ATTACHMENT #2

Berkeley SafeTREC

SAFE TRANSPORTATION RESEARCH AND EDUCATION CENTER

PS21033

CITY OF INDIAN WELLS

COMPLETE STREETS SAFETY ASSESSMENT

Issues, Opportunities, and Suggested Strategies

Assessment Team

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CITY OF INDIAN WELLS
COMPLETE STREETS SAFETY ASSESSMENT

FINAL REPORT

SEPTEMBER 2021

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EXECUTIVE SUMMARY

The City of Indian Wells requested that SafeTREC at the University of California, Berkeley conduct a Complete Streets Safety Assessment (CSSA) study for various locations within the City. A team of two safety experts conducted the CSSA. One of the experts visited the City of Indian Wells and conducted a walking audit on May 17, 2021. The objectives of the CSSA are to improve pedestrian and bicycle safety and to enhance walkability and accessibility for all pedestrians and bicyclists in Indian Wells.

Based on the OTS 2018 statistics, Indian Wells ranked 44 out of 75 California cities in Group F, in total fatal and injury collisions (with a ranking of "1" being the worst and "75" the best). It ranked 71 for pedestrian collisions, and 65 for bicyclist collisions. This ranking is based on a number of weighted factors including population, daily vehicle miles traveled, collision records, collision trends, and others. For more information on OTS rankings, please refer to https://www.ots.ca.gov/media-and-research/crash-rankings-results/

This report is organized into the following chapters:

- Chapter 1 is an introduction to the Complete Streets Safety Assessment for City of Indian Wells.
- Chapter 2 presents background information on bicyclist and pedestrian safety in the City and collision history.
- Chapter 3 presents benchmarking analysis results and suggestions for potential improvement from the benchmarking analysis.
- Chapter 4 presents field walking audit results and suggestions for potential improvements from the audit.

Benchmarking Analysis of Policies, Programs, and Practices

To assess pedestrian safety conditions in Indian Wells, the expert team conducted a benchmarking analysis to understand how the City's existing conditions compared with current best practices. Through a pedestrian and bicycle safety assessment survey conducted with City staff, the expert team identified the City's pedestrian and bicycle policies, programs, and practices and categorized them into three groups:

- Key strengths (areas where the City is exceeding national best practices)
- Enhancement areas (areas where the City is meeting national best practices)
- Opportunity areas (areas where the City appears not to meet national best practices)

While suggestions are provided for each category, cities have differing physical, demographic, and institutional characteristics that may make certain goals or policies more appropriate in some jurisdictions than others. Ultimately, City staff may determine where resources and efforts are best placed for meeting local development and infrastructure goals for pedestrians and bicyclists.

A discussion of the City's pedestrian and bicycle safety policies, programs, and practices, and suggestions for potential improvement or further enhancement to the City's existing programs and policies are presented in *Chapter 3*.

Walking Audit Focal Areas

Per City's request, the following six (6) focal areas (intersections, street segments or corridors) were studied in this assessment:

1 CV-Link path
2 Fairway Drive
3 Eldorado Drive
4 Cook Street
5 Indian Wells Lane
6 Club Drive

Many of the strategies suggested in this report are appropriate for grant applications, including Office of Traffic Safety (OTS) or Active Transportation Program (ATP) funding. The strategies may also be incorporated into a bicycle or pedestrian master plan, documents that could set forth bicycle, pedestrian and streetscape policies for the City, identify, and prioritize capital improvement projects.

The suggestions presented in this report are based on limited field observations and time spent in Indian Wells by the CSSA evaluator. These suggestions, which are based on general knowledge of best practices in pedestrian and bicycle design and safety, are intended to guide City staff in making decisions for future safety improvement projects in the City, and they may not incorporate all factors which may be relevant to safety issues in the City.

As this report is conceptual in nature, conditions may exist in the focal areas that were not observed and may not be compatible with suggestions in this report. Before finalizing and implementing any physical changes, City staff may choose to conduct more detailed studies or further analysis to refine or discard the suggestions in this report, if they are found to be contextually inappropriate or appear not to improve bicycling safety or accessibility due to conditions including, but not limited to, high vehicular traffic volume or speeds, physical limitations on space or sight distance, or other potential safety concerns.

1. INTRODUCTION

1.1. OBJECTIVE OF THE ASSESSMENT

The City of Indian Wells (the City) requested that the Safe Transportation Research and Education Center (SafeTREC) at University of California, Berkeley conduct a Complete Streets Safety Assessment (CSSA) for the City. The objective of the CSSA is to improve safety and accessibility for all people walking and biking in the City of Indian Wells. This assessment emphasizes safety and mobility issues associated with pedestrians and bicyclists.

1.2. ASSESSMENT APPROACH

The SafeTREC Safety experts conducted a pre-visit telephone interview with City staff on May 04, 2021. One of the SafeTREC experts met with City staff and conducted a walking audit at various locations in Indian Wells on May 17, 2021. Positive practices, as well as pedestrian and bicycle safety and accessibility issues were identified at the field audit.

1.3. DISCLOSURES

The benchmarking analysis aims to provide the City with information on current best practices and how the city compares. Cities have differing physical, demographic, and institutional characteristics that may make certain goals or policies more appropriate in some jurisdictions than others. Ultimately, City staff will determine where resources and efforts are best utilized to meet local development and infrastructure goals for people walking and biking.

The suggestions presented in this report are based on limited field observations and limited time spent in the City of Indian Wells by the CSSA evaluator. These suggestions, which are based on general knowledge of best practices in pedestrian and bicycle design and safety, are intended to guide City staff in making decisions for future safety improvement projects in the city, and they may not incorporate all factors, which may be relevant to the pedestrian and bicycle safety issues in the city.

As this report is conceptual in nature, conditions may exist in the focal areas that were not observed and may not be compatible with suggestions in this report. Before finalizing and implementing any physical changes, City staff may conduct more detailed studies or further analysis to refine or discard the suggestions in this report if they are found to be contextually inappropriate or appear not to improve pedestrian and bicyclist safety or accessibility due to conditions including, but not limited to, high vehicular traffic volume or speeds, physical limitations on space or sight distance, or other potential safety concerns.

2. BACKGROUND AND COLLISION HISTORY

The City of Indian Wells is located in Riverside County. Per Office of Traffic Safety, as of 2018, with a population of approximately 5,379, it is categorized as one of the 75 cities in Group F, population 2,501 – 10,000 people, as shown in Table 2-1.

Table 2-1: Indian Wells Summary Statistics

Year	County	Population	Population Group	Daily Vehicle Miles Traveled (VMT)
2018	Riverside	5,379	F	283,638

Source: California Office of Traffic Safety, https://www.ots.ca.gov/media-and-research/collision-rankings/

2.1. PEDESTRIAN AND BICYCLIST SAFETY OVERVIEW

The Office of Traffic Safety (OTS) collision rankings facilitate funding decisions and identify emerging traffic safety problem areas. The rankings allow cities to compare themselves to other cities with similar-sized populations and help them identify potential disproportionate traffic safety issues. OTS rankings are indicators of historical collisions; there are many factors that affect collisions in a city.

Victim and collision data for the rankings were acquired from the California Highway Patrol (CHP) Statewide Integrated Traffic Records System (SWITRS), California Department of Transportation (Caltrans), California Department of Justice (DOJ), and the Department of Finance (DOF).

The 2018 OTS safety rankings for Indian Wells are shown in Table 2-2. Based on the OTS 2018 statistics, Indian Wells ranked 44 out of 75 California cities in Group F, in total fatal and injury collisions (with a ranking of “1” being the worst and “75” the best). It ranked 71 for pedestrian collisions, and 65 for bicyclist collisions.

Table 2-2: Indian Wells Traffic Collisions and Rankings

Type of Collision	Victims Killed & Injured	OTS Ranking (of 59 cities)
Total Fatal and Injury	54	44/75
Alcohol Involved	3	61/75
Motorcycles	2	68/75
Pedestrians	1	71/75
Pedestrians < 15	0	14/75
Pedestrians 65+	0	73/75
Bicyclists	2	65/75
Bicyclists < 15	0	27/75

2.2. PEDESTRIAN AND BICYCLIST COLLISION DATA

The collision data for Indian Wells from January 2015 to the end of 2019 was taken from the SafeTREC Transportation Injury Mapping System (TIMS) database. During this five-year period, 157 collisions occurred in Indian Wells, one of which was fatal. There were 5 collisions involving pedestrians and 6 involving bicyclists.

Pedestrian Collisions

Within the 5-year period analyzed from TIMS data, 5 collisions involved pedestrians, none of which was fatal, but two were with severe injury. Of the 5 collisions, 3 involved pedestrian crossing in crosswalk at an intersection, one crossing not in crosswalk. One was not in road. The following charts depict this data:

Chart 2.1: Number of Pedestrian Collisions by Collision Severity, Indian Wells

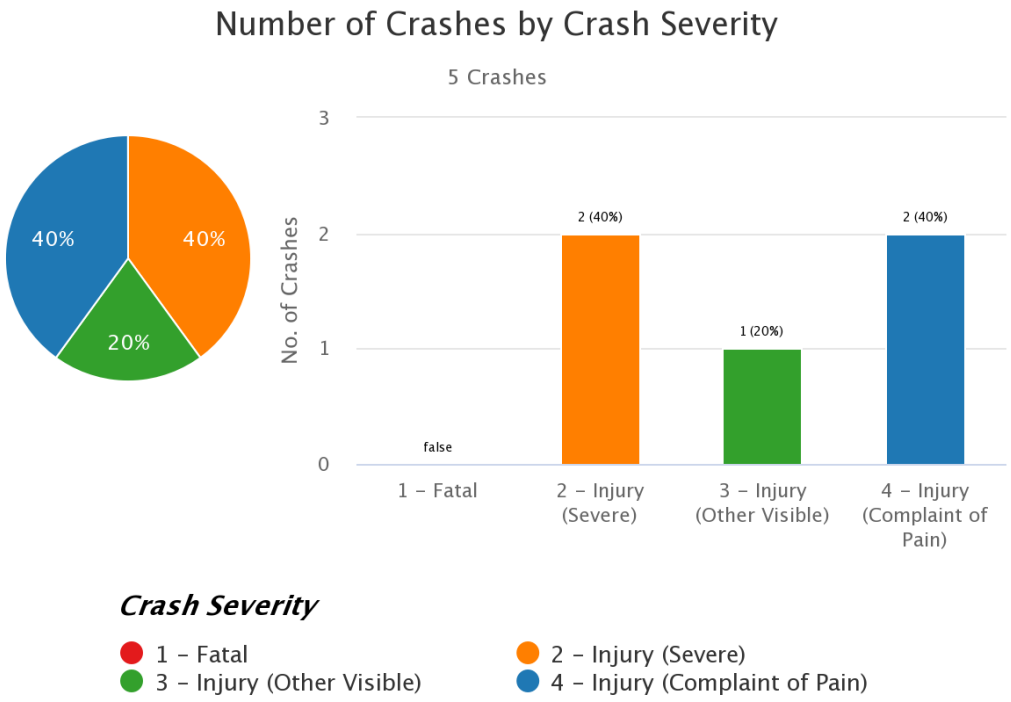


Chart 2.2: Number of Pedestrian Collisions per Day of Week per Time, Indian Wells

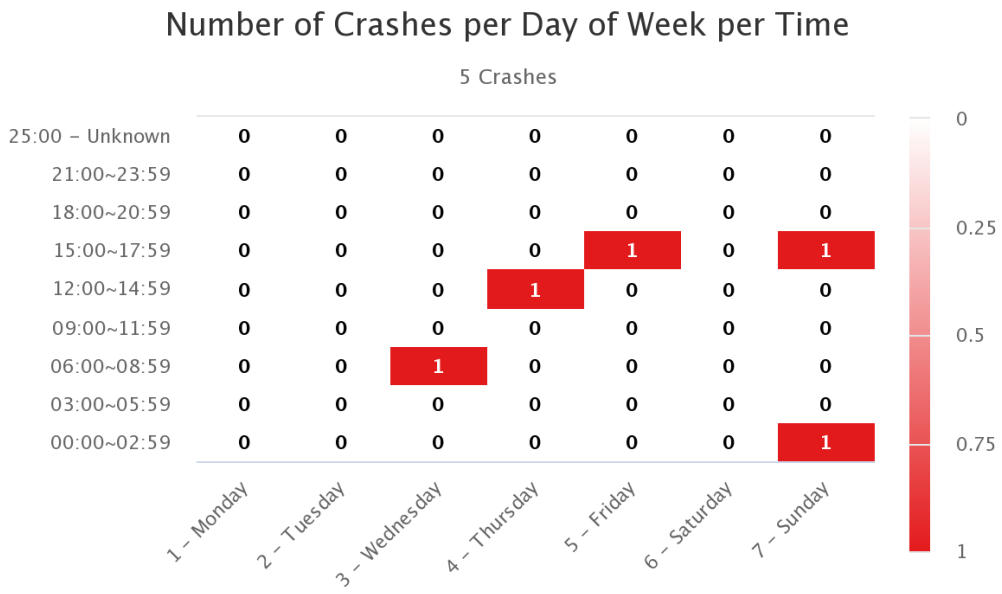
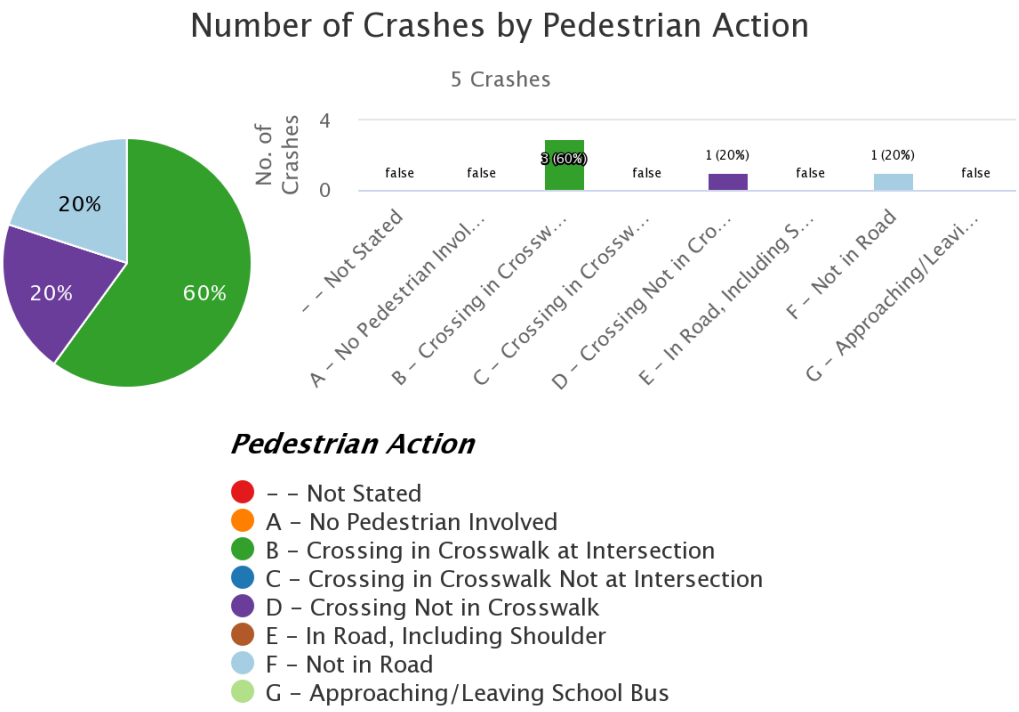


Chart 2.3: Number of Pedestrian Collisions by Pedestrian Action, Indian Wells



Pedestrian Action	Count	%
B - Crossing in Crosswalk at Intersection	3	60.00%
D - Crossing Not in Crosswalk	1	20.00%
F - Not in Road	1	20.00%

Bicycle Collisions:

Based on the TIMS data, within the 5-year (2015-2019) period, there were 6 collisions involving bicyclists, one of which was fatal and 2 were with severe injury. The following charts depict this data.

