Hwy	Pacific Coast Hwy & Bolsa	7th & Channel
4:30	4:42	4:54	5:03	5:20	5:37	5:48	5:56	6:08	6:15	6:22
5:13	5:25	5:40	5:49	6:06	6:28	6:40	6:50	7:03	7:11	7:20
6:00	6:12	6:27	6:36	6:53	7:15					
6:27	6:42	6:56	7:05	7:26	7:50	8:03	8:13	8:26	8:34	8:44
6:58	7:13	7:28	7:39	8:01	8:25					
7:30	7:45	8:00	8:11	8:33	8:57	9:12	9:22	9:33	9:43	9:52
8:02	8:17	8:32	8:43	9:05	9:29					
8:32	8:47	9:02	9:13	9:35	9:59	10:14	10:24	10:35	10:45	10:54
9:01	9:16	9:31	9:42	10:04	10:28					
9:33	9:48	10:03	10:13	10:34	10:58	11:12	11:22	11:33	11:42	11:51
9:57	10:12	10:27	10:37	11:01	11:28					
10:27	10:42	10:57	11:07	11:31	11:58	12:15	12:26	12:40	12:49	12:59
10:59	11:14	11:29	11:39	12:03	12:30					
11:29	11:44	11:59	12:09	12:33	1:00	1:17	1:28	1:42	1:51	2:01
12:00	12:15	12:30	12:40	1:04	1:31					
12:30	12:45	1:00	1:10	1:34	2:01	2:18	2:29	2:43	2:52	3:02
1:01	1:16	1:31	1:41	2:05	2:32					
1:22	1:37	1:52	2:02	2:30	3:02	3:19	3:32	3:47	3:57	4:06
1:46	2:02	2:19	2:31	2:58	3:34					
2:25	2:41	2:57	3:07	3:35	4:05	4:22	4:36	4:52	5:02	5:13
2:58	3:14	3:30	3:40	4:08	4:38					
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5:45	5:59	6:14	6:24	6:47	7:12	7:28	7:40	7:53	8:03	8:11
6:16	6:30	6:45	6:55	7:18	7:43					
6:53	7:08	7:22	7:32	7:51	8:13	8:27	8:39	8:53	9:02	9:10
7:48	8:02	8:16	8:25	8:44	9:05	9:16	9:27	9:41	9:48	9:55
8:56	9:08	9:20	9:28	9:45	10:05					
9:59	10:09	10:21	10:28	10:45	11:05					

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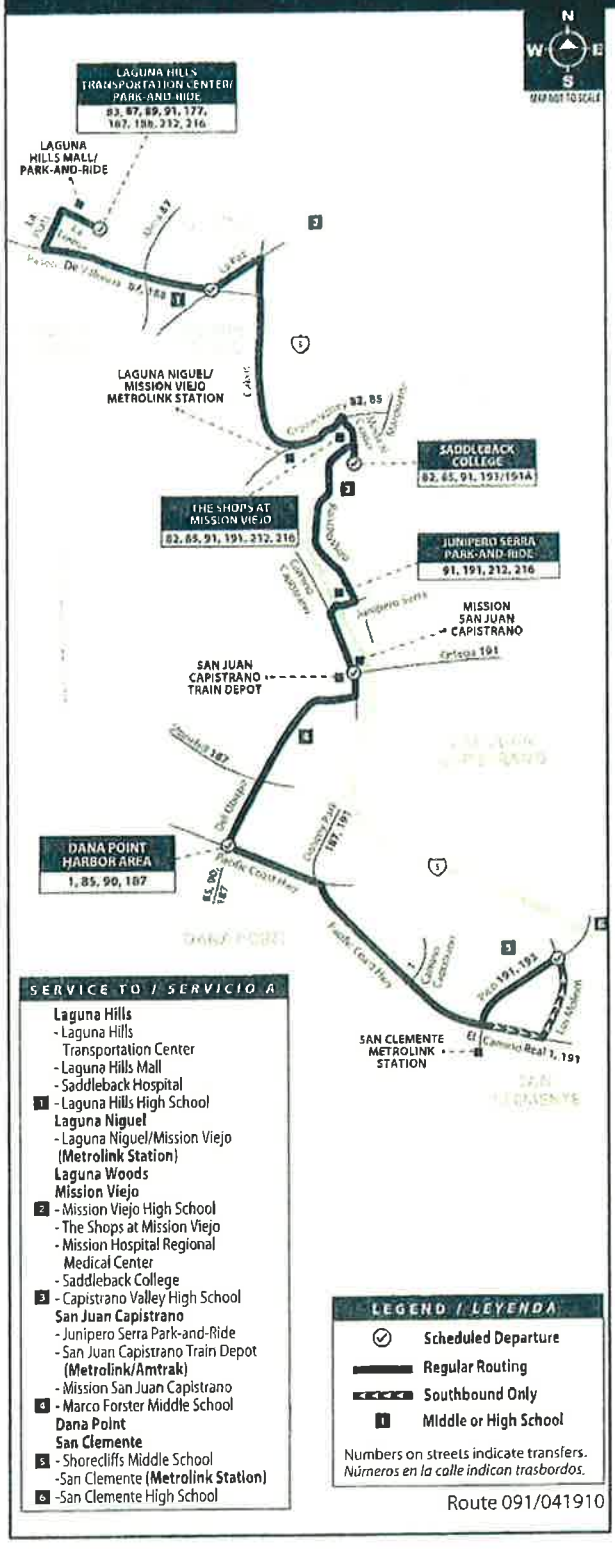
Effective June 13, 2010

Route 91

Laguna Hills to San Clemente
via Paseo De Valencia / Camino Capistrano / Del Obispo St



SERVICE TO / SERVICIO A

Laguna Hills
- Laguna Hills Transportation Center
- Laguna Hills Mall
- Saddleback Hospital
1 - Laguna Hills High School

Laguna Niguel
- Laguna Niguel/Mission Viejo **(Metrolink Station)**

Laguna Woods

Mission Viejo
2 - Mission Viejo High School
- The Shops at Mission Viejo
- Mission Hospital Regional Medical Center
- Saddleback College
3 - Capistrano Valley High School

San Juan Capistrano
- Junipero Serra Park-and-Ride
- San Juan Capistrano Train Depot **(Metrolink/Amtrak)**
- Mission San Juan Capistrano
4 - Marco Forster Middle School

Dana Point

San Clemente
5 - Shorecliffs Middle School
- San Clemente **(Metrolink Station)**
6 - San Clemente High School

LEGEND / LEYENDA

- Scheduled Departure
- Regular Routing
- Southbound Only
- Middle or High School

Numbers on streets indicate transfers.
Números en la calle indican trasbordos.

Route 091/041910

MONDAY - FRIDAY: Northbound
TO: Laguna Hills Transportation Center

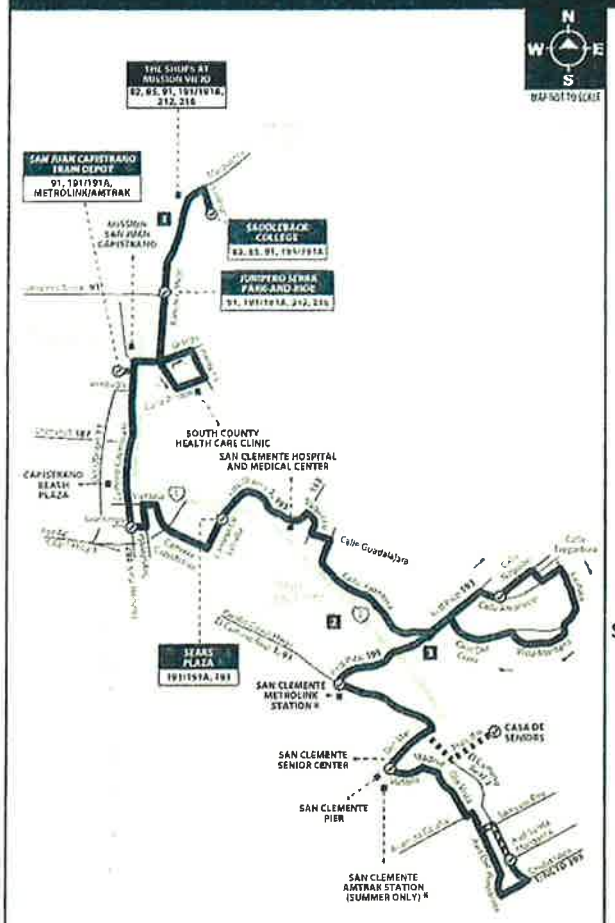
	Pico & Los Molinos	Pacific Coast Hwy & Del Obispo	Camino Capistrano & Ortega	Saddleback College	Paseo De Valencia & La Paz	Laguna Hills Transportation Center
	4:57	5:06	5:15	5:30	5:42	5:53
	5:32	5:41	5:50	6:05	6:21	6:34
	6:07	6:16	6:25	6:40	6:56	7:09
	6:30	6:41	6:56	7:15	7:31	7:44
	7:05	7:16	7:31	7:50	8:06	8:19
	7:40	7:51	8:06	8:25	8:41	8:54
	8:20	8:31	8:43	9:00	9:17	9:30
	8:55	9:06	9:18	9:35	9:52	10:05
	9:30	9:41	9:53	10:10	10:27	10:40
	10:05	10:16	10:28	10:45	11:02	11:15
	10:40	10:51	11:03	11:20	11:37	11:50
	11:15	11:26	11:38	11:55	**12:12**	**12:25**
	11:50	**12:01**	**12:13**	**12:30**	**12:47**	**1:00**
	12:25	**12:36**	**12:48**	**1:05**	**1:22**	**1:35**
	1:00	**1:11**	**1:23**	**1:40**	**1:57**	**2:10**
	1:35	**1:46**	**1:58**	**2:15**	**2:32**	**2:45**
	2:10	**2:21**	**2:33**	**2:50**	**3:07**	**3:20**
	2:45	**2:56**	**3:08**	**3:25**	**3:42**	**3:55**
	3:11	**3:22**	**3:43**	**4:00**	**4:20**	**4:33**
S		**3:24**	**3:45**	**4:02**		
	3:50	**4:02**	**4:16**	**4:35**	**4:53**	**5:06**
	4:25	**4:37**	**4:51**	**5:10**	**5:28**	**5:41**
	5:00	**5:12**	**5:26**	**5:45**	**6:03**	**6:16**
	5:45	**5:57**	**6:11**	**6:30**	**6:48**	**7:01**
	6:57	**7:06**	**7:16**	**7:30**	**7:45**	**7:55**
	7:57	**8:06**	**8:16**	**8:30**	**8:45**	**8:55**
	8:57	**9:06**	**9:16**	**9:30**	**9:45**	**9:55**
	10:03	**10:12**	**10:19**	**10:30**	**10:42**	**10:52**