Chart 2.4: Number of Bicycle Collisions by Collision Severity, Indian Wells

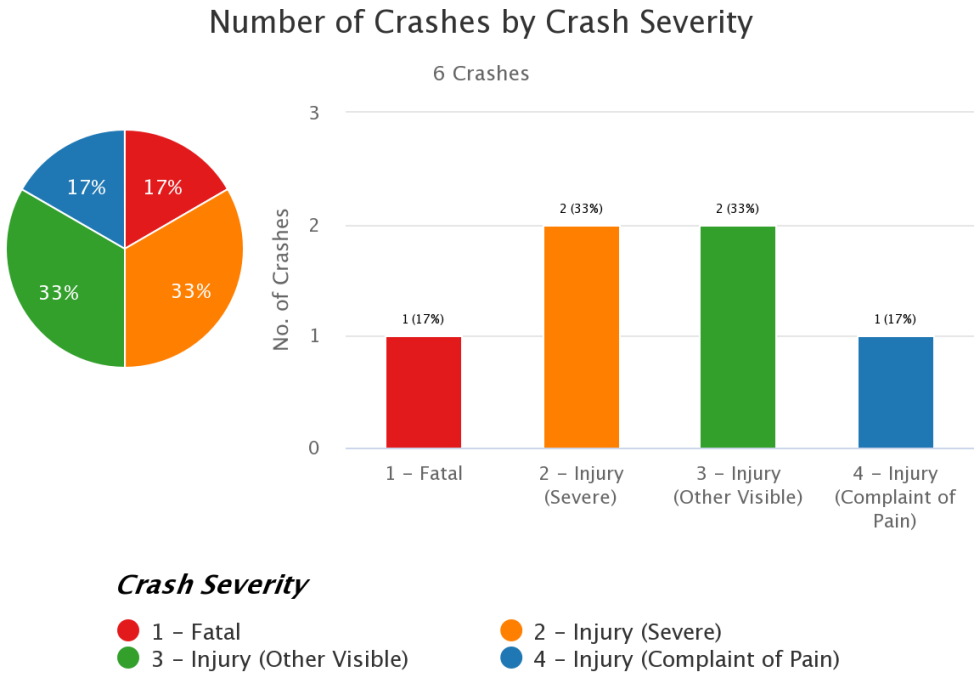


Chart 2.5: Number of Bicycle Collisions per Day of Week per Time, Indian Wells

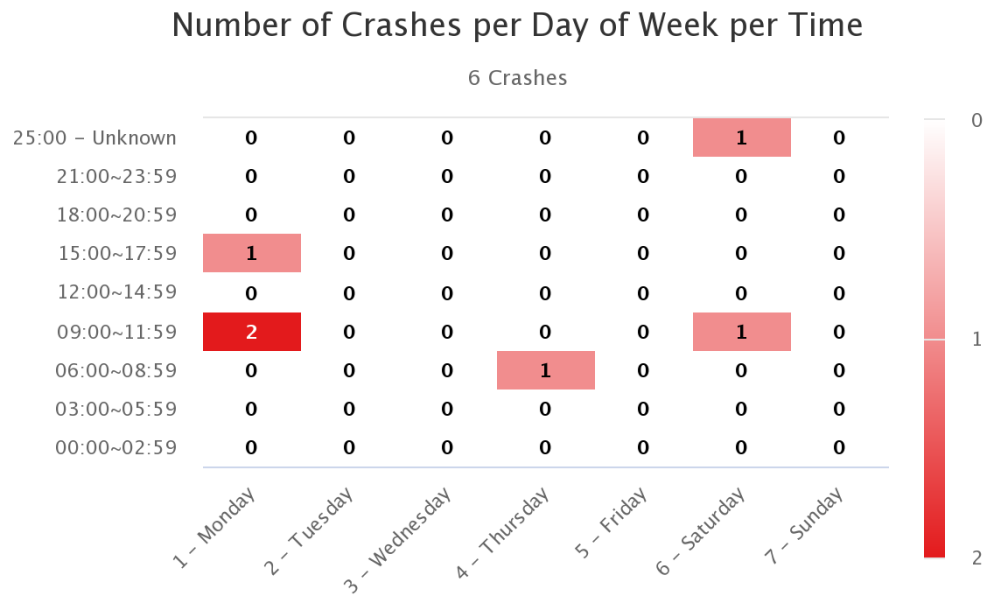
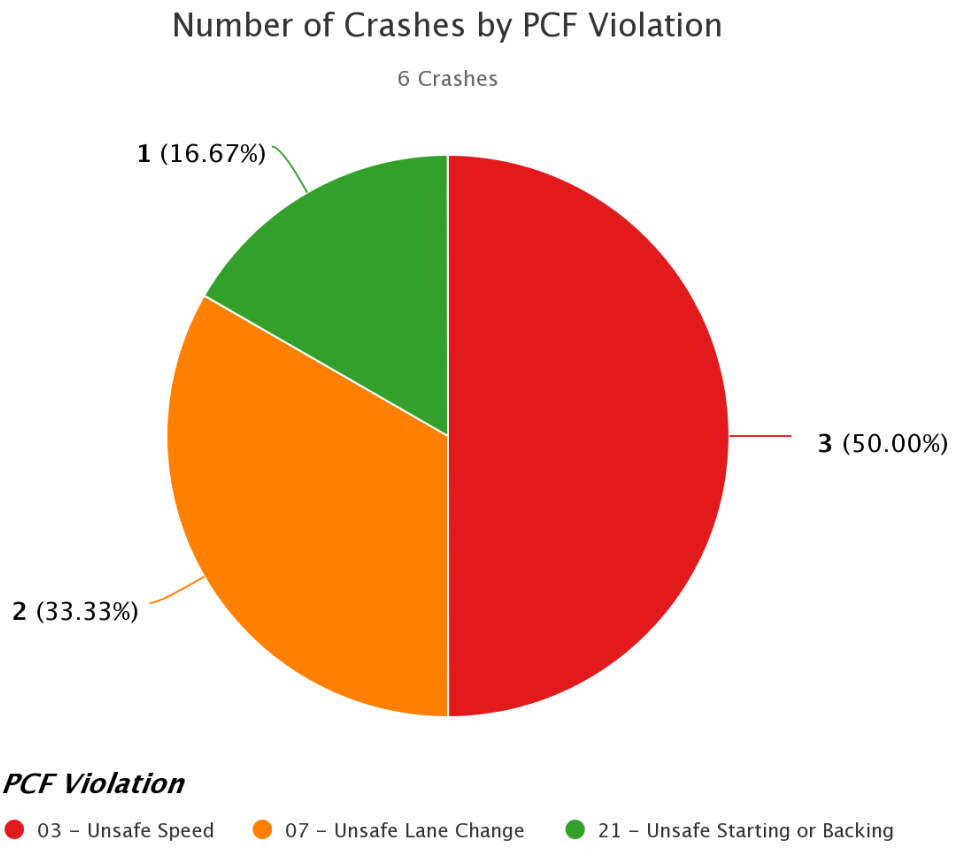


Chart 2.6: Number of Bicycle Collisions by Primary Collision Factor (PCF) Violation, Indian Wells



PCF Violation	Count	%
03 - Unsafe Speed	3	50.00%
07 - Unsafe Lane Change	2	33.33%
21 - Unsafe Starting or Backing	1	16.67%

The type of information provided above was obtained from SafeTREC's TIMS (https://tims.berkeley.edu/) can help the enforcement department in decision making regarding their enforcement efforts.

2.3. STREET STORY

The Street Story program (https://streetstory.berkeley.edu/) is a relatively new tool developed by UC Berkeley's Safe Transportation Research and Education Center (SafeTREC) with OTS support. Street Story is a community engagement tool that allows residents, community groups and agencies to collect information about transportation collisions, near-misses, general hazards and safe locations to travel. To promote access to the tool, SafeTREC conducts technical

assistance sessions with communities and organizations on using Street Story. Street Story is free to use and publicly accessible.

Street Story features a survey where people can record travel experiences. Once a record has been entered, the information is publicly accessible on the website with maps and tables that can be downloaded.

It is suggested that City staff use this free tool to collect information from their residents for local needs assessments, transportation safety planning efforts, safety programs and project proposals.

3. BENCHMARKING ANALYSIS RESULTS AND SUGGESTIONS

3.1. BENCHMARKING ANALYSIS OF POLICIES, PROGRAMS, AND PRACTICES

To assess pedestrian and bicycle safety conditions in the City/County, the CSSA team first conducted a benchmarking analysis to understand how the City's/County's existing conditions compared with current nationwide best practices. Responses were analyzed using a benchmarking matrix, as shown in Table 3-1, which lists the benchmarking topics that fall under the following categories:

- Implementation of Americans with Disabilities Act (ADA) Improvements
- Policies and Programs
- Funding
- Data Collection
- Pedestrian and Bicycle Network Implementation
- Pedestrian and Bicycle Support Programs

The CSSA team also reviewed the local agency's website and relevant documents. Through a pedestrian and bicycle safety assessment interview conducted with local agency's staff, the CSSA team identified the local agency's pedestrian and bicycle policies, programs, and practices and categorized these into three groups:

- Key strengths (areas where the City/County is exceeding nationwide best practices)
- Enhancement areas (areas where the City/County is meeting best practices)
- Opportunity areas (areas where the City/County appears not to meet best practices)

While suggestions are provided for each category, cities have differing physical, demographic, and institutional characteristics that may make certain goals or policies more appropriate in some jurisdictions than others. Ultimately, local agency staff may determine where resources and efforts are best placed for meeting local development and infrastructure goals for pedestrians.

Each topic receives one of those three ratings and is highlighted in green in the table below. This analysis shares information on current best practices and how the City/County compares. With differing physical, demographic, and institutional characteristics, certain goals or policies may be more appropriate in some jurisdictions than others. Ultimately, Local Agency staff may determine where resources and efforts are best placed for meeting local development and infrastructure goals for pedestrians.

The items in Table 3-1 are further elaborated in the following sections, which provide a description for each benchmarking topic, the local agency's current practices, and ideas for improvement or further enhancement. The Local Agency staff may select strategies for implementation based on local priorities.

Table 3-1: Summary of Programs, Policies, and Practices Benchmarking Analysis for the City of Indian Wells

Benchmark Topic	Key Strength	Enhancement	Opportunity
Implementation of Americans with Disabilities Act (ADA) Improvements			
Implementation of Americans with Disabilities Act (ADA) Improvements	Uses state-of-the-practice (PROWAG) ADA improvements with consistent installation practices	Has clear design guidelines but no regular practices for ADA compliance	Has minimal design guidelines and practices related to ADA requirements
ADA Transition Plan for Streets and Sidewalks	Has ADA transition plan in place and an ADA coordinator	Partial or outdated ADA transition plan or an ADA coordinator	No transition plan or ADA coordinator
Policies and Programs			
Pedestrian/Bicycle Coordinator	Has a Coordinator on staff who manages the agency's pedestrian and bicycle programs	Occasionally uses a part-time contract coordinator	Does not have a pedestrian/bicycle coordinator
Formal Advisory Committee	Has a formal, active Transportation Advisory Committee that address bicycle/pedestrian issues	Has an ad-hoc Transportation Advisory Committee. Note: City's Planning Commission may act as Transportation Advisory Committee.	Does not have a Transportation Advisory Committee
Traffic Calming Program	Has a significant traffic calming program with a dedicated funding source	Has a traffic calming program but no dedicated funding source	Explores other traffic calming features other than speed humps
Speed Limits and Speed Surveys	Employs comprehensive practice to proactively review speed limits such as USLIMITS2[1]. Considers traffic calming before raising speed limits in pedestrian or bicycle zones	Reviews data only in response to reported concerns or frequent collisions	Reviews speed limits by following CA MUTCD and CA Vehicle Code.

[1] https://safety.fhwa.dot.gov/uslimits/

Benchmark Topic	Key Strength	Enhancement	Opportunity
Safe Routes to Schools	Has an ongoing Safe Routes to Schools program and funding for recent projects.	Has obtained funding for recent projects, but has no community-wide Safe Routes to Schools program	Does not have a Safe Routes to Schools program and has not obtained recent funding
Crosswalk Installation, Removal, and Enhancement Policies	Has a crosswalk policy that reflects best practices for signalized and uncontrolled crosswalk treatments (FHWA Field Guide), including consideration of Pedestrian Hybrid Beacons	Has no policy, but has an established crosswalk installation, removal, and enhancement practice in place	Does not have a policy or set practices for addressing crosswalk installation, removal, or enhancement
Shared Mobility Services	Has curbside management, shared mobility, or micromobility policies (e.g., permitting, enforcement) in place that prioritize pedestrian and bicyclist safety	Has curbside management, shared mobility, or micromobility policies in place, but without a focus on safety	No curbside management, shared mobility, or micromobility policies in place
Funding			
Funding	Has a dedicated annual funding stream for pedestrian and bicycle projects and local grant matches	Depends on grant funding for projects, and is successful in obtaining grants	Only moderately successful in obtaining grant funding or has trouble spending funds when given grants
Data Collection			
Collection of Pedestrian and Bicyclist Volumes	Collects pedestrian and bicyclist volumes routinely with intersection counts and has a GIS database of counts	Collects some pedestrian and bicyclist volumes, but not routinely	Does not collect pedestrian and bicycle volumes
Inventory of Bikeways, Parking, Informal Pathways, and Key Bicycle Opportunity Areas	Maintains an inventory of missing and existing bikeways in GIS and includes bikeway projects in the CIP	Maintains an inventory of missing facilities and opportunity areas	Does not have an inventory of missing/existing bikeways, parking, informal pathways, or key bicycle areas
Inventory of Sidewalks, Informal Pathways, and Key Pedestrian Opportunity Areas	Maintains an inventory of missing and existing sidewalks in GIS and includes sidewalk projects in the CIP	Maintains an inventory of missing sidewalks, informal pathways, or pedestrian opportunity areas	Does not have an inventory of missing sidewalks, informal pathways, or pedestrian opportunity areas

Benchmark Topic	Key Strength	Enhancement	Opportunity
Pedestrian and Bicycle Traffic Control Audit (Signs, Markings, and Signals)	Maintains an inventory of pedestrian and bicycle signs, markings, and signals in GIS	Has some inventories of signs, markings, and signals	Does not have an inventory of signs, markings, and signals
Collision History and Collision Reporting Practices	Employs a data-driven systemic safety or Vision Zero approach to regularly analyze collision data citywide	Reviews data only following fatalities or other high-profile incidents	Does not have set practices for data review
Pedestrian and Bicycle Network Implementation			
Complete Streets Policy	Has a Complete Streets policy that includes all users and modes, affects new construction and maintenance, considers local context, and provides guidance for implementation	Has a Complete Streets policy that is narrow in scope or applies only to public works projects	Does not have a Complete Streets policy
Active Transportation Plans	Has a recently-updated Active Transportation Plan (or similar) with strategic prioritized list of projects that reflects current best practices (e.g. Level of Traffic Stress analysis, inclusion of Class IV protected bicycle facilities)	Has a Pedestrian or Bicycle Master Plan but it may be outdated and/or no recent projects from the Plan have been completed	Does not have a Pedestrian or Bicycle Master Plan
Existing bike network	Includes current best practice features such as separated bikeways, bicycle boulevards, intersection treatments, and/or buffered bike lanes	Includes Class I, II, and III only	Includes only bicycle routes or no designation
Existing pedestrian facilities	Includes current best practice ADA and safety features such as high visibility crosswalks and advance stop bars, PHBs or RRFBs, bulbouts, etc.	Narrow sidewalks or sidewalk gaps, crosswalks with few or no safety enhancements, with some pedestrian countdown signals	Missing key marked crosswalks and sidewalks, with few ADA improvements and no safety enhancements, and no pedestrian countdown signals

Benchmark Topic	Key Strength	Enhancement	Opportunity
Bike Network Implementation Practices	Age 8 to 80 bicyclist considerations are applied and/or level of traffic stress is considered	Some traffic calming measures are implemented in conjunction with bikeway installation	Treatments are implemented where they fit within the right-of-way and vehicle LOS is not affected
Design guidelines and standards	Uses national best practices focused on bicycle and pedestrian safety for roadway and facility design guidelines and standards	Local standards reference national best practices, but are static or out of date, with minimal customized design policies for pedestrian and bicycle accommodations	Does not have a comprehensive design guidelines or standards for pedestrian or bicyclist treatments
Roadway Surfaces	Roadway resurfacing projects and debris removal are prioritized for bicycle routes.	Roadway surface is acceptable on bicycle routes and routine maintenance, including debris removal, occurs.	Roadway surface conditions are poor on some bicycle facilities and maintenance is not prioritized for bicycle facilities
Attention to Bicycle Crossing Barriers	Colored bike lanes and other innovative treatments, including geometric enhancements, are provided at intersections and interchanges	Bike treatments are installed at some intersections and interchanges	Bike treatments are not installed at intersections or through interchanges
Attention to Pedestrian Crossing Barriers	Has a recently updated policy and comprehensive inventory of barriers. Has design guidelines for addressing barriers	Has no policy, but has identified some barriers and taken steps to improve pedestrian access	Does not have a policy or practices for pedestrian crossings at railroads, freeways, and so on
Traffic Signal	Uses relaxed warrants for traffic signals and/or all-way stops	Uses relaxed warrants for traffic signals or all-way stops	Uses MUTCD Warrants
Pedestrian and Bicycle Support Program			
Bicycling Supportive Amenities and Wayfinding	Bicycle supportive amenities (parking, routing/wayfinding, water fountains, repair stations) are found community-wide	Some bicycle supportive amenities are found in key areas	Bicyclist supportive amenities are not provided in the community

Benchmark Topic	Key Strength	Enhancement	Opportunity
Pedestrian and Bicycle Safety Education Program	Pedestrian and bicycle education programs are data-driven and focused on local safety context; education programs are customized for different groups	Has some traffic safety education programs that include pedestrians and bicyclists	Does not have pedestrian and bicycle safety education programs
Enforcement	Police Department conducts sustained and data-driven enforcement efforts focused on behavior and locations related to most severe bicycle and pedestrian crashes; enforcement activities are designed to consider equity implications	Police Department conducts some enforcement activities related to bicyclist and pedestrian safety	Police Department does not have Traffic Safety Officer(s)

Implementation of Americans with Disabilities Act (ADA) Improvements

Implementation of ADA improvements is key to making walking accessible and safe for everyone, regardless of ability or age.

Suggestions for Potential Improvement

- Continue adding ADA ramps at intersections that currently lack them and upgrade non-complaint ramps
- Develop an ADA improvement program for items such as dual curb ramps, truncated domes, and audible pedestrian signals that applies consistent treatments. The program may provide an inventory, prioritization plan, and funding source for such improvements.

ADA Transition Plan for Streets and Sidewalks

ADA Transition Plans identify gaps and issues in the City/County's current ADA infrastructure, prioritize projects for implementation, and set forth the process for bringing public facilities into compliance with ADA regulations. Transition Plans typically a range of locations, such as public buildings, sidewalks, ramps, and other pedestrian facilities. Some cities also have ADA Coordinators, who are responsible for administering the Plan and reviewing projects for accessibility considerations.

Suggestions for Potential Improvement

- Consider prioritizing sub-areas within the City/County that exhibit greatest pedestrian activity.
- Expand the ADA Transition Plan to include the public right-of-way, particularly the downtown area, other priority development areas, bus stops, and schools.
- Consider having a part-time, trained ADA coordinator to review projects for accessibility and implement the ADA Transition Plan.
- Provide ADA standards and best practice training for engineering staff at all levels.

Pedestrian/Bicycle Coordinator

A pedestrian/bicycle coordinator provides guidance for pedestrian/bicycle planning efforts and oversees implementation of plans. In a sampling of pedestrian-oriented California cities, a common denominator among cities (with a population over 100,000) is a full-time pedestrian/ bicycle coordinator.

Suggestion for Potential Improvement

- Include dedicated time for the pedestrian and bicycle staff person to write grants for both capital projects and ongoing funding for walking and biking related programs and optics as well as to liaison with local non-profit, advocacy groups, and schools.

Formal Advisory Committee

Advisory committees serve as important sounding boards for new policies, programs, and practices. Responding to public concerns through public feedback mechanisms represents a more proactive and inclusive approach to bicycle and pedestrian safety compared to a conventional approach of reacting to collisions.

Public Involvement and Feedback Process

Having multiple touch points with the community creates transparency and open lines of communication between the Local Agency staff, residents, and businesses. Different kinds of formats and venues for public involvement and feedback allows for broader participation from the community. Consideration of local demographics (e.g., languages spoken) and the easiest formats for people to participate (e.g., online, in person but in the course of their daily activities, or at Local Agency-organized meetings) are important for meaningful and productive community dialogue.

Suggestion for Potential Improvement

- Add “safety” or bicycle and pedestrian specific issues as the “work type” when people place a pin in 311 for easy coding and understanding of issues.

- Provide quarterly or annual updates to the community on the "state of walking and biking", including recently completed projects, anticipated timeline for upcoming projects, and what the Local Agency plans to fund.
- Provide notices and interpretation in the most commonly spoken languages.

Traffic Calming Program

Traffic calming programs and policies set forth a consensus threshold on neighborhood requests and approvals, as well as standard treatments and criteria.

Suggestion for Potential Improvement

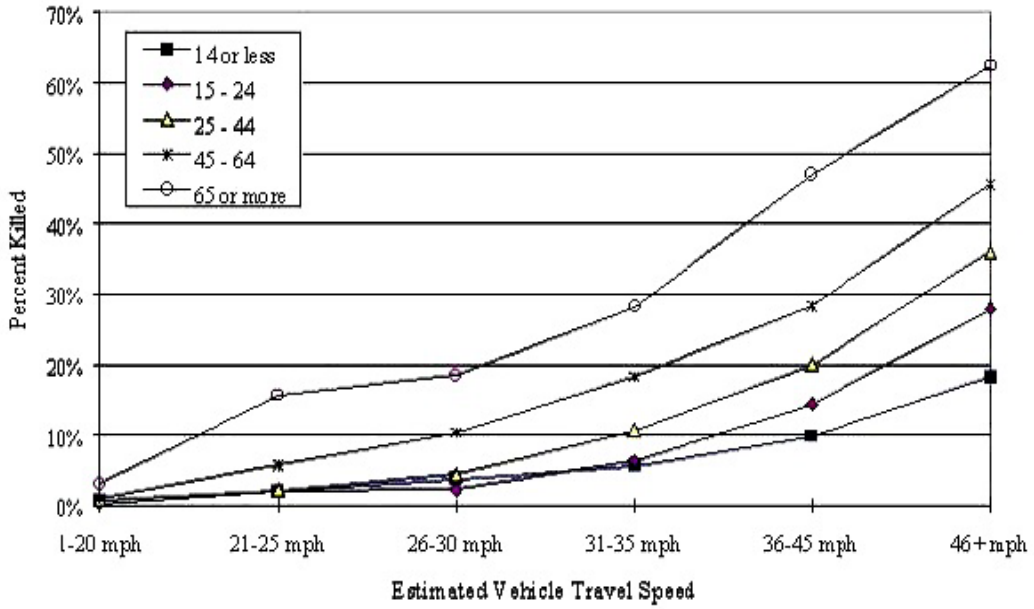
- Increase the amount of dedicated funding available for traffic calming each year.
- Expand the Local Agency's traffic calming toolbox to include other tools, such as raised crosswalks, raised intersections, chicanes, and traffic diverters. They Local Agency could secure additional dedicated funding streams as part of the Bicycle and Pedestrian Plan buildout to accommodate these sometimes costlier (but highly effective) improvements.
- Expand the Local Agency's practices to include proactive traffic calming measures instead of only responding to community requests. The Local Agency could consider allocating a portion of funding to proactive traffic calming, such as on bicycle boulevard streets or safe routes to schools, and then allocate the remaining funding to react to specific community requests.
- Refer to the following resources for traffic calming best practices:
    - *www.trafficcalming.org*
    - Traffic Calming Guidelines from the City of Danville (*https://www.danville.ca.gov/DocumentCenter/View/139/NTMP-Guidelines-Booklet-PDF*)
    - Neighborhood Traffic Management Program from the City of Anaheim (*https://www.anaheim.net/2841/NTMP3*)
    - ITE Technical Resources – Traffic Calming Measures: (*https://www.ite.org/technical-resources/traffic-calming/traffic-calming-measures/*)

Speed Limits and Speed Surveys

Local municipalities have the authority to set the posted speed limit based on current speed data. The speed limit is rounded to the nearest five mile per hour (MPH) increment based on the 85th percentile speed of free-flowing traffic. School zone speed limits in California are a de facto 25 miles per hour or less, where specified. Speed is also critical for complete streets safety.

Pedestrian fatality rates increase exponentially with vehicle speed. Thus, controlling vehicle speeds is one of the most important strategies for enhancing pedestrian and bicyclist safety.

Figure 3-1. Relationship between Vehicle Speed, Victim Age, and Fatalities



Suggestions for Potential Improvement

- Install traffic calming measures, signal coordination, and similar tools to maintain slower speeds appropriate for an urban community, particularly on streets that will be reviewed in the next speed survey.
- After complete streets improvement and other safety improvements are installed, conduct off-cycle speed surveys to review the speed limit and see if it needs to be reduced based on the improvements.
- Consider pedestrian volumes and known complete streets safety issues when setting speed limits and employ traffic calming strategies in locations where speed surveys suggest traffic speeds are too high for pedestrian and bicyclist safety.
- Ensure complete streets design standards have appropriate target design speeds for urban areas and do not contribute to a routine need for traffic calming.
- Consider the use of 15 MPH school zones.

Safe Routes to Schools

Safe Routes to School (SRTS) programs encourage children to safely walk or bicycle to school. The Marin County Bicycle Coalition was an early champion of the concept, which has spread nationally (refer to best practices at www.saferoutestoschools.org). SRTS programs are important

both for increasing physical activity (and reducing childhood obesity) and for reducing morning traffic associated with school drop-off (as much as 30% of morning peak hour traffic).

Suggestion for Potential Improvement

- Form an ongoing steering committee for the program (or each school) comprised of Local Agency staff, school district staff, PTA leaders, and other stakeholders that meets regularly to monitor efforts and identify new opportunities.

- Consider a safe route to school plan for all schools to conduct walk audits, identify recommended safety improvements, and secure funding for those improvements.

Crosswalk Installation, Removal, and Enhancement Policies

A formal policy for crosswalk installation, removal, and enhancement provides transparency in decision-making and adopts best practices in pedestrian safety and accommodation. It includes consideration of all kinds of crosswalks, including uncontrolled and controlled locations.

Suggestion for Potential Improvement

- Develop a City- or Countywide crosswalk policy for the installation, removal, and enhancement of crosswalks at controlled and uncontrolled location. Ensure that it is consistent with best practices and recent research. This includes removing crosswalks only as a last resort and providing midblock crossings where they serve pedestrian desire lines.
- Consider developing a treatment selection "tool" to assist staff with the identification of applicable treatments in a given context.
- When crosswalk enhancements are identified, add them to a prioritized list that will be upgraded over time as funding is available.

Crosswalk policy resources include:

- Federal Highway Administration Study Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations: https://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/guide_to_improve_uncontrolled_crossings.pdf
- National Cooperative Highway Research Program Application of Pedestrian Crossing Treatments for Streets and Highways: http://www.trb.org/Publications/Blurbs/175419.aspx

Shared Mobility Services

Shared mobility services are transportation services — typically offered by private companies — that offer ride-hail services (e.g., Lyft or Uber) for both solo and pooled trips, bike share, and scooter share. Policies for shared mobility services can allow agencies to encourage, prohibit, or direct how they want shared mobility to work in their agency. They can allow for curb space management, clear organization of sidewalk space, and encourage (or discourage) private vendors to come to the City/County. Curb space management is a practice that requires curb

access to be planned, designed, operated, and maintained to enable curb utilization with safe, convenient, and multimodal access for all transportation users.

Suggestion for Potential Improvement

- Adopt a curb management plan to designate how the Local Agency will prioritize and proactive plan for curb uses (e.g., parking, passenger loading, commercial loading, ADA loading and parking, bicycle parking, bus-only lanes) and to make sure that the curb has the highest and best use of space.
- Consider micromobility policies (e.g., permitting, enforcement) in place to prioritize pedestrian and bicyclist safety and keep the sidewalk organized and usable for people of all abilities.

Funding

A dedicated, annual funding stream for bicycle and pedestrian projects ensures that these types of projects will be implemented regularly. Bicycle and pedestrian projects can also be integrated in the other work that the local agency does, including repaving and other routine maintenance of the roadway network.

Suggestion for Potential Improvement

- Partner with other agencies and continue applying for grant funding for both infrastructure and non-infrastructure projects.
- Integrate bicycle and pedestrian projects into the site plan review process for new development.
- Secure additional funding for repaving projects to allow for “quick build” projects and other bicycle and pedestrian safety improvements to be integrated into those projects.
- Establish a dedicated funding source for pedestrian and bicycle projects.

Collection of Pedestrian and Bicyclist Volumes

Pedestrian and bicyclist volume data is important for understand where people walk and bike. This establishes baseline data prior to project implementation and can help prioritize projects, develop collision rates, and determine appropriate bicycle and pedestrian infrastructure.

Suggestions for Potential Improvement

- Routinely collect pedestrian and bicycle volumes by requiring them to be counted in conjunction with manual intersection turning movement counts. https://mtc.ca.gov/sites/default/files/4_AOC_Tech_Transfer_Seminar_Banner_06032013.pdf

- Geocode pedestrian volume data with GIS software along with other data such as pedestrian control devices and collisions to analyze data for trends or hotspots related to pedestrian safety.

Inventory of Bikeways, Parking, Informal Pathways, and Key Bicycle Opportunity Areas

- Migrate the inventory of bikeways, bike parking, and future bike improvements into a GIS format for quick mapping and sharing.

- Identify a staff person responsible for maintaining the GIS data set.

Inventory of Sidewalks, Informal Pathways, and Key Pedestrian Opportunity Areas

A GIS-based sidewalk inventory enables project identification and prioritization, as well as project coordination with new development, roadway resurfacing, and so on. This data set can be available on the Local Agency's website for knowledge sharing with the public as well as agencies.

Suggestion for Potential Improvement

- Create a City- or Countywide inventory of existing and missing sidewalks, informal pathways and key pedestrian opportunity areas in GIS.

- Consider establishing a program to work with property owners to repair damaged sidewalks outside their property. This can be a condition for the sale of the property.

Pedestrian and Bicycle Traffic Control Audit (Signs, Markings, and Signals)

Cities have a wide variety of traffic control devices that regulate how bicyclist and pedestrians should use the street and interact safely with drivers. However, some cities do not have inventories how, when, and where this is installed. Creating a database of this information allows the Local Agency's staff to know where infrastructure may be out of date or in needed of updates. For example, countdown signals are important pedestrian safety countermeasure. The 2012 California *Manual of Uniform Traffic Control Devices* (MUTCD) requires the installation of countdown pedestrian signals for all new signals. Likewise, the CA MUTCD also requires installation of bike detection at all actuated signals. Bike detection is a basic building block of the bike network to make sure that bikes can trigger the traffic signal. Inventorying bike detection and countdown signals allows the Local Agency's staff to approach safety from a systems perspective and develop projects to close gaps in biking and walking infrastructure over time.

Suggestion for Potential Improvement

- Develop a City- or Countywide crosswalk inventory in GIS and maintain it over time. This would allow for a systemic safety approach to enhancing crosswalks, and allow the Local Agency to prioritize all crosswalk enhancement projects City- or Countywide for implementation over time and as money is available.

- Ensure that locations with pedestrian desire lines have safe crosswalks. An updated crosswalk policy can help determine the appropriate crossing treatment at uncontrolled locations without marked crosswalks.

- Include maintenance records within the GIS database inventory of signs, markings and signals.

- Develop a proactive monitoring program for ensuring the quality and proper functioning of traffic control devices.

Collision History and Collision Reporting Practices

Safety is typically approach through both proactive and reactive measures. Identifying and responding to collision patterns on a regular basis is an important reactive approach to bicycle and pedestrian safety, which may be combined with other proactive measures. This is the traditional way most cities have approached safety. However, many are now looking to proactive safety to address safety issues on a system wide basis. This is often paired with a policy goal of getting to zero fatality or severe injury collisions (commonly referred to as “Vision Zero”).

Suggestion for Potential Improvement

- Adopt a data driven systemic safety approach, which would include a systems approach to identifying, prioritizing, and ultimately implementing safety countermeasure and/or a formal commitment to Vision Zero.

- Work with elected officials and department heads to adopt a Vision Zero policy formally stating the Local Agency’s commitment to reducing the number of traffic-related fatalities and severe injuries to zero.

- Additionally, with sufficient pedestrian volume data, the Local Agency could prioritize collision locations based on collision rates (i.e., collisions/daily pedestrian volume), a practice that results in a more complete safety needs assessment. Treatments could then be identified for each location and programmatic funding allocated in the Local Agency’s Capital Improvements Program (CIP).

    - The City of Sacramento’s Pedestrian Master Plan includes a section on how to prioritize locations based on collision rates: http://www.cityofsacramento.org/transportation/engineering/publications.html

Complete Streets Policy

Complete Streets Policies are formal statements showing a local agency’s commitment to planning and designing for all modes of travel and travelers of all ages and abilities.

Suggestion for Potential Improvement

- The following jurisdictions have established practices for complete streets, including implementation of these policies through multimodal level of service thresholds, and may serve as models:
    - Boston, Massachusetts, Boston's Complete Streets: http://bostoncompletestreets.org/about/
    - Philadelphia, Pennsylvania, Philly Free Streets: http://www.phillyfreestreets.com/
    - Baltimore, Maryland, Complete Streets Ordinance: https://transportation.baltimorecity.gov/completestreets
    - South Bend, Indiana, Complete Streets Policy: https://www.smartgrowthamerica.org/app/legacy/documents/cs/policy/cs-in-south-bend-resolution.pdf
    - Town of Ashland, Massachusetts, Complete Streets Policy: https://www.smartgrowthamerica.org/app/legacy/documents/cs/policy/cs-ma-ashland-policy.pdf

Active Transportation Plan

This type of plan includes a large menu of policy, program, and practice suggestions, as well as site-specific (and prototypical) engineering treatment suggestions. Bicycle and Pedestrian Master Plan(s) documents a jurisdiction's vision for improving walkability, bikeability, and bicycle and pedestrian safety; establish policies, programs, and practices; and outline the prioritization and budgeting process for project implementation.

Suggestion for Potential Improvement:

- Implement the low-hanging projects in the Bicycle and Pedestrian Master Plan and seek grant funding for major projects
- Pursue additional funding opportunities for programs identified by the Plan.
- Provide regular updates to the Plan, including bicycle and pedestrian facilities and design guidelines that address the needs of bicyclists and pedestrians of all ages and abilities
- Develop high injury networks for walking and biking to identify routes with the highest incidences of fatal and severe injuries for pedestrians and bicyclists. This will create a systematic safety analysis that can help in prioritizing limited resources.
- Consider identifying existing and missing bicycle and pedestrian infrastructure for safety improvement.

Existing Bike Network

Innovative features such as separated bikeways, bicycle boulevards, and buffered bike lanes can decrease the level of traffic stress experienced by bicyclists, make biking more comfortable, and — in so doing — appeal to a wide range of bicyclists. Level of traffic stress refers to the level of comfort or discomfort a bicyclist might experience. Research conducted by the Mineta Institute in San Jose establishes levels of traffic stress on a scale for 1 to 4 with LTS 1 at the level that most children can tolerate and LTS 4 at the level characterized by "strong and fearless" cyclists (see: http://transweb.sjsu.edu/project/1005.html). A bicycle network that is attractive to the majority of the population would have low stress and high connectivity.

Suggestion for Potential Improvement:

- Continue to identify funding sources and implement the proposed projects identified in the Bicycle and Pedestrian Master Plan.
- Develop design standards for bike boulevards, trails, paths, and landscaping for bicycle network.
- Create a GIS data for existing bike network to identify gaps and opportunities for improvements.

Existing Pedestrian Facilities

Suggestion for Potential Improvement:

- Continue to identify funding sources and implement the proposed projects identified in the Bicycle and Pedestrian Master Plan.
- Create a GIS database for existing pedestrian infrastructure to identify gaps, inventory assets, and create opportunities for systemic safety analysis of all crosswalks.

Bike Network Implementation Practices

Considering the safety and comfort of people biking leads to better bikeway projects that can encourage new biking trips and enhance safety for people biking today and in the future.

Bicycle Level of Traffic Stress (LTS) was originally developed by researchers at the Mineta Transportation Institute. LTS assesses the comfort and connectivity of bicycle networks.

Suggestion for Potential Improvement:

- Prioritize bicycle projects to align with roadway resurfacing and projects that are near school sites.
- Secure enough funding for repaving and other complete streets projects to allow for installation of protected bike facilities and intersection improvements.

- Prioritize Use LTS to strategically implement bikeways and traffic calming treatments that would improve LTS of existing bikeways.

Design Guidelines and Standards

Design guidelines and development standards create a clear set of documents that guide how all transportation improvements should be installed City- or Countywide. As a result, they can create a consistent, high-quality biking and walking experience.

Suggestion for Potential Improvement

- Consider adopting national bicycle and pedestrian safety best practices for roadway and facility design guidelines and standards:
    - NACTO Urban Street Design Guide: http://www.nyc.gov/html/dot/downloads/pdf/2012-nacto-urban-street-design-guide.pdf
    - CROW Design Manual for Bicycle Traffic
    - FHWA Separated Bike Lane Planning and Design Guide https://nacto.org/wp-content/uploads/2016/05/2-4_FHWA-Separated-Bike-Lane-Guide-ch-5_2014.pdf
    - MassDOT Separated Bike Lane Planning & Design Guide https://www.mass.gov/lists/separated-bike-lane-planning-design-guide
    - ITE Recommended Practice for Accommodating Pedestrians and Bicyclists at Interchanges
    - AASHTO Guide for the Development of Bicycle Facilities https://nacto.org/wp-content/uploads/2015/04/AASHTO_Bicycle-Facilities-Guide_2012-toc.pdf

AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities https://transops.s3.amazonaws.com/uploaded_files/Update%20of%20the%20AASHTO%20Guide%20for%20the%20Planning%2C%20Design%2C%20and%20Operation%20of%20Pedestrian%20Facilities.pdf

Roadway Surfaces

The quality of a roadway surface along bikeways is an important consideration when choosing to bike. Rough surface in a bike lane creates an uncomfortable bicycling experience and may also pose safety hazards.

Suggestion for Potential Improvement:

- Prioritize maintenance of roadways where bicycle facilities are present, particularly for closing gaps in the bikeway network or where improved pavement quality is needed on popular bicycle routes.
- Prioritize debris removal on roadways where bicycle facilities are present.
- Assess the needs for new and enhanced crosswalks and curb ramps with each repaving project. Include consideration of lane reductions and quick build projects such as paint and plastic median refuges and bulb outs; high-visibility crosswalks; and advanced yield markings.

Attention to Bicycle and Pedestrian Crossing Barriers

Crossing barriers — such as railroads, freeways, and major arterials — may discourage or even prohibit bicycle access and are often associated with vehicle-bicycle collisions. Large intersections and interchanges and uncontrolled crossings can often deter bicyclists due to high speeds, high number of conflict points with vehicles, and high level of exposure. Identifying and removing barriers and preventing new barriers is essential for improving bicyclist safety and access. Crossing barriers also discourage or even prohibit pedestrian access and can create safety challenges for pedestrians. These can be similar to the biking barriers or present additional challenges.

Suggestion for Potential Improvement:

- Use green routinely to highlight conflict zones at large intersection and interchanges. See Oakland's bicycle lane striping guidance for more information: http://www2.oaklandnet.com/government/o/PWA/o/EC/s/BicycleandPedestrianProgram/OAK024653

- To slow speeds at critical intersections, use smaller corner radii using small design vehicles appropriate for urban areas and updated standard plans to reflect this.

- Review design of slip/trap-right lanes at intersections and implement improvements.

- Implement best practice guidance on bicycle accommodation through interchanges and expressways, as appropriate, using the ITE's *Recommended Practice: Guidelines to Accommodate Bicyclist and Pedestrians at Interchanges* plus consideration of protected bike lane design.

- Identify and create an inventory of pedestrian barriers with targeted recommendations for phased improvements.

- Consider pedestrian barriers and needs in doing bicycle barriers assessment.

Traffic Signal and Stop Sign Warrants

Providing all-way stop or signal control at an intersection may improve pedestrian safety by reducing speeds and controlling pedestrian-vehicle conflicts. Installing bicycling signals and limiting stop signs on bicycle routes may enhance bicycle mobility and safety. The CA MUTCD defines warrants for installing signals and stop signs.

Suggestion for Potential Improvement

- Develop specific signal and stop sign warrants that are pedestrian- and bicycle-friendly.

Sidewalk Furniture or Other Sidewalk Zone Policies

Street furniture encourages walking by accommodating pedestrians with benches to rest along the route or wait for transit; trash receptacles to maintain a clean environment; street trees for shade, and so on. Uniform street furniture requirements also enhance the design of the pedestrian realm and may improve economic vitality.

Suggestion for Potential Improvement

Adopt a Street Furniture Ordinance to include locations and furniture amenities other than those associated with transit stops, as appropriate.

Street Tree Requirements

Street trees enhance the pedestrian environment by providing shade and a buffer from vehicles, which increase pedestrian safety. Street trees may also enhance property values, especially in residential neighborhoods. However, street trees, when improperly selected, planted, or maintained, may cause damage to adjacent public utilities.

Suggestion for Potential Improvement

- Update the Street Tree Ordinance to provide guidance on permissible tree types and permitting requirements, also specifying a requirement for new trees plantings associated with development projects.

Bicycling Supportive Amenities and Wayfinding

In addition to designating roadway or paths in a bicycle network, supportive amenities (including parking, water fountains, and maintenance stations) can encourage bicycling. Wayfinding can both encourage bicycling and enhance safety by navigating cyclists to facilities that have been enhanced for bicyclist use or to local retail opportunities for economic growth.

Suggestion for Potential Improvement:

- Create and deploy a bicycle wayfinding strategy City- or Countywide as recommended in the Bicycle and Pedestrian Master Plan, as well as a Biking Guide.

- Develop a Biking Guide that includes a bike map and bicycle locker and rack locations.

Bicycle Parking Requirements

Safe and convenient bicycle parking is essential for encouraging bicycle travel (especially in-lieu of vehicle travel). Bicycle parking can also facilitate last-mile connections between two modes, such as bicycle parking at a transit station. To be effective, bicycle parking needs to be visible and secure and have enough capacity to accommodate bicycle demand, both long-term and short-term. Long-term and short-term parking can be implemented through a bicycle parking ordinance as in the City of Oakland (see details at http://www2.oaklandnet.com/Government/o/PWA/o/EC/s/BicycleandPedestrianProgram/OAK024596).