S = Operates on days when Dana Hills High School and Marco Forster Middle School are in session.

www.octa.net *Effective June 13, 2010*

Route 191/191A

Mission Viejo to San Clemente
via Rancho Viejo Rd / Camino Capistrano / El Camino Real



*Metrolink and Amtrak operate separate stations in San Clemente (San Clemente Amtrak Summer only). Please Note: This route is operated using mid-size or small buses

SERVICE TO / SERVICIO A

Mission Viejo
- The Shops at Mission Viejo
- Saddleback College
- 1 - Capistrano Valley High School

San Juan Capistrano
- San Juan Capistrano Train Depot (Metrolink/Amtrak)
- South County Health Care Clinic
- Junipero Serra Park-and-Ride
- Mission San Juan Capistrano

Dana Point
- Capistrano Beach

San Clemente
- Sears Plaza
- Rancho San Clemente
- San Clemente Hospital and Medical Center
- 2 - Shorecliffs Middle School
- 3 - San Clemente High School
- San Clemente Civic Center
- San Clemente Metrolink Station*
- San Clemente Amtrak Station* (Summer Only)
- Casa de Seniors
- San Clemente Senior Center
- San Clemente Pier

LEGEND / LEYENDA

- Scheduled Departure
- Regular Routing
- Northbound Only
- 191A Routing
- 1 Middle or High School

Numbers on streets indicate transfers
Números en la calle indican trasbordos

Route 191/10809

MONDAY - FRIDAY: Northbound
TO: Mission Viejo

El Camino Real & Avd Santa Margarita	San Clemente Pier	Casa de Seniors	San Clemente Metrolink Station	Calle Negocio & Calle Amanecer	Sears Plaza	Doheny Park & Domingo	San Juan Capistrano Train Station	San Juan Capistrano Park-and-Ride	Saddleback College	
6:00	6:09	·····	6:19	6:24	6:47	6:55	7:05	7:17	7:28	
6:30	6:39	·····	6:49	6:59	7:22	7:30	7:40	7:51	8:02	
7:00	7:09	·····	7:19	7:29	7:52	8:00	8:10	8:21	8:32	
7:30	7:39	·····	7:49	7:59	8:22	8:30	8:40	8:51	9:02	
8:00	8:09	8:18	8:26	8:36	8:59	9:07	9:17	9:28	9:39	A
9:00	9:10	·····	9:19	9:27	9:49	9:56	10:06	10:19	10:30	
9:52	10:02	10:11	10:19	10:27	10:49	10:56	11:06	11:19	11:30	A
11:00	11:10	·····	11:19	11:27	11:49	11:56	12:06	12:19	12:30	
11:52	12:02	12:11	12:19	12:26	12:49	12:56	1:06	1:19	1:30	A
1:00	1:09	·····	1:17	1:26	1:49	1:56	2:07	2:20	2:31	
1:52	2:01	2:10	2:17	2:26	2:49	2:56	3:07	3:20	3:31	A
S			2:50	3:00	3:24					
2:35	2:44	·····	2:52	3:01	3:24	3:31	3:42	3:55	4:06	
3:00	3:09	·····	3:19	3:29	3:53	4:01	4:11	4:22	4:33	
3:30	3:39	·····	3:49	3:59	4:23	4:31	4:41	4:52	5:03	
4:00	4:09	·····	4:19	4:29	4:53	5:01	5:11	5:22	5:33	
4:35	4:44	·····	4:54	5:04	5:28	5:36	5:46	5:57	6:08	
5:05	5:14	·····	5:24	5:32	5:53	6:01	6:11	6:21	6:32	
6:00	6:09	·····	6:19	6:27	6:48	6:55	7:05	7:15	7:26	

A = Trips operate via El Camino Real and Avenida Presidio serving the Casa de Seniors.
S = Operates on days San Clemente High School is in session.

Existing Rail Transit

San Clemente lies on the coastal rail corridor and is therefore served by both the regional Metrolink and nationwide Amtrak rail transit systems.

There are two rail stations in San Clemente. The San Clemente Metrolink Station is located near the intersection of North El Camino Real and Avenida Pico on Boca De La Playa and is generally referred to as the North Beach Station due both to its actual location and to distinguish it from the San Clemente Pier Station located between Avenida Victoria at the San Clemente Pier. The San Clemente Pier Station is much smaller and consists of simply an uncovered platform and a ticket kiosk.

Metrolink's Orange County Line provides regional transit service for the southern California area up to Ventura County and down to the single station south of San Clemente in San Diego County at Oceanside. In San Clemente, virtually all Metrolink trains stop at the North Beach Station, but stop at the San Clemente Pier Station on a limited basis. Each Metrolink car provides space for four to eight standard sized bikes. Riders must bring their own securing straps. During crowded conditions, the conductor may require a cyclist to move to a different car or wait for another train.

Amtrak's Pacific Surfliner shares the San Clemente Pier Station with Metrolink, but stops in downtown San Clemente on only a very limited basis. Cyclists must reserve space for bicycles when they make a ticket reservation and Amtrak charges a fee for this service. Bicycles are restricted to the designated bicycle parking area and only if space is available. Supplemental restraints are recommended. Bicycles are generally exempt from size requirements on Amtrak, but restrictions may vary by route.

9.3 Existing Trails

The City has a network of trails that run from the beach, up the canyons and along its ridge lines. These trails have been designed to provide a safe walking, hiking and riding experience while maintaining San Clemente's coastal environment. The ridge line trails provide spectacular views of the coast in both directions and pristine coastal canyons in adjacent wildlife reserves. Deer, coyote and bobcats are common, a well as a full complement of local and seasonal birds. San Clemente is an unusual Orange County coastal city in that is bordered on two sides by protected wild lands easily accessible via to San Clemente's citizens the City's trail system. The San Onofre State Beach Park open space along the City's eastern boundary contains a particularly attractive, mostly singletrack trail system especially popular with area mountain bikers.

Beach Trail

A number of these trails traverse undeveloped canyons lying within otherwise developed residential areas. These trails therefore provide the direct access from neighborhoods that the best trail systems are known for. The City of San Clemente publishes an excellent trail map with a wealth of information on trail grades, degree of difficulty and nearby parking availability (See following pages).

Connectivity with existing trails was a consideration when recommending bicycle and pedestrian facilities in this Plan. Ideally, the overall non-motorized mobility network should include direct access to the trail component of the system, further reducing the need to drive a vehicle. Wherever possible, the City should take advantage of opportunities to enhance the network to make connections between the on- and off-street systems as seamless as possible.

Contour singletrack trail - San Onofre State Beach Park

Future trail development in San Clemente's hilly environment, should be carefully designed to avoid overly steep grades that virtually always lead to erosion. With proper design, sustainable and fun trails can be developed by routing across steep slopes and limiting grades to 10 percent, a process known as "contouring." As well as limiting overall grades, other important factors include limiting width to as narrow as possible and designing alignments to change direction and elevation frequently. These design features control erosion in a sustainable manner, which helps to satisfy environmental concerns, as well as result in trails with excellent "trail experience" that all users will appreciate.

A highly recommended trail design resource is the International Mountain Bicycling Association's *Trail Solutions: IMBA's Guide to Building Sweet Singletrack*, which addresses trails for all users in an effective and clear portrayal. For example, it offers the following on contour trail design:

- Do everything possible to keep water off the trail and users on it.
- Build on the contour and use frequent grade reversals to channel water off - "Surf" the hillside. Instead of building switchbacks, build on the contours as much as possible.
- Follow the half-rule: A trail's grade should not exceed half the grade of the sideslope.
- Maximum grade should be 15 percent (except for natural or built rock structures).
- Average grade should stay under 10 percent (with grade reversals) and even less is preferred.
- Route trails to positive control points (viewpoints, water, other attractions).
- Use bench-cut construction and excavate soil from the hillside.
- For reroutes, reclaim old trail thoroughly, including the visual corridor and the old trail tread.
- For highly technical trails where grade will sometimes exceed 15 percent, use natural rock, rock armoring or other rock features to add challenge and maintain sustainability.

Following these basic guidelines will ensure sustainable and enjoyable trails.


San Clemente Trails
Bike Ways
San Juan Capistrano
Orange County
Donna O'Neill Land Conservancy
theconservancy.org
Call to arrange access
949-489-9778
Dana Point
NORTH BEACH
DALE
EL PORTAL
MANRESA
LINDA LANE
CORTO LANE
SAN CLEMENTE PIER
T-STREET
BOCA DEL CAÑON
LOST WINDS
RIVIERA
MONTALVO
CALAFIA
Marine Corps Base Camp Pendleton
San Diego County
Cotton's Point
N
W
E
S
Parking
Restrooms
Trail Access Points
Schools
Water Reservoirs
San Clemente Parks
Parks Under Development
State Parks
Private Golf Courses
High Tension Power Lines
Donna O'Neill Conservancy
PROPOSED Major Roads
Miles
0
0.5
1
2
For Recreation Purposes Only
Not a Legal Document
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San Clemente
Trail & Bike Ways Map

San Clemente Trails

Forster Ridgeline Trail

P Camino Del Rio P Costero Risco

Trail Description: Wide to narrow dirt trails, easy to difficult terrain, light to moderate brush

Highlights: Catalina Viewpoint with Compass Point (A), Rock Garden (B), Ridgeline Terrace (AKA, Stonehenge) (C). Panoramic Ocean views.

Notes: The Northwest end of this trail connects to the San Juan Capistrano Trails. Parking Access: End of Los Mares, street parking on Ponto del Norte). No Parking is available at Vista Hermosa entrance.

Rancho San Clemente & San Pablo Trails

P End of Ave. San Pablo, San Pablo trail entrance, street parking. P 721 Ave Salvador, Rancho San Clemente Ridgeline Trail entrance, street parking. P Steed Park parking lot. Follow steep asphalt path located on hill behind Skate Park. P Cordillera, street parking.