Suggestion for Potential Improvement:

- Implement short-term and long-term, secured bicycle parking at all new development, consistent with the Bicycle and Pedestrian Master Plan and the APBP Bicycle Parking Guidelines, 2nd edition.
- Site bicycle racks to be convenient for bicyclists, out of the way of pedestrians, and with good visibility for security, consistent with the APBP Bicycle Parking Guidelines, 2nd edition.
- Consider implementation of “branded” racks for the City/County (with a unique design or City/County’s symbol).

Pedestrian and Bicycle Safety Education Program

Engineering treatments are often not enough on their own to realize full safety benefits associated with the treatment. Safety education programs complement engineering treatments and increase compliance. Education campaigns target people of all ages, especially school-age children where safe walking and biking habits may be instilled as lifelong lessons.

Suggestion for Potential Improvement

- Conduct a formal education campaign targeting people driving, walking, and biking about street safety. This includes: advertisements on buses and bus shelters, an in-school curriculum, community school courses, public service announcements, and many other strategies. Consider a focus on speed and safe driving.
    - The Street Smarts program in San Jose, CA, provides a model pedestrian safety

Enforcement

Enforcement of pedestrian and bicycle right-of-way laws and speed limits is an important complement to engineering treatments and education programs.

Suggestion for Potential Improvement

The 3-E's of Pedestrian Safety:

Engineering

Education

- Implement sustained pedestrian safety enforcement efforts and involve the media. Use enforcement as an opportunity for education by distributing pedestrian safety pamphlets in-lieu of, or in addition to, citations. The Miami-Dade Pedestrian Safety Demonstration Project provides a model for the role of media in the sustained effectiveness of enforcement. Information is available at: *http://www.miamidade.gov/MPO/docs/MPO_ped_safety_demo_eval_report_200806.pdf.*

- Train officers in pedestrian safety enforcement principles. The Madison, Wisconsin Department of Transportation has developed a DVD in collaboration with the Madison Police Department to train traffic officers in pedestrian and bicycle issues (for more information see *http://www.walkinginfo.org/library/details.cfm?id=2865*). The Bicycle Transportation Alliance in Portland, Oregon offers Pedestrian Safety Enforcement Training (for more information on this five-hour course see: *http://www.bta4bikes.org/at_work/pedestriangrants.php).*

- Establish a radar gun check-out program for trained community volunteers to record speeding vehicles' license plate numbers and send letters and/or document occurrences. Radar gun check-out programs are available in Albany, Pleasanton, and Thousand Oaks, California, among other cities (for more information on the Pleasanton program see: *http://www.sfgate.com/cgi-bin/article.cgi?file=/c/a/2004/04/07/MNG8N6_/04/07/MNG8N61MGG1.DTL).*

Pedestrian Walking Audit Program

Walking audits provide an interactive opportunity to receive feedback from key stakeholders about the study area and to discuss the feasibility of potential solutions. They can be led by Local Agency staff, advocacy groups, neighborhood groups, or consultants.

Suggestion for Potential Improvement

- Include regular walking audits in City- or Countywide pedestrian safety program, based on the suggestions of this CSSA. This effort may complement other "green" or health-oriented programs within the Local Agency.

Bicycling Safety Audit Program

When Local Agency staff and key stakeholders ride along study corridors and experience key route and crossing challenges and best practices, consensus is more readily reached on a vision and action plan for safety enhancements.

- Include regular bicycling audits in the City- or Countywide bicycle safety programs. Encourage interdepartmental participation.

- Routinely conduct bicycle safety audits of key corridors throughout the City/County, including those with recent improvements, those with heavy bicycle demand, and those with high collision rates.

- Collaborate with schools on projects beyond the school district boundaries.

3.1.1. General Plan: Provision for Pedestrian and Bicycle Nodes

Planning principles contained in a local agency's General Plan can provide an important policy context for developing pedestrian-oriented, walkable areas. Transit-oriented development, higher densities, and mixed uses are important planning tools for pedestrian-oriented areas. The General Plan identifies pedestrian priority areas, which are zones in which high volumes of pedestrian traffic are encouraged and accommodated along the sidewalk.

Suggestion for Potential Enhancement

- Create an overlay district for pedestrian priority areas with special pedestrian-oriented guidelines, such as relaxing auto Level of Service standards and prioritizing pedestrian improvements. Prioritize sidewalk improvement and completion projects in these nodes.

- Utilize vehicle miles traveled (VMT) for future transportation impact analysis.

Bike Ordinances (Sidewalk Riding)

Suggestion for Potential Improvement:

- Consider an optional helmet ordinance for adults.
- Consider allowing for context-specific flexibility in sidewalk riding policies and enforcement.

Transportation Demand Management (TDM) Programs

TDM programs encourage multimodal travel by incentivizing non-automobile options. As new development occurs, TDM programs can be expanded, formalized, and strengthened.

Suggestions for Potential Improvement

As part of a comprehensive TDM program:

- Hire or identify a part-time TDM Coordinator.

- Create a TDM program and accompanying website with separate pages for employees, residents, and visitors.

- Establish a Transportation Management Association (TMA) for key commercial and business areas to coordinate parking, transit, and other TDM strategies and policies.

General Plan: Densities and Mixed-Use Zones

Planning principles contained in a local agency's General Plan can provide an important policy context for developing bicycle-oriented and walkable areas. Transit-oriented development, higher densities, and mixed uses are important planning tools for pedestrian-oriented areas.

Suggestion for Potential Improvement

- Utilize vehicle miles traveled (VMT) for future transportation impact analysis.
- Consider allowing moderate to high densities in the downtown and mixed-use zones as well progressive parking policies, such as shared parking and demand-based pricing.
- Consider multi-modal trade-offs in the transportation impact analysis for new development, so that the safety and needs of people walking and biking is weighed heavily and vehicular delay is not the primary performance measure.
- Ensure that wide sidewalks, high quality, protected bike lanes, and intersection safety improvements are included with all new development projects, particularly where densities are higher
- Strongly weigh walking and biking performance measures as well as safety metrics in determining appropriate intersection improvements and street design.

Specific Plans, Overlay Zones, and Other Area Plans

Suggestion for Potential Improvement

- Emphasize bicyclist and pedestrian-oriented design, walkability, and/or placemaking in all new specific plans, overlay zones, and other area plans.

Historic Sites

Historic walking routes or bike trails, such as the famous Freedom Trail in Boston, encourage active transportation and enhance economic vitality.

Suggestion for Potential Improvement

- Continue to implement the goals, policies and programs that support walking trips included in the Historic Preservation and Community Design Element of the General Plan to showcase natural or local sites of interest, and link key features of the Local Agency. Maps of the tour route and historic documentation materials could be made available online or as a mobile app in addition to wayfinding signs, maps, and plaques could also be provided throughout the Local Agency. Consider other areas of the City/County for walking tours and historic signs.
- Consider upgrading History Walk signs with larger text to improve legibility and wayfinding.

Economic Vitality

Improving bicycle and pedestrian safety and walkability can enhance economic vitality. Similarly, enhancing economic vitality through innovative funding options such as Business Improvement Districts (BIDs), parking management, and facade improvement programs can lead to more active areas and encourage walking and bicycling.

Sample store facades

Suggestion for Potential Improvement

- Activate the built environment in business areas through BIDs and façade improvement programs.
- Use wayfinding, walking routes, and events to direct pedestrians to commercial areas throughout the area.
- Install bicycle parking in commercial areas and provide safe, comfortable bike facilities in commercial areas to make it convenient and fun to get to local businesses.

Proactive Approach to Institutional Coordination

Institutional coordination associated with multiple agencies is a critical part of the work of any municipality. Non-local control of right-of-way and differing policies regarding pedestrian and bicyclist accommodation can make the work complex.

Coordination with Schools

Neighborhood-sized schools, as opposed to mega schools on the periphery, are a key ingredient for encouraging walking and bicycling to school. In addition, pedestrian and ADA improvements could be prioritized near schools.

Suggestion for Potential Improvement

- Work with the local school districts to establish a policy on neighborhood-sized and oriented schools as part of a Safe Routes to School policy.
- Work with the school districts to establish suggested walking routes and address potential barriers to pedestrian or bicycle access.

Coordination with Emergency Response

Emergency response requires special roadway design considerations that sometimes conflict with bicycle and pedestrian treatments. One example is the design of turning radii at intersections. Bicyclists and pedestrians benefit from the reduced vehicle speeds of smaller radii, but larger vehicles, such as fire trucks, have more difficulty performing the turn within the smaller space.

These conflicts require consensus building between the Local Agency and the respective departments. Consensus building could include pilot testing of alternative treatments, such as a model traffic circle in an open field.

No information was provided about coordination with emergency response.

Suggestion for Potential Improvement:

- Include the Fire Department early in the process as a stakeholder in the Williams Street and Bancroft Street separated bikeway projects to ensure access needs are accommodated.
- Balance the trade-off between traffic calming safety treatments such as roundabouts or partial street closures and longer emergency response times.
- Encourage emergency and transit responders to participate in test runs of roadway designs that are aimed to reduce speed and improve bicycling access.

Coordination with Health Agencies

Involving non-traditional partners such as public health agencies, pediatricians, etc., in the planning or design of pedestrian and bicycle facilities may create opportunities to be more proactive with pedestrian and bicycle safety, identify pedestrian and bicycle safety challenges and education venues, and secure funding. Additionally, under-reporting of pedestrian-vehicle and bicycle-vehicle collisions could be a problem that may be partially mitigated by involving the medical community in pedestrian and bicycle safety planning.[2]

Coordination with Transit Agencies

Providing safe and comfortable biking and walking routes to transit stops and stations, and the ability to take bicycles on-board transit vehicles increases the likelihood of multi-modal trips.

Suggestion for Potential Improvement:

- Prioritize implementation of safe routes to transit projects around the BART stations as well as to bus stops on AC Transit major corridors.
- Work with transit agencies, Caltrans, and other relevant partners to improve access and safety to stations and bus stops.

[2] Sciortino, S., Vassar, M., Radetsky, M. and M. Knudson, "San Francisco Pedestrian Injury Surveillance: Mapping, Underreporting, and Injury Severity in Police and Hospital Records," *Accident Analysis and Prevention*, Volume 37, Issue 6, November 2005, Pages 1102-1113

4. COMPLETE STREETS AUDIT RESULTS AND SUGGESTIONS

4.1. OVERVIEW

Complete Streets audits are typically conducted as an initial step to improve the street environment for all travel modes within the selected area. Many individuals can participate: residents, stakeholders, and affiliated individuals. During the audits, positive practices are observed and issues and opportunity areas are noted. Observations are made of the interactions among motorists, pedestrians, and bicyclists. Observations are based on the behavior of these different road users, particularly at intersections. For each opportunity area, the group discusses possible suggestions to address safety and operational concerns. Complete Streets audits are highly interactive, with many field observations. The audits are a means to observing and learning how to "see through the eyes of pedestrians and bicyclists."

This chapter presents observations and suggestions made during field observations conducted on May 17, 2021.

Suggestions in this chapter are based on best practices and discussions with participants regarding local needs and feasibility. These suggestions are based on limited field observations and time spent in Indian Wells by the CSSA evaluator. These suggestions are intended to guide City staff in making decisions for future safety improvement projects in the City; they may not incorporate all factors relevant to pedestrian and bicycling safety issues in the City. This report is conceptual in nature, and conditions may exist in the focal areas that were not observed and may not be compatible with suggestions presented below. Before finalizing and implementing any physical changes, City staff may choose to conduct more detailed studies or further analysis to refine or discard the suggestions in this report, if they are found to be contextually inappropriate or appear not to improve bicycling or pedestrian safety or accessibility due to conditions including, but not limited to, high vehicular traffic volume or speeds, physical limitations on space or sight distance, or other potential safety concerns.

4.2. FOCAL AREAS

City staff requested reviews of six focal areas (intersections, street segments or corridors):

#	Focal Area	Issues
1	CV-Link path	Alignment of multi-city regional path along streets through Indian Wells
2	Fairway Drive	Addition of shared use path on south side Intersection concepts for Rancho Palmeras Drive and Eldorado Drive
3	Eldorado Drive	Addition of shared use path between Fairway Drive and Highway 111
4	Cook Street	Addition of shared use path between Fairway Drive and Fred Waring Drive
5	Indian Wells Lane	North-end pedestrian and bicycle connection to Highway 111
6	Club Drive	North-end pedestrian and bicycle connection to Highway 111

Figure 4-1 maps these focal areas.

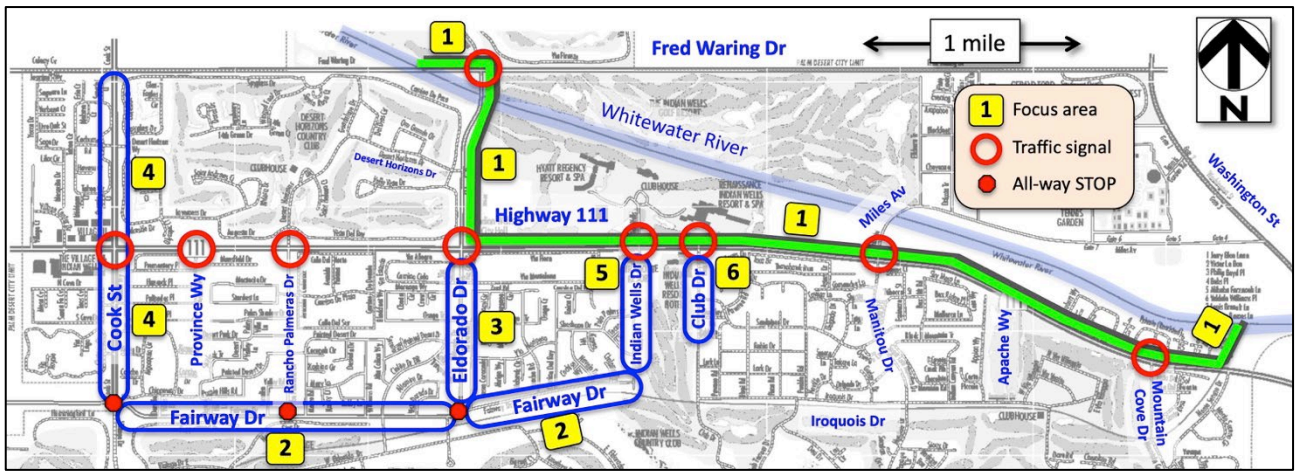


Figure 4-1: Map of focal areas

Section 4.3 presents key issues and suggestions identified during the audit that can be applied citywide. Subsequent sections address the six focal areas, with figures that illustrate the suggestions.

4.3. GENERAL CITYWIDE SUGGESTIONS

The following general suggestions for physical enhancements may be appropriate Citywide or in the focal areas. These are discussed in detail below.

Table 4-1: General Suggestions for Physical Enhancements

Pedestrian	Details
Advance Limit Lines	Install 4' in advance of the limit line or first crosswalk line on STOP and signal-controlled approaches, to deter motorists from encroaching into the crosswalk or blocking sightlines to low pedestrians such as wheelchair users.
Corner curb extensions	Enable pedestrians to make a starting decision where they can see and be seen. Calm inbound right turns by reducing the physical radius. Shorten crosswalks.
Interim curb extensions	Consider Painted Safety Zone / Interim Curb Extension treatments at locations where the need is current but hardscape curb extensions are subject to future funding.
Crosswalk markings	At uncontrolled crosswalks, incorporate wide longitudinal elements (e.g., "ladder rungs") to enable approaching drivers to recognize the crosswalk earlier.
Leading Ped. Interval	Display WALK phase (typically) 3 seconds before same-direction green indication, so pedestrians can occupy the curb lane.
Center islands on side streets	Calm inbound turns. May enable bicyclists preparing to turn left or proceed through to wait further forward than they otherwise would.
Left-side warning signs: symbol orientation	Pedestrian symbol (W11-2) or trail crossing signs (W11-15) installed on the left side of street may depict users approaching, just as the W16-7p Downward Pointing Arrow always points into the approach. (MUTCD 2A.06 Design of Signs specifically allows mirror images. However, sign catalogs may not designate a unique product code.)
Left-side signs on medians	At uncontrolled locations where it is feasible to add a raised median to protect a sign, do this so that each approach sees a pair of warning signs on its side of the street.
Upstream sightlines	Prohibit parking for at least 1 car length upstream of crosswalk, to keep sightlines open to approaching traffic. A curb extension can ensure compliance and is a good place for crosswalk warning signs. "Bike corrals" (in-street racks) can also utilize this area.
Yield Lines	Install on multi-lane approaches to uncontrolled crosswalks, 20'-50' before the crosswalk.
Directional curb ramps	Provide 2 ramps per corner, aligned with sidewalks, rather than diagonal ramps.
Accessibility	Ensure that signal actuation is ADA compliant, including pushbutton height.
Centerline	Install no-passing (double yellow) centerline 50' back from crosswalks.

Advance Limit (Stop) Lines

On approaches to crosswalks that are controlled by signals or STOP signs, installing an advance limit line a short distance (typically 4 feet) before the crosswalk can remind motorists to stop far enough back that their vehicle's front end does not encroach into the crosswalk. Such encroachment can be a safety issue at multi-lane approaches when the front end of a vehicle waiting can hide a low pedestrian (child or wheelchair user) approaching across another lane.

MUTCD Section 3B.16 Stop and Yield Lines applies. Guidance Paragraph #10 states:

> *10 If used, stop and yield lines should be placed a minimum of 4 feet in advance of the nearest crosswalk line at controlled intersections, except… at mid-block crosswalks.*

Corner curb extensions

At intersections with conventional corners and no curb extensions, pedestrians preparing to cross a street typically make their crossing decisions before stepping off the curb, i.e., while on the sidewalk. Due to substantial corner radii at most intersections, this places them over 10 feet outside of the first travel lane they will enter. Corner curb extensions (bulb-outs) enable pedestrians to safely make their decision near the outside travel lane, where they are more visible to approaching motorists and also have a considerably shorter distance to cross. Raised curb extensions also enable crosswalk warning sign assemblies to be installed closer to the travel lanes where they are more visible to motorists. One resource for curb extensions is NACTO's Urban Street Design Guide section: https://nacto.org/publication/urban-street-design-guide/street-design-elements/curb-extensions/

Curb extensions attached to the street's existing curb can be expensive to construct because they must preserve drainage along the street and provide accessible slopes and curb ramps. However, the same safety benefits can be obtained with less expense and without modifying drainage if the extension area is segmented into "floating" islands between which pedestrians including wheelchair users travel at existing street grade.

"Temporary Traffic Calming Curbs" (Calgary, AB)

Figure 4-2: Segmented floating corner island treatment

Interim curb extensions

Many cities are now deploying treatments consisting only of painted lines, colored paint or epoxy fill, and tubular delineators to rapidly and inexpensively create corner-bulb installations in advance of funding availability for hardscape versions (Figure 4-3). These go by various names such as "Painted Safety Zones" (San Francisco), "Painted Curb Extensions" (Pasadena), "Painted Bulbouts" (Denver) and "Interim curb bulbs" (Seattle).

San Francisco MTA writes:

> Painted safety zones are painted road areas that wrap around sidewalk corners to make pedestrian crossing intersections more visible to people driving. Painted safety zones are often flanked by delineators (white posts) and encourage people who drive to slow down, especially when making turns.
>
> https://www.sfmta.com/getting-around/walk/pedestrian-toolkit

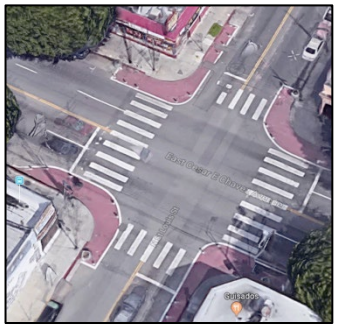
Seattle DOT (SDOT) writes:

> Interim curb bulbs may be appropriate in locations where there is a safety need and a permanent solution is not feasible in the short term, and/or where there is a planned capital improvement within 5 years. At intersections with curb and gutter, an interim curb bulb can only be done [where] there are existing curb ramps. In some cases, curb bulbs may also be integrated with bioretention to manage storm water runoff from the right-of-way.
>
> https://streetsillustrated.seattle.gov/urban-design/adaptive-design/intersection-treatments/

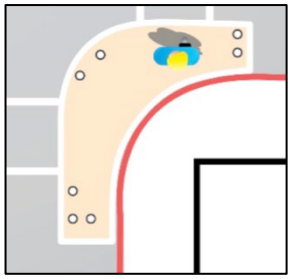
Crosswalk marking patterns – high visibility and contrast edge

The standard crosswalk-marking scheme at controlled approaches has 2 transverse lines and no fill pattern. Many cities use the standard pattern at controlled approaches and a high-visibility pattern at uncontrolled approaches. The following description from San Francisco MTA's crosswalk design guidelines describes the safety advantages of high-visibility markings:

> *Because of the low approach angle at which drivers view pavement markings, the use of longitudinal stripes in addition to or in place of the standard 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 motorist yielding and channelization of pedestrians, leading the Federal Highway Administration (FHWA) to conclude that high-visibility pedestrian crosswalks have a positive effect on pedestrian and driver behavior.*



Los Angeles (Cesar Chavez & St Louis)



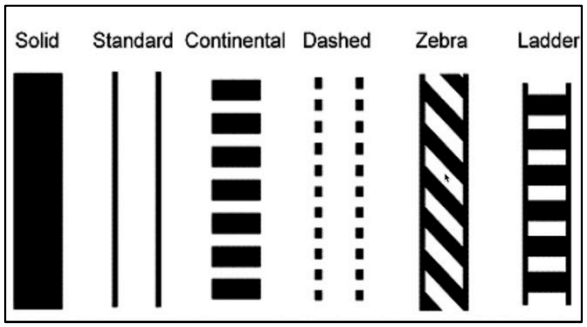
Pasadena Street Design Guide

Los Angeles – Pico & Curson

San Francisco (16th St & Kansas St)

Seattle (Burke-Gilman Trail & 40th Ave NE & NE 52nd Pl)

Figure 4-3: Paint-and-delineator curb extensions



(Figure 12 from FHWA report HRT-04-100, "Safety Effects of Marked Versus Unmarked Crosswalks at Uncontrolled Locations Final Report and Recommended Guidelines")

Figure 4-4: Crosswalk marking patterns (FHWA)

Table 4-2 lists suggested treatments for several crosswalk elements.

Table 4-2: Suggested Crosswalk Treatments

	Approach	Controlled		Uncontrolled	
Elements	**Median**	**None or painted**	**Raised**	**None or painted**	**Raised**
Crosswalk markings		2-line		High-visibility (ladder)	
Warning signs at crosswalk		None		Curbside, 2-sided ("2-sign")	Curbside: 1-sided Median: 2-sided ("4-sign")
RRFBs on crosswalk signs		None		If needed	
Advance markings & signs		Advance limit line 4' upstream		Yield line 20'-50' upstream R1-5 Yield Here signs at yield lines	
Advance warning signs		None		If needed, per MUTCD	

Low-vision pedestrians (persons who are not completely blind) benefit from a continuous "contrast edge" for guidance when crossing streets. The solid transverse lines in the "solid," "standard," "zebra" and "ladder" patterns provide this; the "continental" and "dashed" patterns do not. For all crosswalks at uncontrolled approaches that currently use the continental pattern, it is suggested to add two solid transverse lines to create a ladder pattern.

In prior decades, "artistic" crosswalks were constructed in which the transverse border was a wide cast concrete strip with no retroreflective white marking (12-inch line). Over time the contrast between these strips and the middle of the crosswalk is reduced so the strips no longer provide an effective contrast edge for low-vision pedestrians. To address this, 12-inch transverse lines (white for non-school crosswalks, yellow for school crosswalks) may always be incorporated.

Leading Pedestrian Interval

Leading Pedestrian Interval (LPI) traffic signal phasing displays the pedestrian signal's WALK indication for 3-7 seconds before the green indication for same-direction traffic. LPI gives pedestrians a head start to occupy the crosswalk before turning vehicles. A 2000 study by the Insurance Institute for Highway Safety (IIHS) found that LPI reduces conflicts between turning vehicles and pedestrians.

> *Field Evaluation of a Leading Pedestrian Interval Signal Phase at Three Urban Intersections*. Van Houten, Retting, Farmer, Van Houten. Transportation Research Record (TRR) 2000.

It is suggested that the city consider implementing LPI at signals with high pedestrian activity, prohibiting right-turn-on-red as needed per recent research findings.

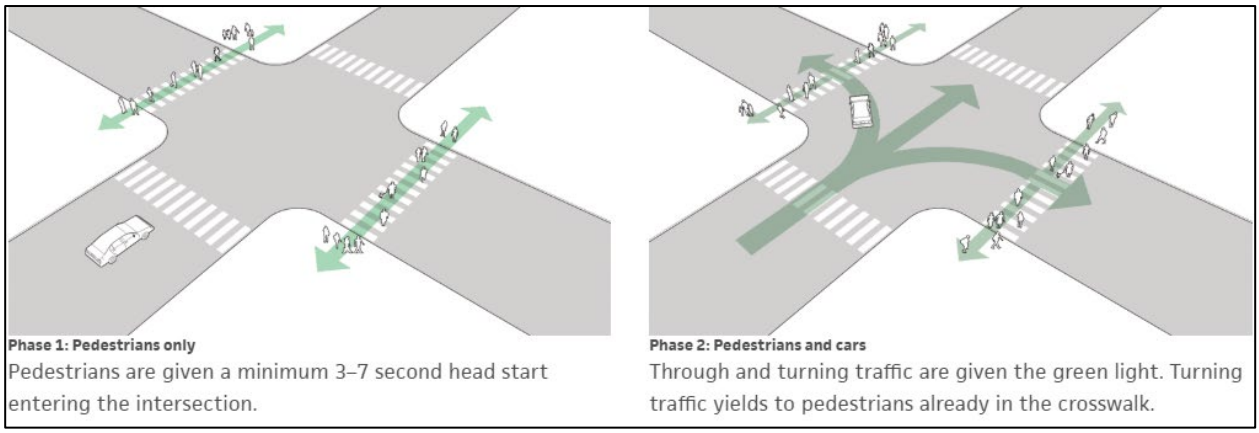


Figure 4-5: Leading Pedestrian Interval phases

Center islands on side streets

Adding pill-shaped center islands just behind the crosswalks side streets at some intersections can improve safety in several ways:

- Calm right turns from the major street
- Calm left turns onto the major street
- Calm through movements on the side street
- Provide a modest refuge for pedestrians crossing the side street, especially slow ones
- Enable the limit lines to be moved forward for better sightlines
- Provide a sheltered place for bicycle users approaching on the side street to prepare to cross or enter the major street

Figure 4-6 shows such an island on a 40-foot residential street in Sunnyvale CA (Canary Drive, at Inverness Way). The island is 6 feet wide and 20 feet long.

Figure 4-6: Median island on residential street (Canary at Inverness, Sunnyvale CA)

4.4. FOCAL AREAS

The following subsections address the six focal areas listed in Section 4.2.

The evaluator explored each focal area with City staff on the field visit day. Staff observations and notes appear in each subsection. Because of the Covid-19 pandemic, observations may not reflect typical (non-pandemic) operation.

4.4.1. Area #1: CV-Link Regional Path

Overview

Coachella Valley Link ("CV-Link") is a multi-use paved path that when completed will connect the cities along the Whitewater River corridor. The path is open to pedestrians, users of conventional and electric-assisted bicycles, and low-speed three- and four-wheel electric vehicles such as golf carts. Indian Wells is Segment #6.

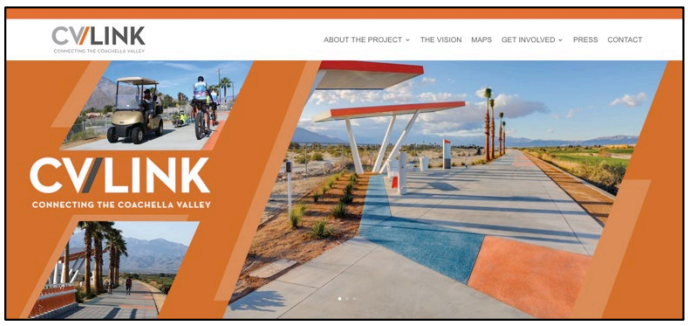


Figure 4-7: CV-Link homepage image (www.coachellavalleylink.com)

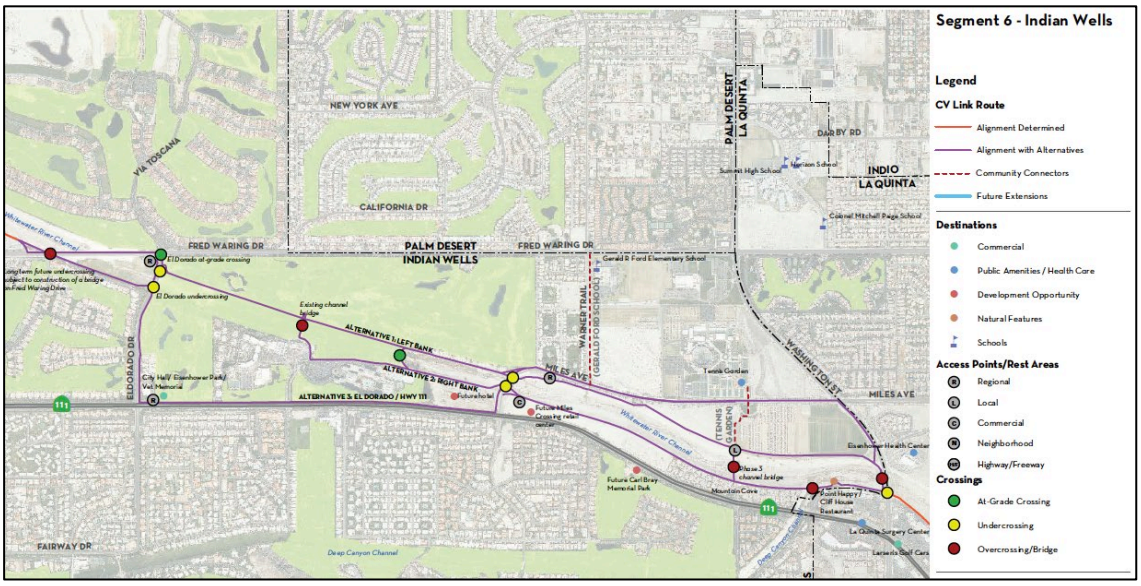


Figure 4-8: CV-Link alignment alternatives through Indian Wells

Each city determines CV-Link's alignment within its boundary. Figure 4-8 shows the three alignment alternatives through Indian Wells: #1: Left (north) Bank, #2 Right (south) bank, and #3 On-Street. On-Street (#3), the City's current adopted alignment, will depart from the river corridor at the western city limit with Palm Desert and return to the river's south bank at the eastern city limit with La Quinta. Alternatives #1 and #2 along the river channel are deferred.

Table 4-3 divides Indian Wells' CV-Link on-street alignment focal area into segments. Discussion follows the table.

Table 4-3: Indian Wells CV-Link Focal Area – Segments

Segment		CV-Link alignment	Notes
1	Fred Waring Drive between river's west/south bank and the Eldorado / Via Toscana signal	Existing north-side separated path	Avoids crossing Fred Waring at the river (high-speed traffic, no controlled mid-block crossing. Future alignments along the river through Indian Wells await construction of a roadway bridge to replace Fred Waring Drive's at-grade crossing, which floods and would require a path tunnel.
2	Eldorado / Via Toscana intersection and Eldorado river crossing	North and east crosswalks	Connect between northwest and southeast corners of intersection
		East side of Eldorado, in new space to be created	Modify intersection's south leg to free up one lane width along east side. Shift east curb westward.
		Share existing barrier-separated golf cart path	Create opening in north end of path barrier. Install guide and warning signs for shared use.
3	Eldorado between river and Highway 111; Desert Horizons Drive intersection	East side landscape area	At Desert Horizons Drive intersection, provide an enhanced crosswalk for residents west of Eldorado
4	Eldorado Drive / Highway 111 intersection	East crosswalk	Enhance to connect with future Eldorado Drive east-side path south of Highway 111
5	Highway 111 between Eldorado and eastern spur channel	North side, widen existing meandering sidewalk	Provide parking bays for landscape crews At Miles Avenue, condition developments to incorporate public access to the river, to support a potential future CV-Link alignment along the river.
6	Highway 111 between eastern spur channel and La Quinta city limit	North side – path bridge planned by CV-Link	Narrow right of way constrained by adjacent hills. CV-Link proposes to construct a path bridge across the spur channel, which crosses under Highway 111. The City of La Quinta envisions a staging area on the east side of the spur channel where it meets the river.

Analysis

Segment 1 – Fred Waring Drive between river and Eldorado Drive / Via Toscana signal

Palm Desert's CV-Link segment reaches Indian Wells on the south/west side of the channel, on the north side of Fred Waring Drive, approximately 2,100' west of that roadway's Eldorado Drive / Via Toscana signal.

Fred Waring Drive runs due east-west through several Coachella Valley cities. It is the main east-west alternative to Highway 111, which follows the base of the mountains to the south. At the river channel it is a high-speed six-lane arterial (Figure 4-9). The river channel runs roughly northwest-southeast at this location. The at-grade crossing is subject to flooding, necessitating periodic debris removal.

Indian Wells' adopted CV-Link alignment departs from the river at this location and crosses the channel on the north side of the road, where there is a 6' sidewalk with a metal pole-and-cable fence, and a separate 6' or wider concrete sidepath that departs from roadway grade and follows the river channel's cross-grade, merging back into the sidewalk approximately 600' west of the Eldorado signal (Figure 4-9). Pedestrians typically use the sidewalk; bicyclists typically use the sidepath even though its surface planes have substantial cross-slope for drainage.

a) Westbound just west of river channel

b) Sidepath and sidewalk at south end of river channel, facing east

Figure 4-9: Fred Waring Drive at and near Whitewater River channel

Other than guide signage to direct users between the river and the Eldorado signal, no significant improvements appear to be needed to implement CV-Link on this segment.

Segment 2 – Eldorado Drive/ Via Toscana intersection and Eldorado river bridge

At the Eldorado Drive / Via Toscana signal 600' east of the river, the on-street CV-Link alignment will use the north crosswalk (across Via Toscana) and the east crosswalk (across Fred Waring) to reach the southwest corner of the intersection, then continue along the east side of Eldorado to share the existing golf cart path's river crossing on the roadway bridge.

As shown in Figure 4-10, there is currently insufficient width to construct a sidepath on the east side of Eldorado between the intersection's southeast corner and the golf cart path without removing three mature palm trees.

Figure 4-10: Eldorado Drive east side north of river bridge – mature palm trees

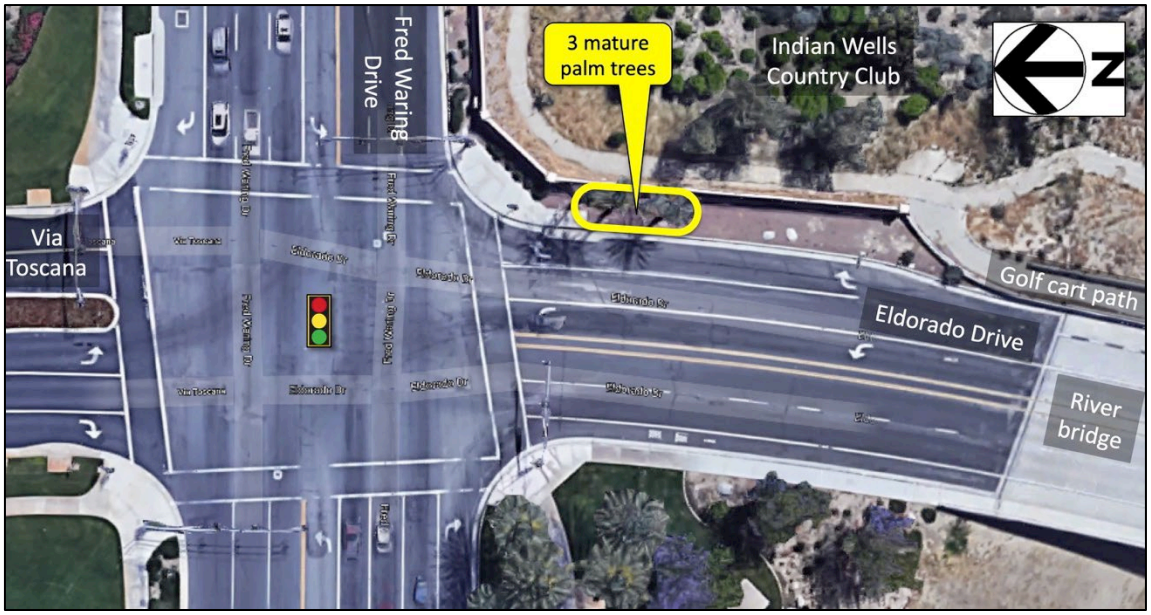


Figure 4-11: Eldorado between Fred Warning and river - existing

However, the two southbound lanes that depart the intersection receive only single-lane movements — Fred Waring's single eastbound right turn lane and single westbound left turn lane, and Via Toscana's single southbound through lane. Removing Eldorado's inner receiving lane and shifting all northbound approach lanes westward would free up one lane width along the east side. Figure 4-12 shows a concept, with CV-Link and its crosswalks highlighted in orange (not suggested as a treatment) and Eldorado's bike lanes in green. White and yellow extension lines through the intersection show certain realigned vehicle and bicycle travel paths.