Trail Description: From Ave. San Pablo to Ave. Salvador, wide dirt trail, easy terrain. Short stretch of sidewalk to Rancho San Clemente trail entrance. Wide asphalt trail, light brush, easy to moderate with a few short difficult inclines. At mile-2, cross Calle Del Cerro to continue trail. Last 300 yards steep dirt incline, panoramic viewpoint at top of Knob Hill. All weather trail.

Highlights: Beautiful panoramic views from the mountains to the sea. Cool breezes, easily accessible. Picnic tables and benches along trail.

Talega Trails

P End of Avenida Talega. Short walk to Cristianitos North (left) and Cristianitos South (right)

Trail Description: Wide to narrow dirt trails, moderate to difficult terrain, light brush, suburban to wilderness

Highlights: Olive trees and cool breezes, highest point on San Clemente trail systems.

Notes: Western half of trail under development; loose dirt, rocks and steep grades. Use caution while enjoying the views. Stay on trail; landfill property to the north and land conservancy to the east.

Prima Deshecha South

P Talega Park parking lot or Ave. Cristianitos street parking. Trailhead begins south side of Ave. Pico.

Trail Description: Wide to moderate dirt trails, easy terrain, light brush, winds behind industrial park. Trail continues north at Pico and Vista Hermosa intersection.

Highlights: Northern section has a tropical feel, with multiple palm trees.

Notes: Follow signs to stay on trail on southern section behind industrial park.

Prima Deshecha North

P Limited street parking on El Brazo

Trail Description: Wide to narrow dirt trails, easy to moderate terrain, flowers in the spring, moderate brush, suburban to rural.

Highlights: Wilderness feel at northern end of trail.

Cristianitos South

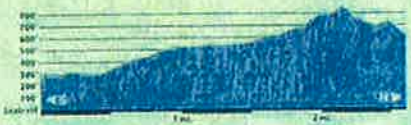
P End of Avenida Talega. Short walk to Cristianitos North (left) and Cristianitos South (right)

P Talega Park parking lot or Ave. Cristianitos street parking. Short distance to trailhead on asphalt.

Trail Description: Wide dirt trails, moderate terrain, light brush, suburban to wilderness.

Highlights: Beautiful views, rolling hills and open space, look eastward for wildlife.

Notes: A favorite because of the views, wilderness feel, easy access points and good trail conditions.



San Clemente Beach Trail

P Metered parking at North Beach parking lot. P Metered parking at Linda Lane Park. P Metered parking at San Clemente Pier in Parque Del Mar parking lot or on street. P Metered and non-metered parking on Paseo de Cristobal at T-Street Beach. P Metered parking at Calafia State Beach, end of Ave. Calafia.

Trail Description: Flat easy trail. Firm decomposed granite surface and elevated walkways. Some sections narrow.

Highlights: Hiking along the beach, beautiful sunsets, breezes and the sound of crashing waves. Best in early morning.

Notes: Very popular trail. Several railroad track crossings, please beware of trains. Bike riders: Several sections require walking your bike, speed limits apply. Numerous other access points. Detailed beach trail map available from San Clemente Beaches, Parks and Recreation Department.

State Park Trails

P Talega Park parking lot or Ave. Cristianitos, street parking. Prima Deshecha trailhead begins south side of Ave. Pico. 1/4 mile to State Park Trails.

P Dog Park at end of La Pata

Trail Description: Wide to moderate dirt trails, easy to moderate terrain, light to heavy brush.

Highlights: Wilderness feel. Main trail is easy; many single-track trails intersect main trail.

Notes: Be aware of your surroundings and location. Bring plenty of water; air tends to be hot and dry in canyon, especially during late spring through fall. State parks map available through state parks administration.

Trestles Trail

P Trestles parking lot, next to Carl's Jr. (cross Cristianitos to trail entrance west of the freeway).

P Corner of Avenida San Luis Rey and Avenida Dolores.

P San Mateo Campground

Trail Description: Easy terrain. Wide trail, dirt to freeway underpass, asphalt west of freeway.

Highlights: Access to popular surf beach, wetlands, San Mateo Creek. Cool breezes.

10 Candidate Bicycle and Pedestrian Programs

The League of American Bicyclists (LAB) has developed a set of guidelines called the "Five Es" to assist cities in becoming bicycle-friendly communities: Engineering, Education, Encouragement, Enforcement and Evaluation and Planning. These criteria are good references for any community seeking to improve its bicycle and pedestrian environment. The basic strategies are as follows:

Encouragement includes developing awareness and building enthusiasm for walking and biking.

Education programs teach drivers, pedestrians and cyclists about their responsibilities and about traffic rules.

Enforcement includes enforcing traffic laws to educate drivers and cyclists to maximize cyclist safety.

Engineering develops a safe, convenient and continuous network of bikeways and walkways that serves the needs of all cyclists and pedestrians. It also maintains and reconstructs existing bicycle facilities and walkways in a manner that promotes safety, increases convenience and minimizes life cycle costs.

Evaluation and Planning compiles data from surveys and site audits to make sure the program is effectively responding to community needs and parent concerns.

While most of the strategies described below were developed to enhance cycling, some can also be employed to benefit walking. This chapter lays out the different steps and programs to improve cycling and walking in the City of San Clemente. The City can conduct additional research on other plans and programs that have been implemented throughout the region and the country. The recommendations are meant to be a starting point to improve the walking and cycling environment.

10.1 Encouragement

Expand Encouragement Efforts During Bike Month

Have the Mayor and/or the City Council proclaim May as Bike Month and participate in Bike to Work Week events. Host pit stops during Bike to Work Weeks and Days. To increase encouragement, host Bike to Work days more often, such as monthly. Coordinate with other agencies on bicycle events such as "Bike to School Day," a ciclovia and bicycle safety courses.

Improve Route Wayfinding Markers

Directional signage allows new cyclists and tourists alike to find their way to their destination or nearby landmark via a recommended route.

The purpose of signage is to direct people and provide information about destinations, directions and/or distances. It increases comfort, assists navigation, warns of approaching roadway crossings and guides users through diverse environments. In the unfortunate event of an emergency, directional signage provides important location information to a potentially uninformed visitor. When applied on a regional level, wayfinding can link communities and provide consistent visual indicators to direct cyclists to their destinations along the route of their choice. Wayfinding signage can achieve public objectives, such as promotion of a community's attractions, education, mile marking and directional guidance. A good wayfinding system functions to achieve the following purposes:

- Help people find destinations from various travel modes
- Establish clear pathways through the use of signs, maps and other landmarks
- Carry user-friendly and understandable messages

People are the single most important component in developing a wayfinding strategy. By identifying user patterns and destinations, wayfinding users understand how the bicycle facility system operates and how to move through spaces and get directed to their destinations.

In designing a wayfinding strategy or system, the following questions need to be considered:

- What user types are likely to use the wayfinding system?
- Where are these users going?
- What do the users or visitors want to see and hear?
- Is the goal navigation, directional information, orientation, location information, or interpretation?
- Is a clear message being sent by the signage?
- Based on the expected user types, what are the safest or most logical paths or routes?

Develop a City-wide Bicycle Facility Map

Many residents and visitors may be unaware of the existing facilities and may therefore be less encouraged to travel by bicycle. The bicycle system could be promote through a publicity campaign and the provision of a map that help users understand the available links between neighborhoods and different areas of the City. This promotes the bicycle facilities as both destinations to enjoy and as transportation routes. It is critical to update the map as new bicycle facilities are implemented or facilities are changed. Annual updating and printing results in a more reliable map. The latest version can be made available for digital download via the City website.

A regularly updated city-wide bicycle map will allow residents to plan their routes by using the bicycle facilities. A map showing where the facilities are, their destinations and even rules of the road can encourage more bicycle use throughout the City. The flip side of the map is an excellent place to locate education materials and sponsorship information. If printing costs are prohibitive, seeking funding though grants and sponsorship is recommended.

Use the map to guide cyclists through the bicycle facility network, assisting their decision-making ability at intersections and decision points. Show a bicycle route or lane's role in the larger network visually through maps. Utilizing a sign hierarchy can emphasize certain types of messages. Information on the latest standards on wayfinding signage can be found in sections 9B.19 - 9B.21 of the *Manual on Uniform Traffic Control Devices* (MUTCD).

Install Warning Appropriate Signage along Popular Routes

Warn drivers that there may be cyclists sharing the roadway with them. Increase drivers' awareness of cyclists with cautionary and safety messages. Cycling is an important component of the transportation system and should be respected by other modes of transportation. However, since cyclists are more vulnerable to injury in a collision with an automobile, drivers should pay particular attention to their presence and safety.

Implement the Boltage Program at Schools

This program's goal is to increase the number of children regularly riding or walking to school using advanced technology to count and provide incentives.

A solar-powered, Radio Frequency ID (RFID) tag reader called a Zap machine automatically registers RFID tags attached to backpacks or helmets. As they pass, the Zap machine registers the number of times children ride or walk to school and securely uploads the data to the Boltage web site so children can see how close they are to earning a prize. The Boltage program is not a competition between children, classes, or schools, but simply an encouragement to get children to ride their bikes to school more often. For more information on this program, go to *www.boltage.org*.

Host a Ciclovia Event

Ciclovias are an event where a street is temporarily closed to motorized traffic and open for non-motorized transportation. It is a celebration of livable streets and communities, encouraging citizens and businesses to get out in the street and enjoy their city through active participation.

A Ciclovía (also ciclovia or cyclovia in English) is a Spanish word, which translates into "bicycle path" and is used to describe either a permanently designated bicycle route or a temporary event, such as the closing of a street to automobiles for use by self-propelled transportation. Bogotá, Colombia, is often credited with starting ciclovias. These events, sometimes referred to as "Sunday Parkways," occur across the United States, including League Bicycle Friendly Communities Madison, Wisconsin, Portland, Oregon and Washington, D.C. The events typically occur on Saturday or Sunday on a city's main streets. The selected streets become car-free and only open to pedestrians, cyclists and skaters. Often the closed streets form a circuitous route and are adjacent to a park. In some cities the event occurs once or twice a year, while others occur every Saturday or Sunday throughout the entire summer. The Portland and Chicago events have different locations around the city each weekend.