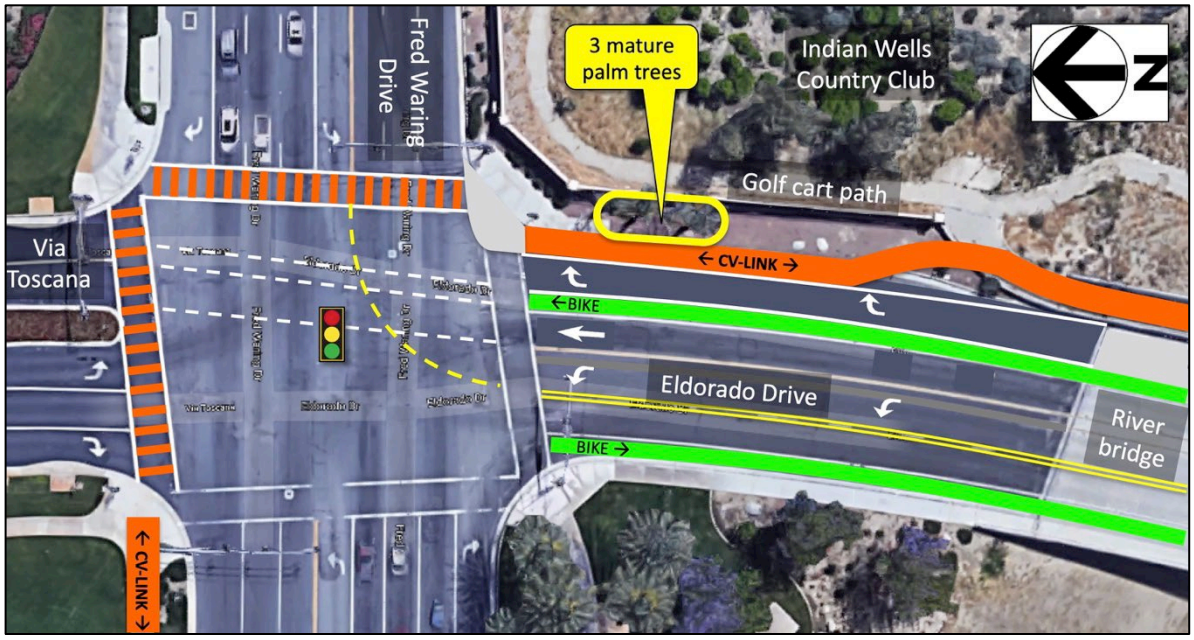


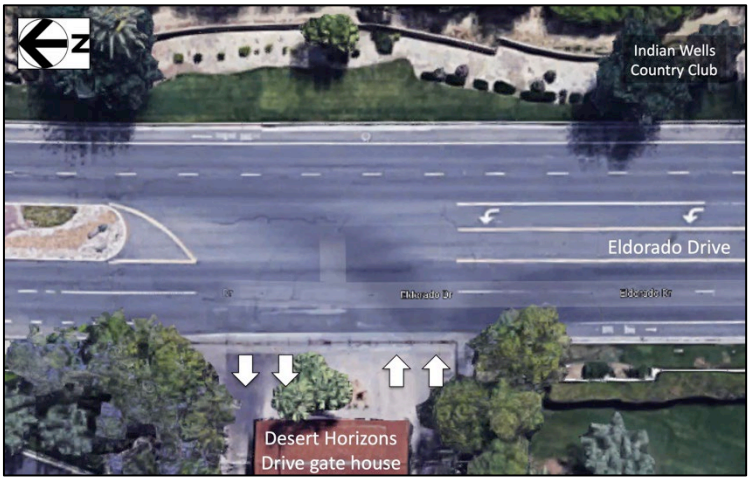
Figure 4-12: Concept for Fred Waring Drive / Eldorado Drive / Via Toscana intersection

South of the intersection, CV-Link will share the existing barrier-separated golf cart path across the river channel on the east side of Eldorado Drive. Path junctions will be added in the golf cart path's barrier wall at the north and south ends of shared segment on the bridge, presumably with signage informing CV-Link users that entry to the Indian Wells Country Club area to the east is prohibited.

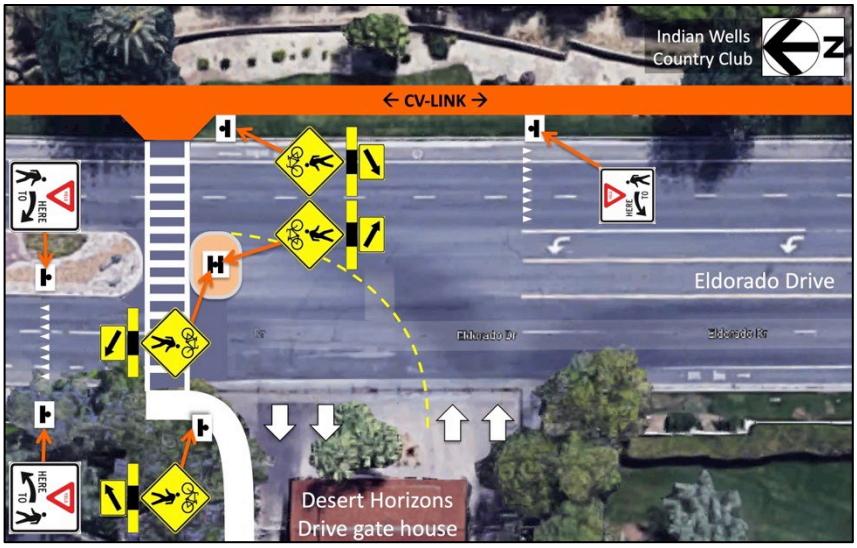
Segment 3 – Eldorado between river and Highway 111; Desert Horizons Drive intersection

The CV-Link alignment will continue along the east side of Eldorado Drive to the northeast corner of the Highway 111 intersection, using the existing wide landscape area. Desert Horizons Drive intersects from the west approximately 1,500' south of Fred Waring Drive, with a gated attended entrance that has two inbound and two outbound lanes. It serves a large development whose residents will need access to the path. Eldorado does not stop at this intersection.

As shown in Figure 4-13, there is a northbound left turn lane and unused buffer lane on the south leg, opposite a wide landscaped median on the north leg. The concept shows a north-leg crosswalk with high-visibility markings, warning sign assemblies using W11-15 Trail Crossing signs and optional pedestrian-activated Rectangular Rapid Flashing Beacons (RRFBs), yield lines with R1-5 Yield Here signs, and a median refuge island. (The dashed yellow line is not suggested for installation — it shows how the outbound vehicle left turn path from Desert Horizons Drive will clear the median refuge island.)



a) Existing



b) Concept

Figure 4-13: Eldorado Drive / Desert Horizons Drive intersection

Segment 4 – Eldorado Drive / Highway 111 intersection

CV-Link's on-street alignment will continue south along the east side of Eldorado to Highway 111, past Indian Wells Fire Department Station 55 and City Hall. Beginning at the fire station's north driveway, the wide CV-Link path would replace the existing sidewalk. It would turn east at the intersection's northeast corner and follow the north side of Highway 111 to the City of La Quinta before reconnecting with the south bank of the river channel.

The signal's east crosswalk and a proposed path along the east side of Eldorado Drive will connect residents south of Highway 111 to CV-Link. To reduce conflicts between pedestrians and bicyclists crossing Highway 111, it is suggested to widen the east crosswalk and delineate it as adjacent parallel bicycle and pedestrian crossings, with the bicycle area aligned inboard (west) of

the pedestrian area. The bicycle crossing area would not be delineated as a bike lane because it would not be aligned with bike lane north or south of Highway 111.

Segment 5 – Highway 111 between Eldorado Drive and eastern spur channel

The CV-Link alignment will follow the north side of Highway 111 between Eldorado Drive and the La Quinta city limit. For most of this distance a meandering sidewalk exists, and the only major improvement needed would be to widen the surface for shared use with bicycle traffic. It is suggested to consider installing a 15' shared surface delineated as a 10' two-way bicycle area (5' + 5') with directional arrows and dashed yellow centerline (passing permitted), adjacent to a 5 pedestrian priority area at the same grade as the bicycle area (i.e., not raised), preferably distinguished by pavement color. Figure 4-14 shows such a path on the San Francisco — Oakland Bay Bridge. In practice, groups of pedestrians flex onto the bicycle area when no bicyclists are present, and solo bicyclists give them space when passing.

Figure 4-14: 5 meter (~15') delineated path (SF-Oakland Bay Bridge East Span)

City staff said that landscape crews park along the north side of Highway 111 on this stretch to maintain plantings and irrigation. At various locations the existing curb descends to street grade or has a driveway-like apron (Figure 4-15). Other examples of "verge" or "indented" parking appear in Figure 4-16.

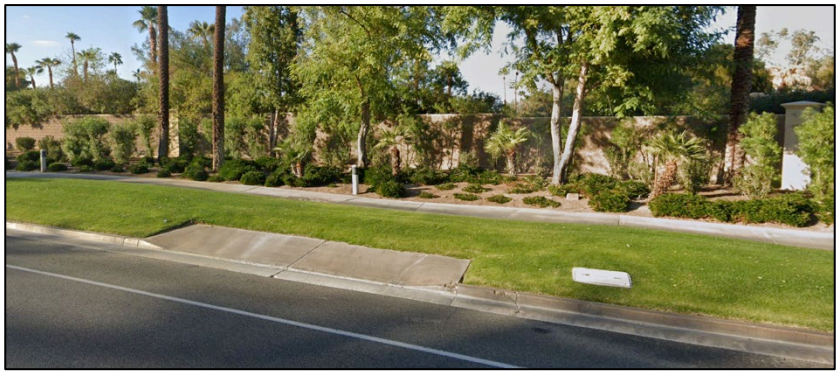


Figure 4-15: Driveway apron on north side of Highway 111, for landscape access

Figure 4-16: Indented or "verge" parking

Proposed developments on the north side of Highway 111 near Miles Avenue would install CV-Link segments along their frontage. Because Indian Wells' future CV-Link network may include a path along the south side of the river, such developments should also be conditioned to construct or provide access easements for public-access shared-use paths between the Highway 111 CV-Link and the south side of the river as suggested in Figure 4-17.

Figure 4-17: Public access spur locations for developments near Miles Avenue

Segment 6 – Highway 111 between eastern spur channel and La Quinta city limit

Indian Wells' eastern city limit with La Quinta follows the east side of a spur channel that runs northward under Highway 111 to the river.

Figure 4-18: Highway 111 facing east across spur channel toward La Quinta

The County proposes to construct a shared use path bridge across the channel on the north side of Highway 111. The City of La Quinta proposes to construct a CV-Link staging area (trailhead with parking) on the east side of the spur's junction with the river, in the "Point Happy" area that occupies the northwest quadrant of the Highway 111/ Washington Avenue intersection located about 1,500 east of the channel.

No suggestions are offered for this segment.

4.4.2. Area #2: Fairway Drive between Cook Street and Eldorado Drive

Existing conditions and field observations

Overview

Within Indian Wells, Fairway Drive runs east-west 2,500' (approximately 1/2 mile) south of Highway 111. It extends 5,200' (approximately one mile) between Cook Street / Vintage Drive and the north leg of Eldorado Drive, then continues east approximately 2,800' (1/2 mile) to Indian Wells Lane, which also runs north toward Highway 111.

Developments to the south are golf course subdivisions, with gated entrances at Vintage Drive (south leg at Cook Street), opposite Cielito Drive, and Eldorado Drive (south leg).

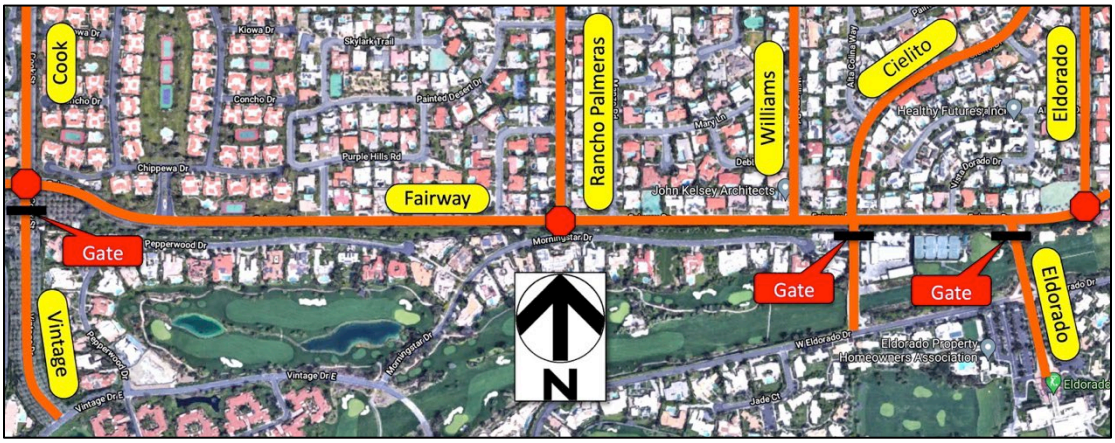


Figure 4-19: Fairway Drive context

On the 5,200' segment between Cook / Vintage and Eldorado (north leg), Fairway is 40' wide, with an 8' north-side parking lane, two 5' bike lanes and two 11' traffic lanes. There is no sidewalk along north-side fronting houses, but there is a wide landscape area on the south side the width of which varies considerably. The eastbound right turn pockets serving the gated entrances opposite Cielito Way and at the south leg of Eldorado Drive indent into this landscape area.

The segment's endpoint intersections at Cook / Vintage and Eldorado are all-way stops, as is the midpoint intersection at Rancho Palmeras Drive, approximately 1/2 mile from the endpoints. All other intersections on this segment are one-way stops.

Observations

Because there is no sidewalk on the north side — only a parking lane, residents of north-side fronting houses and developments served by streets that intersect from the north routinely cross the street and walk along the south side lawn and landscape corridor for recreation, despite there being no sidewalk or path. One such south-side pedestrian is visible at the right side of Figure 4-23(a) [Cielito Drive gated access].

The usable width available for installing a shared use path on the south side varies considerably depending on the varying setback to the tall wall that encloses the golf course developments and the presence of mature trees and hedges along the wall.

Figure 4-20 shows these conditions at Williams Drive, where the south wall setback is at a minimum and tall hedges are present. Here the distance between the south curb and face of hedge is approximately 12'.

a) Aerial (north at top)

b) Street view, facing west

Figure 4-20: Fairway at Williams, showing minimum south-side area width

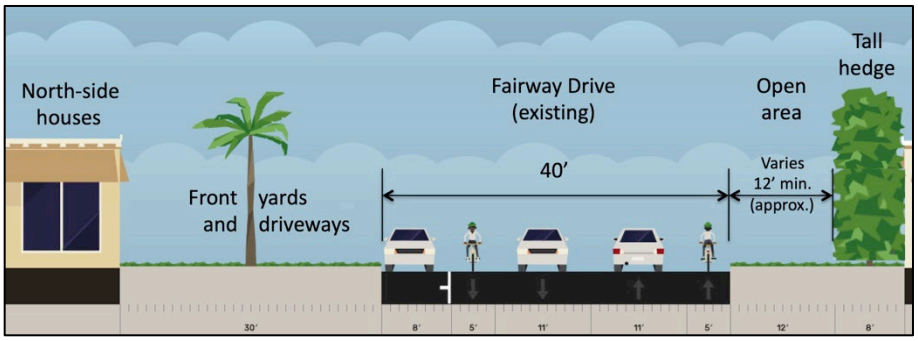
Analysis

Alternate cross section concept, to create south-side path

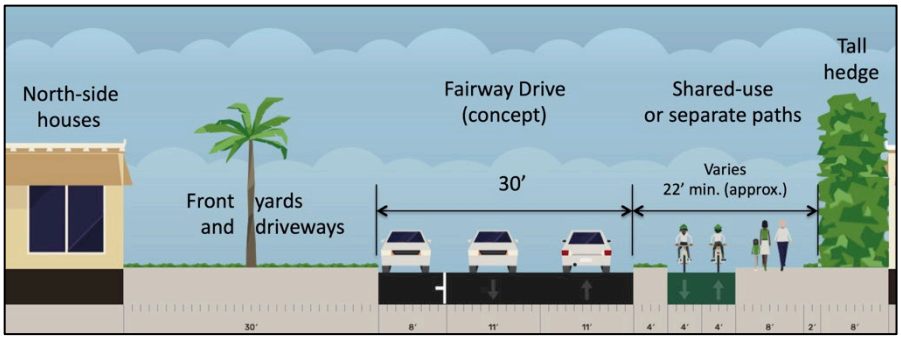
During the field visit an alternative cross section for Fairway Drive was discussed that would widen the south-side landscape corridor by 10', enabling the installation of a wide shared use path. This would be achieved by reconstructing the south curb and gutter 10' further north, narrowing the street from 40' to 30' and eliminating the two 5' bike lanes.

To keep the street easy for pedestrians to cross and comfortable for on-street bicyclists to be passed by vehicles, traffic calming measures would be installed to lower the vehicle speed distribution. The existing double yellow (no passing) centerline would either be replaced with a dashed (passing permitted) centerline or eliminated. R117 (CA) “PASS [BIKES] 3 FT MIN” signs would encourage comfortable passing of on-street bicyclists.

Figure 4-21 illustrates this cross-section transformation. In the concept image, the widened south-side area is used for a “mode-separated” path that aligns both bicycle directions closer to the street and the pedestrian area further away. This will maximize pedestrian comfort and also align the faster path traffic (bicyclists) further from sight obstructions where the path crosses the gated access points at Cielito Drive and the south leg of Eldorado.



a) Existing



b) Concept

Figure 4-21: Fairway Drive cross section concept

Traffic calming

To make crossing the street to/from the south-side path comfortable for all users, and to maximize comfort for faster bicyclists who choose to use the street, it will be important to deter motorist speeding. Currently on this segment, Fairway stops only at its midpoint intersection with Rancho Palmeras Drive, with 1/2-mile straightaways to the east and west. To deter speeding, traffic calming measures with closer spacing are suggested. Installing three measures on each 1/2-mile subsegment would create 1/8-mile spacing — approximately 650’. The 1/4-mile points approximately coincide with the T intersections at Azure Hills Lane and Williams Road. For these intersections it is suggested to consider either a small (“neighborhood”) traffic circle combined with small “deflector” islands in the north parking lane and along the south curb, or a raised crosswalk or raised-intersection treatment.

Additional calming measures are suggested at the 1/8-mile points, midway between the Azure Hills Lane and Williams intersections. The westernmost and easternmost 1/8-mile points roughly coincide with the T intersections at Dorado Villas Drive (where Fairway has a westbound right turn pocket) and Vista Dorado Drive. At those locations "intersection" treatments could be considered as suggested above.

The two remaining 1/8-mile points (midway between Azure Hills Lane and Paradise Valley Road, and midway between Rancho Palmeras Drive and Williams Road) do not coincide with intersections. At those locations it is suggested to consider speed cushions — segmented speed humps with wheel gaps placed to enable fire trucks to pass through without raising a wheel. On-street bicyclists also use these gaps.

Combined concept

Figure 4-22 illustrates the full concept for Fairway Drive, including the east-west path along the south-side of Fairway and also north-south paths along Cook and Eldorado (north leg) connecting to Highway 111 and beyond — including CV-Link along Highway 111.

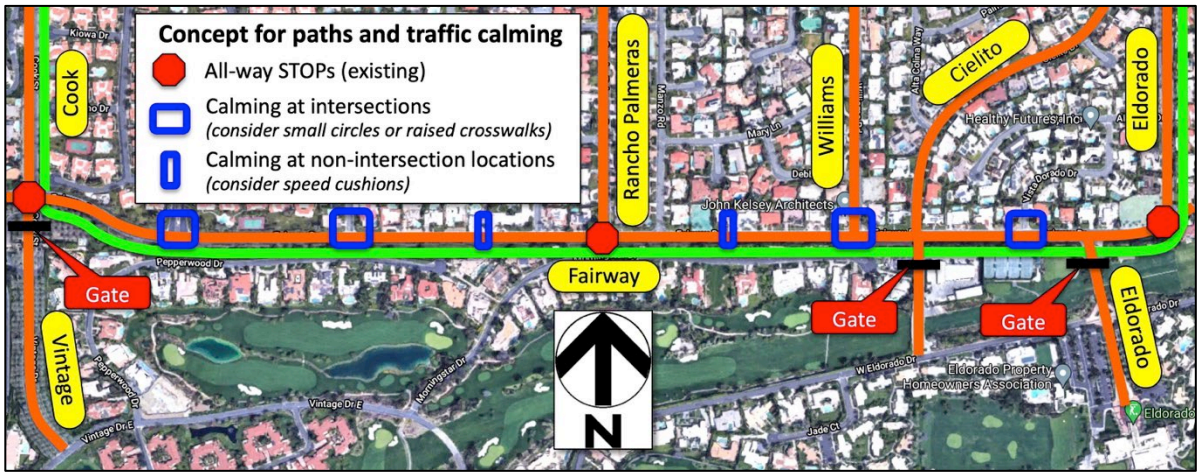
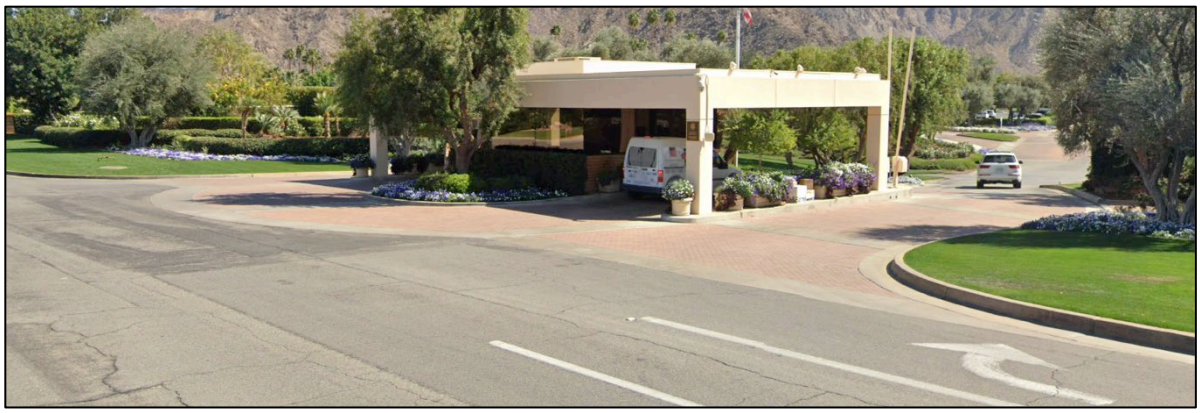


Figure 4-22: Fairway Drive full concept (paths and traffic calming)

Blue rectangles represent traffic calming treatments at 1/8-mile (approximately 650') spacing.