Musicians and groups promoting free, healthy activities are often stationed along the route. These elements are a unique mix in each city. The theme is often centered on health, exercise and active transportation.

Business and Employer Incentive Programs

The City and local businesses can support bicycling and the development of a comprehensive bicycle transportation system as a viable alternative to the automobile. Developing a bicycle system that meets the needs of both commuter and recreational users is only a small part to improve the cycling culture in the City.

The City can encourage the League of American Bicyclists' (LAB) Bicycle Friendly Business program to encourage and facilitate use of alternative modes of transportation by employees and customers. Local business can give discounts, free gifts and incentives to those who frequent their business by bicycle. The same incentives can be given to their employees who commute by bicycle. The City and local businesses can provide secured bicycle parking, shower and locker facilities to employees to encourage more bicycle commuting.

Encourage fringe benefits, such as the Bicycle Commuter Benefit Act, which allows employers to reimburse bicycle commuters who regularly use their bikes for a substantial portion of travel between home and work. Companies can reimburse employees on a tax-free basis for "reasonable expenses" incurred as a bicycle commuter. This can include the actual purchase of a bicycle and almost any type of accompanying equipment and accessories such as lights, racks and clothing, up to the annual limit of $240, or however much a company chooses to offer.

Implement a Bicycle Sharing Program

Bicycle sharing is an innovative approach to increase bicycle usage throughout an urban area. Bicycles are becoming the popular choice as an alternative mode of transportation as gas prices, obesity rates and concerns over the environment increase. Providing a bicycle share program, combined with other transportation systems, allows a more diverse, flexible and cost-effective method of alternative transportations. This program can reduce the number of overall vehicle trips and travel time between residences and transit stops, schools and shopping centers.

Successful bicycle sharing programs have been implemented in Canada, Europe and cities like Washington DC and Chicago. Many more cities, colleges and universities are planning to implement these bicycle sharing programs. These systems are highly advanced using key cards, on-line advanced purchase, GPS and Radio Frequency Identification (RFID) technologies making it possible for bicycle sharing to be smart and simple for all users. Bicycle fleets can also be implemented to local businesses and City staff. This program has been successful in Houston, Portland and San Francisco.

Programs such as B-Cycle can even track riders by their associated membership numbers. Data such as distance, duration, calories burned and carbon offset are captured and uploaded to personal web pages at *Bcycle.com*. This data can also be helpful for those commuting and exercising that the same time.

Develop a Series of Short Loop Rides Around San Clemente

Southern California is one of the best locations for bicycle riding. The mild year-round weather attracts many professionals and recreational cyclists throughout the year. Bicycle racing and cycling clubs are a great way to get new cyclists into the sport that then carries on to daily life such as bicycle commuting. Local cities such as Chula Vista, San Diego and San Marcos participate in bicycle racing during the spring. The City can work with the local bicycle clubs and shops to promote and organize a bicycle race and/or weekly bicycle rides throughout the City. Start local races that showcase San Clemente's landmarks. Local races can draw attention to the City and at the same time encourage cycling as a fun and healthy sport.

Build a BMX/Mountain Bicycle Skills Park

BMX parks are popular with young people and participation can encourage cycling throughout their lives. These parks encourage kids to ride their bikes to and from the park and promote riding their bicycle as a means of transportation. With San Clemente's year-round mild weather, the BMX parks would be utilized in all seasons and can generate revenue for local businesses that support the park. BMX and mountain bicycle skills parks are rare in Orange County and the City can promote the BMX park and hold events. The City can promote this venue as a healthy activity and coordinate events with other local activities.

Participate in Walk and Bike to School Day

This one-day event is an international effort in more than 40 countries to celebrate the many benefits of safely walking and bicycling to school and to encourage more families to consider getting out of the car and onto their feet on the way to school in October. Walking and rolling to school also embodies the two main goals of First Lady Michelle Obama's Let's Move! campaign: to increase our kids' physical activity and to empower parents to make these kinds of healthy choices.

The National Center for Safe Routes to School, which serves as the clearinghouse for the federal Safe Routes to School (SRTS) program, coordinates on-line registration efforts and provides technical support and resources for Walk to School Day. Safe Routes to School programs are sustained efforts by parents, schools, community leaders and local, state and federal governments to improve the health and well-being of children by enabling and encouraging them to walk and bicycle to school. Safe Routes to School activities range from building sidewalks, to getting drivers to slow down in school zones, to encouraging students to take active trips to school with school-wide competitions. On average, at least 50 percent of Walk to School Day events are part of an ongoing SRTS program each year. For more information, go to *www.walktoschool.org*.

Bicycle School Bus and Walking School Bus

These programs are volunteer-based in which children are assisted by adults to walk or bicycle to school. In some cases, this program has been as informal as two families taking turns walking or riding their bikes to school or a more structured route with meeting points, a timetable and a regularly rotated schedule for trained volunteers. Parents often cite safety issues as one of the primary reasons they are reluctant to allow their children to walk to school. Providing adult supervision may help reduce those worries for families who live within walking or cycling distance to school.

The City could start with one school as a pilot program and expand to other school if there is demand. Success with a simple walking school bus or a bicycle train may inspire a community to build a more structured program. This may include additional routes, more days of walking and bicycle and more children. Alternating days between walking and biking to school can provide variety to a structured program. These programs and volunteer efforts require coordination and potential attention to other issues, such as safety training and liability. These efforts can coincide with other educational programs such as "bike rodeos" at the schools. The participating school principal and administration, law enforcement and other community leaders should be involved to help promote an alternative travel to automobiles. For more information visit *www.walkingschoolbus.org*.

It is recommended that the bicycle school bus (BSB) operate with trained instructors on bicycles who meet at designated neighborhood sites to escort children cyclists to school and return them to the same spot after school.

Along the way, the BSB leader would instruct the children in how to safely navigate the roadway, cross streets, when and how to use pedestrian crosswalks with and without signals, basic hand signals, and general awareness of their surroundings from a transportation perspective. The program should be conducted using paid, trained professionals, just like a motorized school bus and a crossing guard position.

The experience gained through participation and active instruction would enable BSB kids to learn and practice safe behaviors in a way that other bicycle education programs can not provide. Even when children participate in bicycle rodeos, their parents are often still so fearful of their safety that they do not allow them ride their bicycles to school. As a result, children do not get the practice they need to improve their bicycle handling skills or to implement knowledge learned from the rodeos. Parents often can not spend enough time cycling with their children, and when they do, they often lack the necessary training themselves to properly instruct their children in how to interact with vehicle drivers and roadway infrastructure. The BSB program would address all those variables and make children better and safer cyclists.

1. The BSB would consist of an adult on a bicycle in the lead (engine) position and another adult bicyclist in the caboose position. The kids would be in between the two.

2. The leader and caboose would both be qualified by having passed the LAB's Traffic Skills 101 and drug tests, and undergo a rigorous background check, just like a school bus driver and crossing guard.

3. The leader and caboose would both be required to have a smart phone for communication between neighborhood and school. PEDal could develop a smart-phone application that would be used to take roll upon pick up at the neighborhood and school, with an automatic message sent to the parent upon departure and arrival.

4. Near the start of each school semester, a basic bicycle rodeo would be conducted as a prerequisite to participation in the BSB. The rodeo would provide an opportunity to assess the participating child's capacity to handle the bicycle, ownership and proper fit of a helmet, and mechanical reliability of his/her bicycle.

BSB leaders could be a key source of information for traffic enforcement officials. For example, PEDal could develop an app that interfaces with its QR code navigation system to upload roadway safety comments via smartphone from cyclists. The comments would provide feedback to City officials and police about incidents and facility conditions that may otherwise go unreported. The app would link the GPS coordinates specific to the uploaded comment.

10.2 Education

Expand Driver Education Efforts

Install "BICYCLES MAY USE FULL LANE" signage and include the "share the road" message in local driver's education classes. Educating drivers and cyclists alike is an important tool for the safety of those using the roads. The more knowledgeable all users are about the rights and rules each party has, the less potential there will be for conflict and incidents. Direction and destination signage should be placed to inform cyclists of the route to their destination or nearby landmark.

Cycling and Driver Education Messages Added to Routine Local Activities

Increased education for drivers and cyclists is needed. Increase public awareness of the benefits of bicycling and of available resources and facilities. Getting more people on bikes will also help modify drivers' behavior. In other cities, the primary method of education being used to reach both drivers and cyclists is the LAB's BikeEd Road 1 course.

More educational opportunities such as bicycle rodeos, public service announcements and increased education at schools are opportunities to be investigated to increase awareness within the city and to demonstrate to more people that bicycling to work or for recreation is easy, safe and fun. A guide to developing a bicycle rodeo created by Cornell University can be found at *http://www.bike.cornell.edu/pdfs/Bike_Rodeo_404.2.pdf*. The Orange County Bicycle Coalition (OCBC) is another local resource to utilize for information and assistance.

Create a Public Education Campaign Aimed at the Behavior of Cyclists, Pedestrians and Drivers

Develop a traffic-calming program designed to makes streets a more pleasant and safer place, which ultimately can reduce the number of traffic-related collisions, injuries and deaths. This program can address the traffic problems through the driver, pedestrian and cyclist. The intent is to raise public awareness and discussion about peoples' attitudes and actions on the streets. It can offer new ways of thinking and reinforce that laws are to be followed. The City of San Jose has developed a program and strategic objectives for this type of campaign. The campaign information can be found at *http://www.getstreetsmarts.org*.

Locally, the City of San Diego in partnership with the local MPO and bicycle coalition has created a public education campaign entitled "Lose the Roaditude." More information can be found at *http://losetheroaditude.com*.

Expand the Safe Routes to School Program and Encourage All Schools to Get Involved

Encouraging schools to participate in the Safe Routes to School program may increase the number of children that ride their bikes or walk to school. Inactivity among children is a health issue, one that must be taken seriously. In the age of computers, the internet and video games, outdoor activity has taken a back seat to indoor entertainment. Bicycling to school is a way to get children active and to introduce exercise into their daily routine. Many parents feel that riding a bicycle on the street is unsafe and do not allow their children to ride to school. Bicycle safety education is important and can be incorporated into after school activities for both children and parents.

The City should assist with "bike rodeos" and other bicycle education programs for City schools. Funding is available at both the federal and state level for a Safe Routes to School program. This funding can be used for a variety of activities including site specific evaluation and planning, infrastructure costs and education programs. Assistance with funding applications and program facilitation is available from local non-profits. More information can be found at: *http://www.saferoutesinfo.org*.

The following are steps to begin the development of a Safe Routes to School Program:

- Include youth perspectives in the development of the Safe Routes to School improvement plan.
- Determine areas of the improvement planning process that student perspectives will be most useful.
- Have students make field observations and conduct assessments on their knowledge, attitudes and beliefs around Safe Routes to School concepts.
- Integrate student assessments into the planning process.
- Identify a youth Safe Routes to School liaison at the participating school district and/or school.
- Use the SafeRoutes toolkit for in-depth descriptions of classroom activities to educate students during the assessment step. *http://www.saferoutesinfo.org/resources/index.cfm*

Step 1: Form a Safe Routes to School Task Force that involves parents, school administrators and teachers, neighbors and community organizations, City officials and staff members and students.

Step 2: Evaluate existing conditions through parents surveys, student surveys, traffic counts, injury data, speed checks, safe routes checklists and schools policies relevant to school travel modes and physical activity (i.e., P.E. requirements, recess time and after-school activities).

Step 3: Expand the circle by presenting findings to the community, holding a design workshop, having an open house and convening a strategy meeting.

Step 4: Develop a project list and accompanying map by identifying problem areas, setting priorities, grouping projects by geographic area, identifying short-term and long-term solutions, costing out the program and using the whole toolbox of solutions (education, encouragement, enforcement and engineering).

Step 5 Make it official by going through the regular planning process and having the plan adopted in the City plan.

Step 6 Get improvements funded by developing a funding program, identifying funding opportunities and working with the City to apply for grants.

Institute a Cycling Education Program Through the Schools or Through the City's Parks and Recreation Department

Teaching students how to safely ride their bicycle on the streets of San Clemente is an important element in making the City a safer place to ride a bike. With the relatively high percentage of children (compared to the national average) riding their bikes to school and other activities in 2012, it is critical to educate them on the proper rules of the road. There are numerous examples of successful programs throughout the country. Education programs will need support from the school administration, teachers, parents and community. Education should be considered as essential, if not more essential, than new bicycle facilities.

Among existing programs, the Texas SafeCyclist curriculum is nationally recognized as a comprehensive bicycle safety education course. It is directed at fourth and fifth grade elementary school physical education teachers and their students. In an attempt to institutionalize bicycle safety and physical fitness standards in Texas schools, the Texas Bicycle Coalition Education Fund (TBCEF) sends field instructors to school districts across the state to train and certify P.E. teachers in the program so that they may, in turn, train their students in bicycle and pedestrian safety education. Teachers report that the SafeCyclist Curriculum is easy to implement in the classroom and that students enjoy the materials.

With the financial support of the Texas Department of Transportation, the U.S. Department of Education and committed private and member donors, TBCEF is able to offer the certification training and all curriculum materials to each participating teacher for free. The Texas SafeCyclist Program has gained both national and international recognition and is considered the model for youth bicycle safety education. In 2003, the National Highway and Traffic Safety Administration (NHTSA) conducted an evaluation of the program and concluded that the program positively influenced children's behavior, essential skills and knowledge gain.

The Orange County Bicycle Coalition (OCBC) could be the liaison to start a program similar to the Texas SafeCyclist. With certified League Cycling Instructors (LCIs) and a strong bicycle advocacy stance, the OCBC would be the most qualified organization to produce such a program for the City.

If it is not possible to fit it in the curriculum or budget, this program can be a successful after-school or summer school program. Seeking financial support from a local private health care source, like the Kaiser Permanente Foundation, is also an option.

Implement a Program to Encourage Proper Helmet Use

There are many resources available for assistance with curriculum, materials and information about bicycle safety and specifically helmet usage, fitting and safety statistics. The California Department of Public Health lists California specific resources for teachers: *http://www.cdph.ca.gov/HEALTHINFO/INJVIOSAF/Pages/BicycleSafety.aspx*.

The Bicycle Helmet Safety Institute is another resource with a wealth of information, links and free toolkits. It is a small, non-profit consumer-funded program providing bicycle helmet information at *http://www.bhsi.org*.

10.3 Enforcement

Encourage local law enforcement to use targeted enforcement to educate drivers and cyclists about applicable traffic laws and to share the road. This could be in the form of a brochure or tip card explaining each user's rights and responsibilities. Encourage the Sheriff's Department to warn and educate cyclists and pedestrians about breaking the laws, the rules of the road and safety procedures. This will help educate law enforcement, drivers, pedestrians and cyclists. Possible traffic safety problems where enforcement is part of the solution may include the following:

- Speeding in school zone
- Illegal passing of school bus
- Not yielding to pedestrians in a crosswalk
- Parking violations – bus zone, crosswalks, residential driveways, time zones
- Risks to pedestrians and cyclists during drop-off and pick-up times.
- Lack of safety patrol/crossing guard operations
- Unsafe pedestrian and bicycle practices
- Other school zone traffic law violations

Designate a Sheriff's Office Liaison for the Cycling Community

This liaison would be the main contact for the residents concerning bicycle-related incidents. A liaison that serves the cycling community is an integral piece of communication between law enforcement and the cycling community. The liaison would be in charge of educating fellow officers about bicycling rules, etiquette and behavior to better serve both drivers and cyclists alike. Allocate funding for the training and support of this duty, as well as for necessary bicycle equipment.

Establish a Process for Referrals to Law Enforcement

Design a communication process that encourages students and parents to notify the school and police of the occurrence of a crash or near-miss during school commute trips involving auto, bus, pedestrian, or bicycle transportation. Include the Orange County Sheriff's Office and City of San Clemente Public Works in this reporting system to help produce more valuable data. Enlist the help of law enforcement with a number of traffic safety duties:

- Enforcement of traffic laws and parking controls through citations and warnings.
- Targeted enforcement of problem areas – an intensive, focused effort during the first two weeks of school and a strategy for the rest of the year.
- Participation in School Safety Committees and Safe Routes to School task force to help identify safety problems and solutions.

10.4 Engineering

Expand and Maintain the Bicycle Network

Expand bicycle access to all parts of the City through a signed network of on and off-street facilities, low-speed streets and secure parking. Assist cyclists to cross barriers (including Interstate 5) and to reach their desired destinations in a convenient, timely and comfortable manner on a bicycle route network. Consider bicycle-friendly design using new technologies and innovative treatments at intersections and on roads and bikeways. Install bicycle stencils and bicycle-sensitive loop detectors (or other detector type) on bikeways as part of new signals, signal upgrades and resurfacing/re-striping projects conforming to the latest CA MUTCD guidelines. More facilities within the bicycle network will encourage bicycle use as a transportation and recreation mode. Drivers will note increased bicycle use throughout the City, which acts as a recurring reminder to safely share the road. Implement candidate facilities through prioritized projects corresponding with available funding.

Local cyclists should be involved in identifying maintenance needs and ongoing improvements. Develop a maintenance schedule for bicycle facilities. This includes regular sweeping and debris removal. When the City or other agencies such as utilities repair roads, the road needs to be restored to satisfactory quality, with particular attention to surface smoothness and restriping suitable for cycling.

Provide Training Opportunities for Engineering, Planning Staff and Law Enforcement on How to Accommodate Cyclists

Provide training opportunities for engineering, planning staff and law enforcement on how to best accommodate cyclists. Help City staff to better understand cyclists' needs and behavior, their right to use City streets, as well as multi-use paths for transportation. For example, in California a source for outside evaluation is the Institute of Transportation Studies at the University of California, Berkeley, which is been one of the world's leading centers for transportation research, education and scholarship. Its mission is to conduct research and provide instruction to transportation professionals. Additionally, the City can contact the Orange County Bicycle Coalition (OCBC) for staff training available on a fee for service basis.

Increase the Amount of Secure Bicycle Parking

Provide plentiful, high quality bicycle parking facilities to complement the bicycle route network consistent with regional bicycle planning. Increasing bicycle parking, especially in areas of high bicycle traffic, will encourage bicycle use and give cyclists a safe place to park their bikes. Provide short- and long-term bicycle parking in employment centers and multifamily developments, at schools, special events, recreational areas and transit facilities such as train stations. If there is a safe, weather-proof place to park their bicycles, employees may be more inclined to commute by bicycle to work. Bicycle racks should be monitored for rust and disrepair. See other section for more information on how to select and install bicycle racks.

Promote Intermodal Travel

The City can do this by increasing connections between public transport and bicycles, by improving access and bicycle parking at bus stops and other public transport vehicles. This can be enhanced by distributing information on cyclists' options to put their bikes on a bus rack or in a train car to travel outside the City without the use of a personal vehicle.

Identify Opportunities to Make Engineering Improvements

Engaging the public and school officials on the need to improve facilities at schools is important to promote walking and biking to schools, transit stops and shopping centers. Examples of items to address are:

- Traffic control signs in school zone – legible, visible and placed properly
- Curb and pavement markings – crosswalks, parking controls and bicycle lanes
- Signal timing adjustments – especially during morning and afternoon peak times, to allow more time for children to cross the street
- Vegetation trimming and object removal from sidewalks and paths
- Drop-off/pick-up operations – safe, efficient, monitored and enforced
- Off-street lots for drop-off/pick-up
- Parking controls – bus zone, ADA spaces, truck loading, no parking and time zones
- Traffic safety monitoring, supervised crossings and school zone enforcement

10.5 Evaluation and Planning

Integrate Development of the Cycling and Pedestrian Network Into Larger Land Use Planning and Development Projects

Future developments such as businesses, parks and residential developments need to take into account bicycles as a mode of transportation and incorporate appropriate facilities to meet their needs. Secured bicycle parking such as racks or lockers, as well as showers and changing rooms are a few examples of incorporating facilities within new developments, along with bicycle paths and bicycle lanes. As a condition of project approval, require development projects to construct adjacent bicycle and pedestrian facilities included in the proposed system and provide adequate bicycle parking.

This includes coordinating bikeway and pedestrian improvements to coincide with already scheduled and funded projects to minimize any overlapping costs or work. For example, include bikeway and pedestrian improvements in the City's Capital Improvement Program.