The south-side path will cross the gated driveways at Cielito and Eldorado (south leg). The Cielito gate is a minor access point signed "Service Traffic Only — Members Please Use Main Gate." The Eldorado gate is a major access with separate entrance lanes for members and visitors. Design of the path crossings at these locations is beyond the scope of this report. However, it is suggested to incorporate crossing warning signs and high-visibility pavement markings. Because the wall will restrict sightlines between outbound drivers and path traffic just ahead, the signs to warn outbound traffic may need to be inboard (south) of the wall.

a) Cielito access point, signed “Service Traffic Only.” Note pedestrian approaching from right.



b) Eldorado south leg (main access). Note separate entry lanes for members and visitors.

Figure 4-23: Gated access points at Cielito and Eldorado (south leg)

Rancho Palmeras Drive intersection

Rancho Palmeras Drive intersects Fairway Drive from the north at the midpoint of the one-mile focal area segment. It is 56’ wide with parking on both sides, no sidewalks, and no bike lanes. This substantial width creates opportunities to make crossing the street and traveling along it more comfortable for pedestrians and bicyclists.

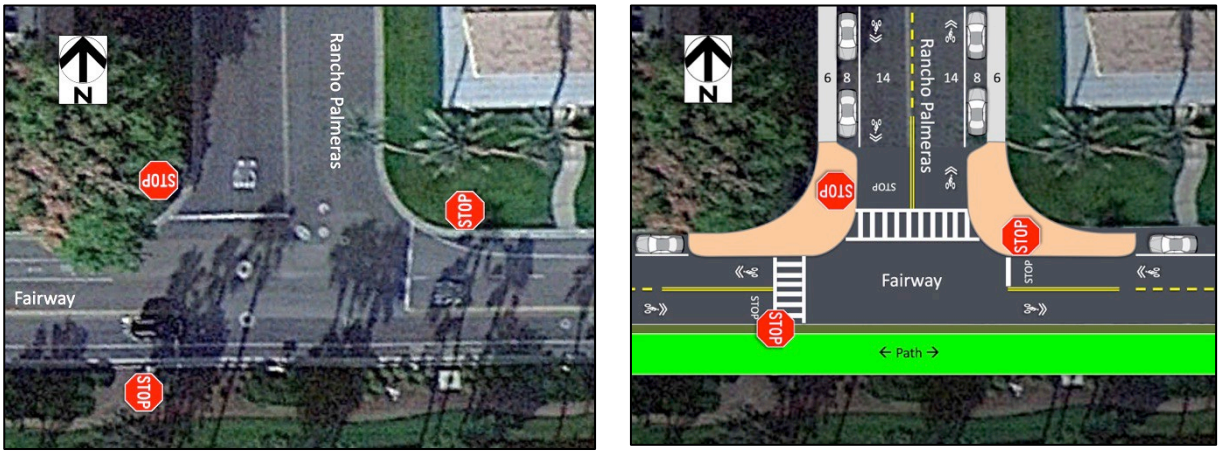
- Corner curb extensions. At the intersection there are parking lanes on both Fairway and Rancho Palmeras. This enables installation of full-corner curb extensions to the 8’ depth of the parking lanes, shortening the crossing distance across Fairway by 8’ and across Rancho Palmeras by 16’.

- Sidewalks. Depending on the type of bikeway selected, either 5’ (minimum desirable) or 6’ (preferred) attached sidewalks could be installed on Rancho Palmeras Drive.

- Bikeways. Given the street’s existing 56’ width, after reconstructing curb and gutter to add sidewalks, and retaining both 8’ parking lanes, sufficient width would remain to accommodate bicyclists. With 5’ sidewalks, 5’ bike lanes and 10’ travel lanes would fit.

With 6' sidewalks, only 4' bike lanes (inadvisable along parking lanes) and 10' travel lanes would fit. Alternatively, 14' shared lanes would fit.

Because Rancho Palmeras carries relatively low volume, it is suggested to install 14' shared lanes with Shared Lane Markings ("sharrows") centered 4' from the parking lane line. 14' is generally recognized as the minimum lane width sufficient for motor vehicles to pass bicyclists within the lane. However, it is suggested to install a dashed (passing permitted) centerline and R117 (CA) "PASS [BIKES] 3 FT MIN" signs to encourage more comfortable passing across centerline whenever there are adequate oncoming gaps.



a) Existing (R.P. 56' w/o sidewalks, Fairway 40')

b) Concept (R.P. 44' w/sidewalks, Fairway 30')

Figure 4-24: Fairway / Rancho Palmeras intersection

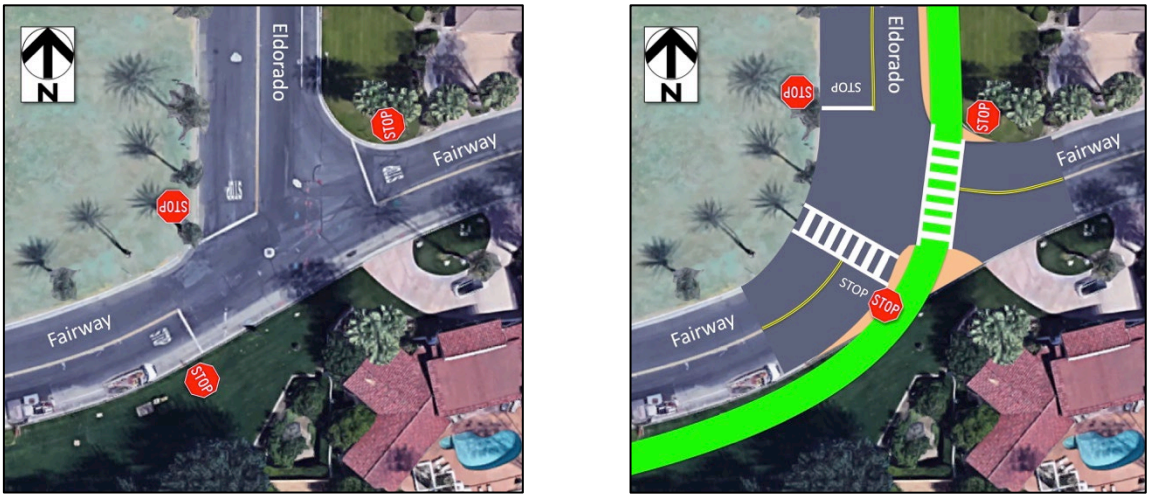
Eldorado Drive (north leg) intersection

At the east end of the one-mile focal area segment, Eldorado Drive intersects Fairway from the north. To the east, Fairway narrows, drops the bike lanes, and continues east 2,800' (approximately 1/2 mile) to Indian Wells Lane, which runs north toward Highway 111.

At this intersection Eldorado is aligned north-south and Fairway is aligned roughly west-southwest / east-northeast. The northwest corner is a large vacant area that appears to be two house lots. The acute-angle northeast corner is set back, presumably to facilitate westbound-to-northbound right turns, but this may also enable southbound stop-sign violators turning left into Fairway's east leg to cut the corner at high speed.

The major traffic movement is between Eldorado and the west leg of Fairway. In addition, the City envisions a shared use path along the east side of Eldorado, which would effectively continue the Fairway Drive path described in this section up to Highway 111 to connect with CV-Link. As such, there would be a path crossing across Fairway's east (minor) leg.

Connecting the west and north legs with a curve and "squaring up" the east (minor) leg would eliminate high-speed turning movements into and out of the east leg by stop-sign violators, reducing risk for crosswalk users.



a) Existing b) Concept

Figure 4-25: Fairway / Eldorado intersection

Suggestions

Table 4-4 summarizes suggestions to implement the Fairway Drive path concept and the enhancements to the Rancho Palmeras Drive and Eldorado Drive (north leg) intersections.

Table 4-4: Suggestions for Fairway Drive Between Cook and Eldorado

#	Location	Item	Suggestion
1	Fairway Drive	Street cross section	a) Retain north-side parking. b) Remove bike lanes. c) Shift south curb 10' northward; reconstruct curb and drainage.
2		Centerline	a) Remove double-yellow centerline. b) Either install dashed centerline or omit centerline.
3		Regulatory signs	Install R117 (CA) "PASS [BIKES] 3 FT MIN" signs periodically, to cue desired passing behavior
4		South-side paths	Construct two-way bike path closer to south curb, and adjacent pedestrian travel area closer to wall and hedge
5		Path crossings at two gated entries (Cielito, Eldorado)	Construct path crossings north of access points, with high-visibility pavement markings and warning signage
6	Azure Hills Lane	Traffic calming	Install a calming measure. Consider a neighborhood traffic circle, raised intersection, or one raised crosswalk.
7	Williams Road	Traffic calming	Install a calming measure. Consider a neighborhood traffic circle, raised intersection, or one raised crosswalk.
8	Rancho Palmeras Drive	Crossing enhancements	a) Install full corner curb extensions on NW and NE corners b) Consider high-visibility crosswalk markings on west and east legs, due to south-side path traffic
9		Layout north of Fairway (56' available)	Consider narrowing to 44' to add 6' attached sidewalks and provide 8' parking lanes, 14' shared travel lanes with sharrows. Change centerline to dashed (passing permitted) except solid within 50' of north crosswalk.
10	Eldorado Drive (north leg intersection)	Realignment to facilitate path connection between Fairway and Eldorado	Realign all three legs to create a squared-up angled T intersection, with Fairway's east leg perpendicular to the center of a quarter-circle curve. (This recognizes that the main vehicle and pathway connection is between Fairway's west leg and Eldorado [north leg].) Install a high-visibility path crosswalk across Fairway's realigned east leg.

4.4.3. Area #3: Eldorado Drive south of Highway 111

Existing conditions and field observations

Overview

Eldorado Drive extends approximately 1/2 mile south of Highway 111 to Fairway Drive. For most of this distance it is 86' wide with no sidewalks, two travel lanes and an unbuffered bike lane in each direction, and an 18' raised landscaped median with left turn pockets featuring wide "stinger" peninsulas. The width of each half-section, excluding the median, is 34'.

At its southern end, shown in Figure 4-26, Eldorado narrows on its west side to 54' at Altamira Drive and continues 450' to Fairway Drive with no sidewalks, a 28.5' wide southbound lane (including 8' for west-side parking), a 18' northbound lane, a 7.5' northbound bike lane (6.0' asphalt, 1.5' concrete gutter), and a double yellow (no passing) centerline. On the 250' transition from 5-lane to 2-lane, the outside southbound lane becomes a trap right turn lane serving Altamira. Red lines indicate prohibited parking; the curbs are not actually painted red.

Figure 4-26: Eldorado Drive layout south of Highway 111

Analysis

On Eldorado's 1,300' southern half between Fairway and Osage Trail, the northbound direction is fed by only one lane from Fairway, and Altamira presumably contributes little volume, so only one traffic lane is needed — the outside lane's width could be repurposed. The traffic lanes appear to be 13' wide, which current practice considers extra-wide even for a moderate-speed arterial, so also narrowing the remaining traffic lane to 11' would free up 15' of width — ample for a shared use path with a landscape buffer. If the width of the existing northbound bike lane was also incorporated, with the thought that bicycle traffic would use the path, the total available width for the path corridor would be 15' + 7.5' = 22.5' — ample for a mode-separated path layout similar to the Fairway Drive concept, with a 10' two-way bicycle area and an 8' pedestrian area.

On the two-lane segment between Fairway and Altamira, the 7.5' northbound bike lane width could be combined with 7' obtained by narrowing the 18' northbound travel lane to 11', for 14.5' of raw material, and a few feet of existing landscape depth is present behind the east curb at all locations on this segment (width varies based on backyard wall alignment). Allowing for a 2' wide traffic barrier and 1' shy-away distance along backyard walls of east-side houses, at least 13' of clear path travel width should be available for a shared use path even on this narrower segment.

Between Osage Trail and Highway 111 there is only one other intersecting street — Cam Cielo (west leg) / Via Montelana (east leg). If the northbound volume contributed at Osage Trail and this intersection still did not necessitate two northbound traffic lanes, the east-side path corridor could continue north to Highway 111 where it would connect via the east crosswalk to the City's CV-Link path alignment on the north side.

Design of markings and signage to carry an east-side two-way bicycle and pedestrian facility across the Osage Trail and Via Montelana intersections is beyond the scope of this report.

Installing enhanced marked and signed crosswalks across Eldorado at Altamira, Osage Trail and Cam Cielo would also be suggested to connect west-side residents to the east-side path facility. It is suggested that those crosswalks be installed on the south legs, given that there is a southbound right turn only lane on the north leg at Altamira, and given that the total north-leg traffic volume at both Osage Trail and Cam Cielo / Via Montelana is presumed to be greater than the respective south-leg volume at those intersections because each intersection south of Highway 111 distributes trips into the subdivisions it serves.

Suggestions

Table 4-5: Suggestions for Eldorado Drive Between Highway 111 and Fairway Drive

#	Location	Item	Suggestion
1	Northbound direction	Creating width for an off-street path	a) Remove the outer northbound travel lane and bike lane. b) Reconstruct the east curb west of its current alignment to absorb the freed-up width.
2		Crossing east-side intersecting streets	On the east leg at Osage Trail and Via Montelana, install wide high-visibility crosswalks / cross-bikes with traffic barriers across the side-street medians.
3	West side (southbound), Altamira to Fairway	Parking and bikeway	Repurpose the width of the 28.5' southbound lane as 5' attached sidewalk, 8' parking, 5' bike, and 10.5' travel lane.
4	Altamira intersection	Crosswalk across Eldorado	Install a high-visibility crosswalk on the south leg, with standard crosswalk warning signage (W11-2 Pedestrian Symbol + W16-7p Downward Pointing Arrow).
5	Osage Trail intersection	Crosswalk across Eldorado	Install high-visibility crosswalks on the south legs, with thumbnail (half-round) islands to protect pedestrians across the medians. Install standard crosswalk warning signage (W11-2 Pedestrian Symbol + W16-7p Downward Pointing Arrow). If after installation the conflict level so indicates, consider enhancing the west (southbound) crosswalk with pedestrian-activated Rectangular Rapid Flashing Beacons (RRFBs).
6	Cam Cielo / Via Montelana intersection	Crosswalk across Eldorado	
7	Highway 111 intersection	East leg crosswalk	Enhance with high-visibility markings Install expanded hard-surface pedestrian/bicycle waiting areas on the southeast and northeast corners.

4.4.4. Area #4: Cook Street between Fairway Drive and Fred Waring Drive

Existing conditions and field observations

Overview

Cook Street extends approximately 1/2 mile south of Highway 111 to an all-way STOP intersection with Fairway Drive. South of Fairway it becomes Vintage Drive (gated entry) and continues approximately 1/4 mile further south into the Vintage Club golf course development

Cook extends north of Highway 111 for 1/2 mile along the west side of the Desert Horizons superblock, to the city limit at Fred Waring Drive. On the east side a meandering sidewalk runs within a 45' deep landscape area occupied only by lawn and palm trees. Cook continues north through Palm Desert, crossing the Whitewater River and ending at its Interstate 10 interchange.

On the segment south of Highway 111 the speed limit is 35 mph. The only street intersecting from the east is opposite Cove Gate Road, serving the new Province at Indian Wells subdivision. On the southernmost 1/4 mile north of Fairway Drive, four culs-de-sac of the Algonquin Circle subdivision (accessed from Fairway) back up to Cook's east-side right of way: Chippewa Drive, Concho Drive, Kiowa Drive and Huron Drive.

a) Intersections between Highway 111 and Fairway Drive

b) Northbound (east) side just north of Fairway Drive

Figure 4-27: Cook Street existing conditions

Analysis

The northbound half-street (median curb to outside curb) appears to be 32’ wide, with a 7’ unobstructed landscape area (mostly lawn) between the curb and adjacent subdivision walls.

Cook’s northbound direction north of Fairway is fed only by one lane of traffic at the all-way STOP Fairway / Vintage intersection. If the west-side intersections of Chateau Circle and Cove Drive contribute relatively low volume (likely because southbound traffic does not stop at those streets), it seems likely that the northbound direction does not need two traffic lanes between Fairway and The Province’s access point — and possibly all the way to Highway 111.

If so, the combined 26’ width of the 7’ landscape area, 7’ northbound bike lane and 12’ outer northbound travel lane could become a path corridor, similar to the suggestion for Eldorado Drive between Fairway Drive and Highway 111. Figure 4-28 shows a potential layout.

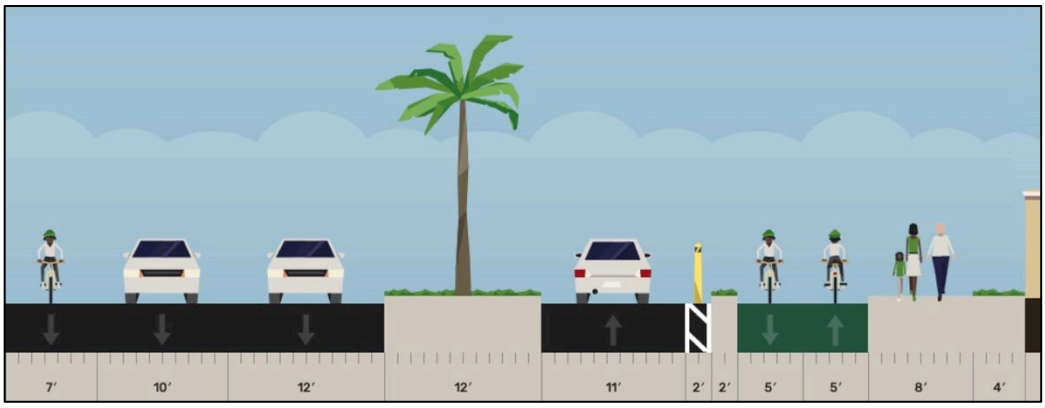


Figure 4-28: Cook Street concept (facing north from Fairway)

Suggestions

Table 4-6: Suggestions for Cook Street North of Fairway Drive

#	Location	Item	Suggestion
1	Northbound (east) side	Cross section	a) Remove the outer northbound travel lane and bike lane b) Narrow the inner northbound travel lane to 11’ c) Reconstruct curb, gutter and drainage d) Construct a two-way bikeway, adjacent at-grade walkway, and landscape buffers similar to Figure 4-28
2	At 4 culs-de-sac (Huron, Kiowa, Concho, Chippewa)	Access for subdivision	Working with the subdivision, implement connections to the east-side bikeway and walkway wide enough for shared use
3	East side, Hwy 111 – Fred Waring Dr	Enhance existing facility	Widen the existing meandering sidewalk to at least 15’ to support shared use by bicycles. Delineate a two-way bicycle travel area.