Establish a Bicycle/Pedestrian Advisory Committee or Working Group

Establish a Bicycle/Pedestrian Advisory Committee or Working Group to assist the City with implementation of this Plan's projects, policies and programs. The creation of a working group would allow City staff, volunteers and bicycle advocates to continue efforts to improve cycling and walking throughout the City. A focused group can act as a liaison to the community and can address issues of concern to local cyclists and pedestrians. The group can review the implementation and regularly evaluate the progress of improvements in this Plan. It may be advisable that past attendees to the public workshops be included in a solicitation to apply for membership in this working group. City support for budgeting time and resources for City staff to attend and support these meetings is also recommended.

Consistency and Cooperation

Strive for intra-agency coordination within the City to ensure that this Plan's recommendations are incorporated at every level of transportation planning, engineering and design. Ensure all City policies, plans, codes and programs are updated and implemented to take advantage of every opportunity to create a more bicycle- and pedestrian-friendly community. An integrated approach results in creative funding opportunities, synergistic teamwork and successful projects. An example is a Portland, Oregon project integrating traffic-calming measures and stormwater retention. Intersection curb extensions were installed to serve as a traffic-calming measure, but they were also designed to serve as catch basins to capture stormwater. This ingenious program is called Portland's "Greenstreets Program" and allowed the city to utilize stormwater retention funding to install otherwise costly traffic-calming infrastructure that also improved the local urban visual environment.

Cooperation should also extend beyond City limits. Coordinate with adjacent military, local and regional agencies to ensure strong bicycle and pedestrian connections and inclusion of the City's plans in other planning efforts.

Create City Staff Position of Bicycle/Pedestrian Coordinator
The position of a bicycle/pedestrian coordinator or program manager can help coordinate between different City departments to ensure consistency and cooperation in planning projects. A bicycle/pedestrian coordinator would manage programs and implement projects listed in the Bicycle Pedestrian Master Plan. The coordinator would be responsible for updating the plan in a timely manner and maintaining a prioritized list of improvements, updated cost estimates and appropriate funding sources. These are critical to integrating bicycling and walking into the City's plans and projects and the investment in a staff position would show the City is committed to a "complete streets" transportation system. This investment is also often returned since this position usually is responsible for securing state and federal funding for bicycle and pedestrian projects. For more information see a full report at: *http://www.bikeleague.org/resources/reports.*

Develop a Bicycle Pedestrian Report Card
The City could develop a bicycle pedestrian report card, a checklist used to measure the success of plan implementation and actions within San Clemente. The report card could be used to identify the magnitude of accomplishments in the previous year, since inception and general trends.

The bicycle pedestrian report card could include, but be not limited to, the following categories. The list below represents a wide menu of factors that the City could present together as a report card or a la carte:

- System completion
- Travel by bicycle or on foot (counts)
- Safety
- Funding

As opposed to focusing on the actual annual change in a given category, the City could establish the report card to track trends. For example, an upward trend in travel by bicycle or walking would be viewed as a success, regardless of the specific increase in the number of cyclists or walkers. Safety should be considered relative to the increase in cyclists and walkers. Sometimes crash numbers go up simply because cycling or walking increases, at least initially. Instead, measure crashes as a percentage of an estimated overall mode share count.

A major portion of the bicycle pedestrian report card would be an evaluation of system completion. An upward trend would indicate that the City is progressing in its efforts to complete the bicycle pedestrian network identified

in this document. The report card could be updated annually and could be expanded to included elements of other transportation modes in the City, such as transit. The report card could be developed to utilize information collected as part of annual and on-going evaluations, as discussed in the following sections. The report card is not intended to be an exhaustive effort for City staff, but rather a straightforward means of conveying the results of the City's recent efforts to the public.

If a committee is appointed to help implement the Plan and guide future progress as it relates to cycling and walking in the city, it can be a task of the committee to review the report cards and adjust future plans and goals accordingly.

Review Collision Data
Continue to collect and track collision data. Traffic collisions involving cyclists and pedestrians could be reviewed and analyzed regularly to develop plans to reduce their frequency and severity. Any such plans should include Police Department involvement and should be monitored to determine their effectiveness. Results of the number of bicycle- or pedestrian-related traffic collisions should be recorded in the bicycle pedestrian report card.

Conduct Annual and/or Seasonal Cyclist and Pedestrian Counts Throughout the City
Conduct regular cyclist and pedestrian counts throughout the city to determine mode share baseline and changes. Gathering cyclist and pedestrian counts would allow the City to collect information on where the most cycling and walking occurs. This assists in prioritizing and justifying projects when funding is solicited and received. Cyclist and pedestrian counts can be advantageous in collecting data to study cycling and walking trends throughout the City. Analysis that could be conducted includes:

- Changes in volumes before and after projects have been implemented
- Determining needs for non-motorized facilities
- Trip generation rates
- Prioritization of local and regional projects
- Research on clean air change with increased bicycle use
- Traffic impacts

Counts should be conducted at the same locations and at the same time every year. Conducting counts during different times of the year may be beneficial to understand the differences in traffic patterns throughout the year.

In addition, bicycle and pedestrian counts should be collected as part of any existing traffic counts. Results of the number of cyclists and pedestrians should be regularly recorded for inclusion in the bicycle pedestrian report card.

Quantify Encouragement Efforts

As part of education and encouragement goals, the City should strive to conduct at least three bicycle-related encouragement events per year. Examples of encouragement events include bike-to-work day events, bicycle rodeos, ciclovias etc. The annual tally of events could be completed in conjunction with completion of the bicycle report card. Similar walking events should also be considered.

Glossary

A

Accessible
Accessible facilities are those that can be reached, used and traversed by people of all ages and abilities without difficulty.

Active Transportation
Also known as Non-Motorized Transportation and Human-Powered Transportation, includes walking, bicycling, small-wheeled transport (skates, skateboards, push scooters and hand carts) and wheelchair.

Alley
A privately maintained thoroughfare, tract, or easement, usually narrower than a street that provides access to the rear boundary of one or more lots and is not intended for general traffic circulation.

Americans with Disabilities Act (ADA)
Legislation defining the responsibilities of and requirements for transportation providers to make transportation accessible to individuals with disabilities.

Assistive Mobility Devices
Any device designed or adapted to help people with physical limitations to perform actions, tasks and activities (e.g. wheelchairs, crutches, or canes).

Average Daily Traffic Volume (ADT)
The average number of vehicles passing a specific point during a 24 hour period.

B

Barriers To Travel
Barriers usually refers to natural (hills, lakes, rivers) or man-made (freeways, bridges without sidewalks, neighborhood traffic control devices) obstacles to through traffic or access.

Bicycle
A device upon which any person may ride, propelled by human power through a belt, chain or gears and having either two or three wheels in a tandem or tricycle arrangement.

Bicycle and Pedestrian Master Plan
A plan that identifies goals, objectives and performance measures for a government to accommodate bicycle and pedestrian travel.

Bicycle Boulevard
A street that prioritizes the movement of bicycles, often a parallel street to a major arterial street. Roadway often has special treatments such as bicycle lanes or sharrows and bicycle signal detectors

Bicycle Transportation Account
The Bicycle Transportation Account (BTA) is an annual program providing state funds for city and county projects that improve safety and convenience for bicycle commuters. In accordance with the Streets and Highways Code (SHC) Section 890-894.2 - California Bicycle Transportation Act, projects must be designed and developed to achieve the functional commuting needs and physical safety of all cyclists. Local agencies first establish eligibility by preparing and adopting a Bicycle Transportation Plan (BTP) that complies with SHC Section 891.2. The BTP must be approved by the local agency's Regional Transportation Planning Agency.

Bicycle Transportation Plan (BTP)
Caltrans' official term for master plans addressing bicycle facilities.

Bicyclist or Cyclist
A person who rides or travels by bicycle or similarly legally described conveyance.

Bike Box
An advanced stop line at an intersection exclusively for bikes that allows cyclists to move ahead of turning vehicles.

Bikeway
Generic term for any of several classifications of bicycle facilities.

Bicycle Facilities
Facilities designed to accommodate bicycle travel for recreational or commuting purposes. Bikeways are not necessarily separated facilities (such as off-road paths), but may be designed to be shared and operated along with other travel modes (such as painted on-road bicycle lanes or sufficiently wide shoulders with bicycle signage).

Bicycle Friendly Community Program (BFC)
The League of American Bicyclists' (LAB) Bicycle Friendly Community Program (BFC) promotes better cycling conditions and advocacy by providing incentives, hands-on assistance and award recognition for communities that actively support bicycling.

Bicycle Level of Service
An objective measure of roadway segment bicycle friendliness. Criteria include traffic volume, speed, roadway width, shoulders and adjacent parking.

Bicycling or Cycling
The act, sport, or technique of riding or racing on a bicycle or similarly legally prescribed vehicle.

Bicycle Lane (Caltrans Class 2)
A lane on the paved area of a roadway for preferential use by cyclists. It is usually located along the edge of the paved area or between the parking lane and the first motor vehicle travel lane. It is identified by "Bicycle Lane" signing, special lane lines and other pavement markings. Cyclists have exclusive use of a bicycle lane for longitudinal travel, but must share the facility with motor vehicles and pedestrians crossing it.

Bicycle Route (Caltrans Class 3)
A street identified as a bicycle facility by "Bicycle Route" guide signing. There are no special lane markings, except for optional Shared Lane Markings or "sharrows." Bicycle traffic shares the roadway with motor vehicles.

Bicycle Signal Heads
Electronic signals placed at intersections intended to notify cyclists when it is safe to proceed. Bicycle signals can be programmed to provide an exclusive bicycle phase at signalized intersections, allowing cyclists to proceed in advance of drivers.

Bike Station
A facility which provides bicycle parking/storage and related services, such as locker rooms, showers, restrooms, cyclist information and bicycle repair. These centers should also include ancillary commercial tenant spaces such as newsstands, food service, sale of bicycle parts or equipment, etc. Such facilities must be directly served by public transit.

Bridge
A structure spanning and providing passage over an obstacle, such as a waterway.

Buffer
The area between the outside edge of the roadway and the roadside edge of the sidewalk or pedestrian facility that provides a space between pedestrian traffic and motorized traffic. This buffer can contain paved areas, grassy areas, or trees.

Built Environment
The human-made surroundings that provide the setting for human activity, production and consumption. The built environment consists of houses, office buildings, roadways and entire cities.

C

CALTRANS
California Department of Transportation

CEQA
California Environmental Quality Act

CIP
Capital Improvement Program

CMAQ
Congestion Mitigation and Air Quality

Complete Streets
Complete Streets are streets designed and operated to enable safe access for all users. Pedestrians, cyclists, drivers and transit riders of all ages and abilities must be able to safely move along and across a "complete" street.

Connectivity
A measure of how well transportation facilities (such as roadways and sidewalks) are connected to each other and to important destinations.

Continuity
A measure of the proportion of a transportation facility that is uninterrupted. For example, a sidewalk that runs along a roadway for 500 feet, disappears for 200 feet and then starts again would be a discontinuous sidewalk with low continuity.

Crash or Collision
A crash or collision reflects a mistake or combination of mistakes and are, as such, not "accidents." In terms of cyclists, collisions may involve the ground, a fixed object (e.g. a tree or bollard), a pedestrian, another cyclist, a parked or moving motor vehicle or an animal. They usually involve a mistake(s) on the part of users and/or the facility designers.

Crosswalk
Also known as a pedestrian crossing, a crosswalk is a point on a roadway employing some means of assisting pedestrians or other non-motorized transportation modes to safely cross a roadway. Crosswalks usually consist of some combination of on-road paint, a crossing signal for pedestrians and signage warning drivers of the presence of pedestrians. Crosswalks are most commonly located at signalized intersections, but can be located anywhere along a roadway.

Cul-de-sac
A short street having one end open to traffic and the other temporarily or permanently terminated by a vehicle turnaround at or near the terminus.

Curb Cut
Also known as a Curb Ramp, a curb cut is a short ramp installed where a sidewalk meets a roadway to create a smooth transition between the two surfaces rather than a steep drop of several inches. Curb cuts are especially essentially for sidewalk users such as cyclists, pedestrians with limited mobility and those using wheelchairs or strollers.

CVC
California Vehicle Code

Cycle Track
A bicycle lane physically separated from the roadway and the sidewalk.

Design Speed
A speed determined for design and correlation of physical features of a bikeway that influence bicycle operation. It is the maximum safe speed that can be maintained over a specified section of bikeway when conditions are so favorable that design features of the bikeway govern.

D

Detectable Warning
A standardized surface feature built in or applied to walking surfaces or other elements to warn people who are blind or visually impaired of specified hazards.

Downtown
Also referred to as the Central Business District, is the portion of a town that serves as the commercial and cultural "center" of activity.

Driveway
A privately maintained access to residential, commercial or industrial properties.

Easement
Allows another person the right to use private land for a specific purpose. The most usual easements are those granted to public utility companies to run lines on or under private property. Other common easements are for storm drainage pipes and ditches, for walkways and for access roadways.

E

Federal Highway Administration (FHWA)
The Federal Highway Administration is the federal agency that carries out federal transportation programs in partnership with state and local agencies to meet the nation's transportation needs.

F

Federal Recreational Trails Program (FRT)
The Recreational Trails Program is an assistance program of the Department of Transportation's Federal Highway Administration. Federal transportation funds benefit recreation by making funds available to the states to develop and maintain recreational trails and trail-related facilities for both non-motorized and motorized recreational trail uses.

Federal Transit Administration (FTA)
The Federal Transit Administration administers federal funding to support a variety of locally planned, constructed and operated public light rail, commuter rail, streetcars, monorail, passenger ferry boats, inclined railways and people movers.

G

Geographic Information Systems (GIS)
Computer-base mapping tool employing analysis of spatial relationships.

Global Positioning Systems (GPS)
Satellite-based navigation system made up of a network of 24 satellites placed into orbit by the U.S. Department of Defense.

Greenway
A corridor of undeveloped land, usually including some kind of trail or pathway that is provided for recreational purposes and/or environmental protection.

I

Intermodal
Relating to the connection between any two or more modes of transportation.

L

Land Use
Refers to the division and usage of natural land for various human purposes. In planning terms, land use usually refers to the designation of land space for discrete purposes, through ordinances or zoning codes, such as commercial, residential, or industrial development. Land use can also connote the physical quantity of land that is consumed for human purposes, rather than left as wilderness.

League of American Bicyclists (LAB)
Founded as the League of American Wheelmen in 1880. Cyclists, known then as "wheelmen," were challenged by rutted gravel and dirt roads and faced antagonism from horsemen, wagon drivers and pedestrians. LAB promotes cycling for fun, fitness and transportation and work through advocacy and education. 2011 membership was 300,000 cyclists and 700 organizations.

League Certified Instructor (LCI)
Person who has successfully completed the League or American Bicyclists' certified instructor course.

Level of Service (LOS)
A qualitative assessment of a roadway's operating conditions. For local government comprehensive planning purposes, level of service means an indicator of the extent or degree of service provided by, or proposed to be provided by, a facility based on and related to the operational characteristics of the facility. Level of Service indicates the capacity per unit of demand for each public facility.

Livable
Refers to the suitability of a place (town, city, or neighborhood) to support a high quality of life that contributes to the health and happiness of its residents.

M

Master Plan
A comprehensive plan to guide the long-term physical development of a particular area, corridor or facility.

Master Plan of Arterial Highways (MPAH)
The MPAH map is an element of the overall transportation planning in Orange County that defines a countywide circulation system in response to existing and planned land uses. As administrator of the MPAH, OCTA is responsible for maintaining the integrity of the MPAH map through its coordination with cities and the County and to determine consistency of projects with the MPAH map.

Median Refuge
An area within an roadway island or median intended for pedestrians to wait safely away from travel lanes for an opportunity to continue crossing the roadway.

Metropolitan Planning Organization (MPO)
An organization made up of local elected and appointed officials responsible for the development and coordination of transportation plans and programs, in cooperation with the state, for metropolitan areas.

Midblock Crosswalk
A legally established crosswalk not at an intersection.

Mixed-Use Development
Mixed-use developments counter the post–World War II practice of physically separated land uses by providing areas where residences, commercial buildings and businesses are located within close proximity to each other. Examples of true mixed-use areas are commonly found in the downtown areas of large cities where restaurants, offices and residences are often located in the same building.

Mobility
The ability to move or be moved from place to place.

Mode
A particular form of travel (e.g. walking, traveling by automobile, traveling by bus, traveling by bicycle, or traveling by train).

Mode Split
The proportion of total person-trips using various specified modes of transportation.

Multimodal
The availability of transportation options using various modes (such as automobile, bicycle and pedestrian) within a system or corridor.

Multi-use Path (Caltrans Class 1)
A special pathway facility for the exclusive use of pedestrians, cyclists, joggers, skaters and others for recreational or transportation purposes, separated from motor vehicle facilities by space or a physical barrier. A multi-use path may be located on a portion of a street or highway right-of-way or in a special right-of-way not related to a motor vehicle facility. It may be grade-separated or have street crossings at designated locations. It is identified with signs and also may have pavement markings.

Manual on Uniform Traffic Control Devices (MUTCD)
A manual specifying signage, signals and other traffic control devices. There is also a California version that takes precedence within the state.

N

Neighborhood
A geographical area that is a subset of a larger town or city, usually defined by shared social or architectural features that set it apart from adjacent areas.

National Highway Traffic Safety Administration (NHTSA)
A division of the USDOT that is responsible for making roadway travel safer.

O

Orange County Transportation Authority (OCTA)
OCTA is Orange County's regional transportation planning agency and public transit service provider.

P

Parks and Open Spaces
Parcels of land set aside for recreational use and/or environmental resource protection. These areas can be publicly or privately owned and development on the site is usually unauthorized.

Paved Trail
A relatively smooth path covered with paving material such as asphalt, concrete, or macadam. Paved trails can include off-road paths, such as greenway trails, as well as sidewalks alongside a roadway.

Pedestrian
A person walking or traveling by means of a wheelchair, electric scooter, crutches or other walking devices or mobility aids. Use of the term pedestrian is meant to include all disabled individuals regardless of which equipment they may use to assist their self-directed locomotion (unless they are using a bicycle). It also includes runners, joggers, those pulling or pushing strollers, carriages, carts and wagons and those walking bicycles.

Pedestrian Access Route
A corridor of accessible travel through the public right-of-way that has, among other properties, a specified minimum width and cross slope.

Pedestrian Crossing Interval
The combined phases of a traffic signal cycle provided for a pedestrian crossing in a crosswalk, after leaving the top of a curb ramp or flush landing, to travel to the far side of the vehicular way or to a median, usually consisting of the WALK interval plus the pedestrian clearance interval.

Pedestrian-Scale (or Human-Scale) Design
Encompasses a number of design strategies that enhance a pedestrian's experience of the built environment. Pedestrian-scaled design includes designing roadways, buildings, signage and parking lots for the convenience and comfort of pedestrians as well as drivers. Examples include lighting on sidewalks, parking lots located behind or to the side of buildings, attractive storefronts and way-finding signs intended to guide people who are traveling on foot rather than in automobiles.

Pedestrian Facilities
Includes roadside sidewalks, trails and paved or unpaved off-street trails.

Pedestrian Network
A continuous sidewalk or pedestrian-facility system that allows pedestrians to make uninterrupted trips and accommodates stroller or wheelchair users to utilize the sidewalks.

Pedestrian Signals
Electronic signals placed at pedestrian-crossing locations intended to notify pedestrians when it is safe to cross the street. Pedestrian signals can also be programmed to provide an exclusive pedestrian phase at signalized intersections, whereby all automobile traffic is given a red light and only pedestrian crossing movement is allowed.

Pedestrian Signal Indication
The illuminated WALK/DON'T WALK message (or walking person/hand symbols) that communicates the pedestrian phase of a traffic signal and their audible and tactile equivalents.

Placemaking
The process of creating unique space, such as plazas, squares, streets and waterfronts, attractive to people because they are pleasurable or interesting.

Private Street
A privately owned and maintained access provided for by a tract, easement or other legal means, typically serving three or more potential dwelling units.

Public Street
Publicly owned facility-providing access, including the roadway and all other improvements, inside the right-of-way.

R

Raised Traffic Devices
The ceramic disks and bars that are glued to pavement to channel traffic. Also known as "buttons," "turtles" and "slugs," depending upon their shape.

Recreational
Serving individuals who use bicycles primarily for the trip enjoyment itself. Ultimate destination is often of secondary importance.

Regional Transportation Planning Agency (RTPA)
Agency responsible for regional transportation planning, in this case the Orange County Transportation Authority (OCTA).

Regional Transportation Plan (RTP)
The Regional Transportation Plan (RTP) is a long-term blueprint of a region's transportation system. Usually RTPs are conducted every five years and are plans for thirty years into the future. The plan identifies and analyzes transportation needs of the metropolitan region and creates a framework for project priorities. These plans are normally the product of recommendations and studies carried out and put forth by a metropolitan planning organization (MPO).

Resurfacing
The addition of a layer or layers of paving material to provide additional structural integrity, improve serviceability and rideability.

Right-of-Way
A general term denoting land, property, or interest therein, usually in a strip, acquired for or devoted to transportation purposes.

Road Diet
Conversion of four lane undivided roadways to three lanes (two through lanes and a center turn lane), The fourth lane may be converted to bicycle lanes, sidewalks and/or on-street parking. In other words, existing space is reallocated. The overall area remains the same.

Rules of the Road
That portion of a vehicle law that contains regulations governing the operation of vehicular and pedestrian traffic. Theoretically, to improve safety and efficiency, these are uniform for a large area. If laws are different in different jurisdictions good drivers in one place can become dangerous simply by crossing a political boundary. Among the important tasks of the rules of the road is to eliminate ambiguity. In every traffic situation the combination of facility design and traffic laws should make it unambiguous who has the right-of-way.

S

Safe Routes to School (SRTS)
A federally funded and state-administered program that encourages local schools and jurisdictions to undertake projects that will encourage children to walk or bicycle to school and to make such trips safer.

SAFETEA-LU
(Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users) The federal surface transportation legislation (Public Law 109-59) that authorized programs for highways, highway safety and transit.

SCAQMD
South Coast Air Quality Management District

Sidewalk
A paved walkway along the side of a street. Also the portion of a right-of-way intended for pedestrian use.

Sight Distance
A measurement of the user's visibility, unobstructed by objects, along the normal travel path to the furthest point of the roadway surface.

Shared Roadway
A roadway open to both bicycle and motor vehicle travel. Unless bicycle travel is explicitly prohibited, all highways, roads and streets are "Shared Roadways." Some Shared Roadways may have wide curb lanes or paved shoulders, to increase comfort for cyclists. However, in most cases these roadways do not have sufficient width to accommodate a bicycle lane.

Shared Lane Markings (Sharrow)
A shared lane symbol in the pavement that includes a chevron and bicycle symbol. This is intended to remind drivers to share the roadway and to designate the ideal roadway position for the cyclist.

Shoulder
Any portion of a roadway to the right of the right-most travel lane, but not including curbs, planting buffers and sidewalks. Shoulders can have a variety of surface treatments including pavement, gravel or grass. Depending on their width and surface, they serve a variety of purposes, including providing space for vehicles to slow and turn right, accommodation of stopped or broken-down vehicles, to allow emergency vehicles to pass, for structural support of the roadbed, or for bicycle and pedestrian travel.

Shy Distance
A space along side or above a facility to any fixed object (trees, limbs, poles, signs, beams, walls, fences, guard rails or drop-off.)

Smart Growth
Land-use development practices that create more resource-efficient and livable communities, with more accessible land-use patterns, an alternative to sprawl.

Sprawl
Dispersed, low-density, single-use and automobile-dependent land-use patterns.

Stopping Sight Distance
The total distance traveled from the instant a vehicle operator sights an object to the time the vehicle comes to rest. Perception time, plus reaction time and braking distances equal stopping sight distance.

Streetscaping
Changes to the street and surrounding areas intended to improve the experience of pedestrians and others using the area. Streetscaping improvements can include changes to the roadway cross-section, traffic management, sidewalk conditions, landscaping, street furniture and building fronts. Common streetscaping improvements include pedestrian-scaled lighting, benches and street trees.

Surface Transportation Program (STP)
The STP provides flexible funding that may be used by states and localities for projects on any Federal-aid highway, including the NHS, bridge projects on any public roadway, transit capital projects and intra-city and intercity bus terminals and facilities. A portion of funds reserved for rural areas may be spent on rural minor collectors.

T

Traffic-calming
This is a form of "traffic management" and involves actions to reduce and slow motor vehicle traffic, usually in residential neighborhoods. Techniques for traffic-calming include preventing through traffic, installing traffic circles, narrowing the street, using a rougher roadway surface, planting street trees, or building speed bumps.

Traffic Control Device
Signs, signals or other fixtures, whether permanent or temporary, places on or adjacent to a traveled way by authority of a public body having jurisdiction to regulate, warn or guide traffic.

Transportation Demand Management (TDM)
TDM is the application of strategies and policies to reduce travel demand (specifically that of single-occupancy private vehicles), or to redistribute this demand in space or in time.

Traffic Signals
Electronic signaling devices located at roadway intersections to control competing flows of traffic.

Transit Center
A transportation facility providing an interface between more than one mode of transportation.

Transit Oriented Development (TOD)
A transit-oriented development is a residential or commercial area designed to maximize access to public transport and often incorporates features to encourage transit ridership. A TOD neighborhood typically has a center

with a train station, metro station, tram stop, or bus station, surrounded by relatively high-density development with progressively lower-density development spreading outwards from the center.

Transportation Enhancement Program (TE)
The TE Program required each state to set aside 10 percent of its Surface Transportation Program funds for transportation enhancement projects. These federal funds cannot be used for traditional highway projects or roadway improvements. They are for activities that go above and beyond common transportation practice.

U

Universal Design
Transportation systems designed to accommodate a wide range of users, including people with disabilities and other special needs.

Utility
A privately, publicly, or cooperatively owned line, facility, or system for producing, transmitting, or distributing communications, cable television, power, electricity, light, heat, gas, oil, crude products, water, steam, waste, or any other similar commodity which directly or indirectly serves the public. Additionally, the privately, publicly, or cooperatively owned company that owns the line, facility, or system.

V

Vehicle Miles Traveled (VMT)
Total miles traveled by all vehicles in a geographic area over a specific time period. VMT is a good indicator of driving habits, since 2003 VMT has nearly leveled off.

Volume
The given number of vehicles that pass a given point for a given amount of time (hour, day, year.)

W

Walk Score
Walk Score is a number between 0 and 100 that denotes the walkability of any address (with 0 being least walkable and 100 being most walkable). It is based on an algorithm that ranks communities nationwide based on an area's number of common destinations (business, restaurants, parks, schools) within walking distance of any given starting point.

Walkability
Walkability is often measured according to the environmental, health, financial and safety benefits offered to pedestrians within a community. More broadly, walkability is a measure of how conducive an environment is to walking.

Warrant
A minimum requirement for justifying the authorization of a traffic control device. For examples, traffic volume, crash statistics and existing design.

BTA Compliance

California Streets and Highways Code Section 891.2 Requirements for Bicycle Transportation Plans

The specific locations of items needed for compliance with this code section are shown on the following pages. For reviewer convenience, code text and associated document sections are highlighted below:

A city or county may prepare a bicycle transportation plan, which shall include, but not be limited to, the following elements:

(a) The estimated number of existing bicycle commuters in the plan area and the estimated increase in the number of bicycle commuters resulting from implementation of the plan.
See Appendix Section F (under separate cover).

(b) A map and description of existing and proposed land use and settlement patterns which shall include, but not be limited to, locations of residential neighborhoods, schools, shopping centers, public buildings and major employment centers.
See Pages 53 and 54.

(c) A map and description of existing and proposed bikeways.
See Pages 17 to 29.

(d) A map and description of existing and proposed end-of-trip bicycle parking facilities. These shall include, but not be limited to, parking at schools, shopping centers, public buildings and major employment centers.
See Pages 53 and 80 to 82, Page 9: P-1.6, Page 11: P-1.27 and I-1.7.

(e) A map and description of existing and proposed bicycle transport and parking facilities for connections with and use of other transportation modes. These shall include, but not be limited to, parking facilities at transit stops, rail and transit terminals, ferry docks and landings, park and ride lots, and provisions for transporting cyclists and bicycles on transit or rail vehicles of ferry vessels.
See Pages 177 to 182.

(f) A map and description of existing and proposed facilities for changing and storing clothes and equipment. These shall include, but not be limited to, locker, restroom and shower facilities near bicycle parking facilities.
See Page 9: P-1.6, Page 11: P-1.27 and I-1.7 and Page 199.

(g) A description of bicycle safety and education programs conducted in the area included in the plan, efforts by the law enforcement agency having primary traffic law enforcement responsibility in the area to enforce provisions of the Vehicle Code pertaining to bicycle operation, and the resulting effect on accidents involving cyclists.

San Clemente has two League of American Bicyclists (LAB) League Certified Instructors (LCIs), trained to teach LAB bicycle safety curriculum. The fundamental course is called Traffic Skills 101, which teaches students how to safely operate their bicycles on a road shared with vehicles and how to comply with applicable California Vehicle Code sections. There are also LAB curricula for students younger than 14.

(h) A description of the extent of citizen and community involvement in development of the plan including, but not be limited to, letters of support.
See Appendix E (under separate cover).

(i) A description of how the bicycle transportation plan has been coordinated and is consistent with the local or regional transportation, air quality or energy conservation plans, including, but not be limited to, programs that provide incentives for bicycle commuting.
See Page 11: I-1.4 and Page 13: P-4.2

(j) A description of the projects proposed in the plan and a listing of their priorities of implementation.
See Pages 17 to 29.

(k) A description of past expenditures for bicycle facilities and future financial needs for projects that improve safety and convenience for bicycle commuters in the plan area.

Past expenditures for maintaining bicycle facilities including bicycle lanes are included in the Pavement Management Program. Over the last five years the City improved over 7.6 miles of existing bicycle lanes at a cost of approximately $100,000 per year.

Future financial needs include both maintaining existing bicycle infrastructure and candidate Capital Improvements Projects identified in this Bicycle and Pedestrian Master Plan. Future financial needs for implementing the candidate projects in the Master Plan exceed the city's available funding for street infrastructure. The future financial needs for improving the safety and conveyance for bicycle commuters in the plan area range from $100,000 to $1,000,000 per year. The actual budgets will be determined by the priorities established by the City Council during the budget process and will be affected by securing grant funding for candidate projects.