4.4.5. Area #5: Indian Wells Lane south of Highway 111

Existing conditions and field observations

Overview

As shown in Figure 4-29, Indian Wells Lane's southern segment ends at a cul-de-sac approximately 670' south of Highway 111. The street's axis aligns with a low wall enclosing the east parking lot of the Miramonte Indian Wells Resort and Spa complex. A double row of palm trees runs parallel to the wall, along the west edge of an open parcel with two tennis courts served by a parking lot that shares the Highway 111 junction with the Miramonte complex.

a) Overview north of Pala Palms Drive

b) Driveway intersection detail at Highway 111

Figure 4-29: Indian Wells Lane between Pala Palms Drive and Highway 111 - existing

The cul-de-sac has a pedestrian gate that connects to the Miramonte driveway, however there is no sidewalk along the parking lot it serves, so pedestrians traveling to/from Highway 111 conflict with private-vehicle movements for over 500' (a 2-minute walk for an able-bodied adult).

Figure 4-30: Indian Wells Lane north cul-de-sac – gate to Miramonte property

Analysis

It would be beneficial for residents of Indian Wells Lane and connecting streets to be able to walk and bike to/from Highway 111 and CV-Link without having to travel within the Miramonte complex or conflict with traffic associated with it. The space between the palm trees along the east side of Miramonte lot's low wall appears to be an ideal alignment for a path (Figure 4-31). The distance between the cul-de-sac wall and the tennis court driveway is approximately 500'.

a) Double row of palm trees along low wall enclosing Miramonte east parking lot (center right, upper)

b) Concept for path and driveway crosswalks

Figure 4-31: Concept for path between Indian Wells Drive culs-de-sac and Highway 111

Suggestions

Table 4-7: Suggestions for Indian Wells Lane Connection to Highway 111

#	Location	Item	Suggestion
1	Along east side of Miramonte east parking lot's perimeter wall	Shared use path	Construct 10' or wider path between rows of palm trees, with a new opening (possibly gated) in the culs-de-sac north wall.
2	Crossing of driveway serving tennis courts	Crosswalks	Install crosswalks with curb ramps and a median gap across the driveway.
		Yield line and sign	Install a R1-2 Yield sign facing incoming traffic, with a yield line (shark's teeth) marking upstream.
3	Between north side of driveway and Highway 111 intersection	Shared use path	Construct 10' or wider path to complete the link to Indian Wells Drive.

4.4.6. Area #6: Club Drive between Highway 111 and Sandpiper Drive

Existing conditions and field observations

As shown in Figure 4-32, Club Drive north of Sandpiper Drive runs between the Indian Wells Resort Hotel complex and a shopping plaza with a restaurant, bookstore and other businesses. The distance between Sandpiper Drive's north curb and Highway 111's south crosswalk is approximately 750' (a 3-minute walk for an able-bodied adult). Club Drive's width on this segment is 50' curb-to-curb and 68' between the low walls that enclose the hotel and shopping center. There are bike lanes except through the guard booth area, but no sidewalks. The 9' deep planting strips are landscaped with 6' of mostly-unobstructed lawn in front of 3' hedges with periodic wall projections into the hedge areas.

A guard station controls entry to the residential area to the south. It has two inbound lanes (one controlled and one for members) and two outbound lanes.

Indian Wells Resort Hotel on the west side has three driveways respectively 65', 140' and 460' south of Highway 111's south crosswalk. Small monument signs designate the northernmost as "ENTRANCE" and the next as "EXIT." A one-way southbound drive aisle runs between the middle and south driveways, serving single-loaded diagonal parking along the eastern facade.

The shopping center on the east side also has three driveways — one offset slightly south of the hotel's northern exit driveway, one roughly midway along the hotel's eastern frontage (i.e., no vehicular cross movement) and one opposite the hotel's south driveway. Vicky's of Santa Fe Restaurant occupies an outbuilding at the north end of the parking lot and has a U-shaped drop-off / valet service driveway. Parking operations in the shopping center lot change after non-restaurant retail closes and restaurant dinner valet operation begins. The shopping center only has sidewalks and walkways along the buildings east of the central outbuilding (Always Best Care Senior Services); there are none at the restaurant or in the main section of the lot.

Figure 4-32: Club Drive between Sandpiper Drive and Highway 111 - existing

Figure 4-33: Indian Wells Country Club guard station on Club Drive at Sandpiper Drive

Figure 4-34: Club Drive landscaping along east (retail) side. West (hotel) side is similar

Analysis

Figure 4-35 shows pedestrian "desire lines" (idealized travel paths, constrained by obstacles) along and across Club Drive. Prefix C denotes Commercial (shopping center); CR = restaurant, CN / CC / CS = (N)orth, (C)entral and (S)outh paths in the east-west direction across the parking lot. Prefix H = Hotel. CC has no counterpart on the hotel side because the hotel has no receiving sidewalk along its east parking lot. XN and XS are locations for crosswalks across Club Drive. Sidewalk alignments E and W connect the residential area and the Highway 111 intersection's southeast and southwest corners.

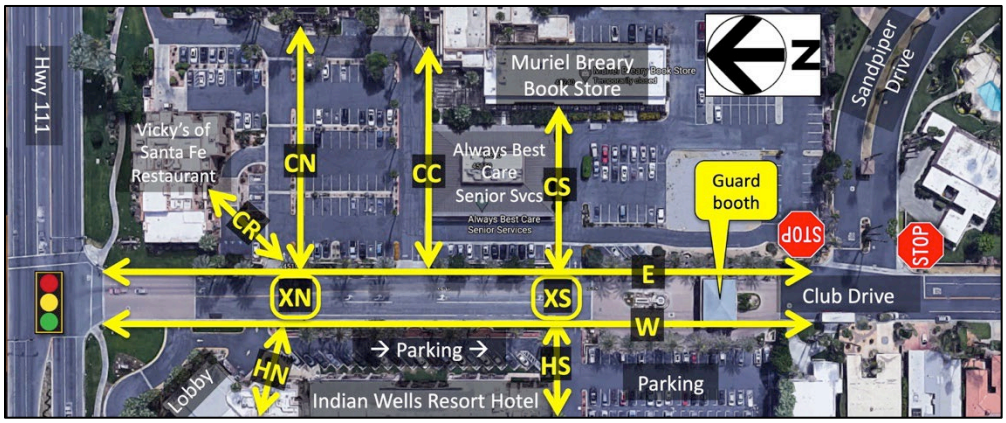


Figure 4-35: Pedestrian "desire lines" along and across Club Drive near Highway 111

Line “E,” representing an east-side sidewalk along Club Drive, is the most important pedestrian element for connecting the residential area south of the guard station with the shopping center and Highway 111. Because it is on the same side as the shopping center, shopping and dining trips along it not involve crossing Club Drive north of Sandpiper. Also, vehicle conflicts on the east (northbound, exit) side of the guard station are likely to be less intense than on the west (southbound, entry) side. Implementing walkways CS and CR would connect residents between the east sidewalk (E) and all shopping center buildings; central walkway CC is not needed for this purpose. To implement (E), it is suggested to install a 6’ wide attached sidewalk on the east side of Club Drive, replacing the lawn area, with a bypass around the back of the USPS mailbox that is located near where “E” meets “CC.”

It does not seem as important to implement “W” as a sidewalk because hotel guests can circulate north-south within the hotel and reach Highway 111’s south sidewalk by crossing the entrance driveway north of the lobby. Also, few residents of homes south of the guard booth probably walk to/from the hotel, except perhaps to patronize its restaurants — and those trips could be served by Club Drive’s east sidewalk plus crosswalk XN.

Items HN (Hotel north access) and XN (Club Drive north crosswalk) are most important for connecting hotel guests and staff with the shopping center and its restaurant. HN crosses the hotel’s east-side parking drive aisle — a simple single-direction decision for pedestrians. Crosswalk XN across Club Drive would need to be aligned on the south side of the shopping center’s north driveway, the major movements of which are inbound (southbound) left turns from Highway 111 and outbound (northbound) right turns returning to Highway 111. It would be beneficial to provide a median refuge, which could be as simple as a pair of half-round islands.

After crossing Club Drive at XN, restaurant patrons would benefit from a marked crosswalk across the shopping center’s north driveway, a sidewalk along the east side of Club Drive (E) and a spur walkway connecting to the restaurant, implementing desire line CR. Figure 4-36 shows conceptual alignments for HN, XN (with a median refuge), E, CR (restaurant walkway) and CN (directly walkway across the parking lot to the shopping center’s main building).

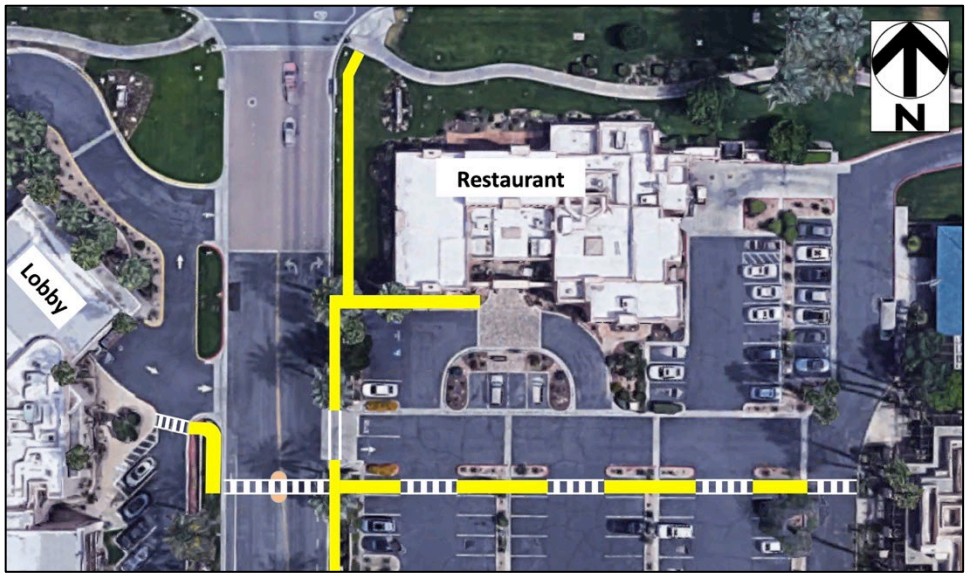


Figure 4-36: Connecting hotel lobby area with the shopping center and its restaurant

Although HN + XN + CR + CN are sufficient to connect most hotel guests and staff to/from the restaurant, guests with rooms closer to the south end of the hotel complex may prefer to cross Club Drive closer to that end, i.e., at XS. Note that because Club Drive has a southbound left turn lane serving the shopping center's south driveway, no median refuge is feasible at XS.

Pedestrians who cross at XS could use east-side sidewalk (E) to reach the restaurant. Having the shopping center install a walkway along CS (south face of senior services outbuilding) would also connect those pedestrians with the shopping center's main building to the east.

Suggestions

Table 4-8 summarizes the above suggestions, using letter codes for walkway and crosswalk elements depicted in Figure 4-35 (e.g., "CS," "XN").

Table 4-8: Suggestions for Club Drive Hotel/Commercial Area Near Highway 111

#	Location	Item	ELEMENT: Suggestion
1	Club Drive	Bike lanes	Retain for continuity with existing bike lanes within gated community south of guard station. Consider green pavement color for bike lanes through the hotel / commercial area north of the guard station.
2	Club Drive	North-south walking trips between residences south of the guard booth, the shopping center, and Highway 111	E: Install a 6' wide attached sidewalk along the east side of Club Drive between the guard station and Highway 111. E: Implement a separated walkway along the east edge of the guard station complex, perhaps using flexible delineator posts.
3	Hotel north end (lobby area)	Hotel guests and staff walking between the lobby and the restaurant across Club Drive, and the main body of the shopping center	HN: Install a marked crosswalk across the one-way driveway that serves the hotel's east-side parking aisle. XN: Install a high-visibility marked and signed mid-block crosswalk on the south side of the shopping center's north driveway, with a median refuge. CR: Work with the shopping center to connect east sidewalk "E" to the restaurant with a direct walkway. CN: Work with the shopping center to directly connecting east sidewalk "E" to the shopping center's main buildings to the east, by install walkways and crosswalks in the northernmost stalls of the portion of the parking lot south of the restaurant.
4	Hotel south end	Hotel guests and staff walking to/from the shopping center	HS: Install a marked crosswalk across the one-way driveway that serves the hotel's east-side parking aisle. XS: Install a high-visibility marked and signed mid-block crosswalk on the north side of the shopping center's south driveway, aligned with HS. CS: Work with the shopping center to install an internal walkway aligned with the south face of the

APPENDIX A: GLOSSARY OF PEDESTRIAN IMPROVEMENT MEASURES

Pedestrian Improvement Measures			
Measure	**Description**	**Benefits**	**Application**
Traffic Control Countermeasures			
Traffic Signal or All-Way Stop	Conventional traffic control devices with warrants for use based on the Manual on Uniform Control Devices (MUTCD).	Reduces pedestrian-vehicle conflicts and slows traffic speeds.	Must meet warrants based on traffic and pedestrian volumes; however, exceptions are possible based on demonstrated pedestrian safety concerns (collision history).
HAWK Beacon Signal	HAWKs (High Intensity Activated Crosswalks) are pedestrian-actuated signals that are a combination of a beacon flasher and a traffic control signal. When actuated, HAWK displays a yellow (warning) indication followed by a solid red light. During pedestrian clearance, the driver sees a flashing red “wig-wag” pattern until the clearance interval has ended and the signal goes dark.	Reduces pedestrian-vehicle conflicts and slows traffic speeds.	Useful in areas where it is difficult for pedestrians to find gaps in automobile traffic to cross safely, but where normal signal warrants are not satisfied. Appropriate for multi-lane roadways.
Overhead Flashing Beacons	Flashing amber lights are installed on overhead signs, in advance of the crosswalk or at the entrance to the crosswalk.	The blinking lights during pedestrian crossing times increase the number of drivers yielding for pedestrians and reduce pedestrian-vehicle conflicts. This measure can also improve conditions on multi-lane roadways.	Best used in places where motorists cannot see a traditional sign due to topography or other barriers.
Stutter Flash	The Overhead Flashing Beacon is enhanced by replacing the traditional slow flashing incandescent lamps with rapid flashing LED lamps. The beacons may be push-button activated or activated with pedestrian detection.	Initial studies suggest the stutter flash is very effective as measured by increased driver yielding behavior. Solar panels reduce energy costs associated with the device.	Appropriate for multi-lane roadways.

Pedestrian Improvement Measures			
Measure	**Description**	**Benefits**	**Application**
In-Roadway Warning Lights	Both sides of a crosswalk are lined with pavement markers, often containing an amber LED strobe light. The lights may be push-button activated or activated with pedestrian detection.	This measure provides a dynamic visual cue and is increasingly effective in bad weather.	Best in locations with low bicycle ridership, as the raised markers present a hazard to bicyclists. May not be appropriate in areas with heavy winter weather due to high maintenance costs. May not be appropriate for locations with bright sunlight. The lights may cause confusion when pedestrians fail to activate them and/or when they falsely activate.
High-Visibility Signs and Markings	High-visibility markings include a family of crosswalk striping styles including the “ladder” and the “triple four.” One style, the zebra-style crosswalk pavement markings, were once popular in Europe, but have been phased out because the signal-controlled puffin is more effective (see notes). High-visibility fluorescent yellow green signs are made of the approved fluorescent yellow-green color and posted at crossings to increase the visibility of a pedestrian crossing ahead.	FHWA recently ended its approval process for the experimental use of fluorescent yellow crosswalk markings and found that they had no discernible benefit over white markings.	Beneficial in areas with high pedestrian activity, as near schools, and in areas where travel speeds are high and/or motorist visibility is low.
In-Street Pedestrian Crossing Signs	This measure involves posting regulatory pedestrian signage on lane edge lines and road centerlines. The In-Street Pedestrian Crossing sign may be used to remind road users of laws regarding right of way at an unsignalized pedestrian crossing. The legend STATE LAW may be shown at the top of the sign if applicable. The legends STOP FOR or YIELD TO may be used in conjunction with the appropriate symbol.	This measure is highly visible to motorists and has a positive impact on pedestrian safety at crosswalks.	Mid-block crosswalks, unsignalized intersections, low-speed areas, and two-lane roadways are ideal for this pedestrian treatment. The STOP FOR legend shall only be used in states where the state law specifically requires that a driver must stop for a pedestrian in a crosswalk.
Pedestrian Crossing Flags	Square flags of various colors, which are mounted on a stick and stored in sign-mounted holders on both side of the street at crossing locations; they are carried by pedestrians while crossing a roadway.	This measure makes pedestrians more visible to motorists.	Appropriate for mid-block and uncontrolled crosswalks with low visibility or poor sight distance.

Pedestrian Improvement Measures			
Measure	**Description**	**Benefits**	**Application**
Advanced Yield Lines	Standard white stop or yield limit lines are placed in advance of marked, uncontrolled crosswalks.	This measure increases the pedestrian's visibility to motorists, reduces the number of vehicles encroaching on the crosswalk, and improves general pedestrian conditions on multi-lane roadways. It is also an affordable option.	Useful in areas where pedestrian visibility is low and in areas with aggressive drivers, as advance limit lines will help prevent drivers from encroaching on the crosswalk. Addresses the multiple-threat collision on multi-lane roads.
Geometric Treatments			
Pedestrian Overpass/ Underpass	This measure consists of a pedestrian-only overpass or underpass over a roadway. It provides complete separation of pedestrians from motor vehicle traffic, normally where no other pedestrian facility is available, and connects off-road trails and paths across major barriers.	Pedestrian overpasses and underpasses allow for the uninterrupted flow of pedestrian movement separate from the vehicle traffic.	Grade separation via this measure is most feasible and appropriate in extreme cases where pedestrians must cross roadways such as freeways and high-speed, high-volume arterials. This measure should be considered a last resort, as it is expensive and visually intrusive.
Road Diet (aka Lane Reduction)	The number of lanes of travel is reduced by widening sidewalks, adding bicycle and parking lanes, and converting parallel parking to angled or perpendicular parking.	This is a good traffic calming and pedestrian safety tool, particularly in areas that would benefit from curb extensions but have infrastructure in the way. This measure also improves pedestrian conditions on multi-lane roadways.	Roadways with surplus roadway capacity (typically multi-lane roadways with less than 15,000 to 17,000 ADT) and high bicycle volumes, and roadways that would benefit from traffic calming measures.

Pedestrian Improvement Measures			
Measure	**Description**	**Benefits**	**Application**
Median Refuge Island	Raised islands are placed in the center of a roadway, separating opposing lanes of traffic with cutouts for accessibility along the pedestrian path.	This measure allows pedestrians to focus on each direction of traffic separately, and the refuge provides pedestrians with a better view of oncoming traffic as well as allowing drivers to see pedestrians more easily. It can also split up a multi-lane road and act as a supplement to additional pedestrian tools.	Recommended for multi-lane roads wide enough to accommodate an ADA-accessible median.
Staggered Median Refuge Island	This measure is similar to traditional median refuge islands; the only difference is that the crosswalks in the roadway are staggered such that a pedestrian crosses half the street and then must walk towards traffic to reach the second half of the crosswalk. This measure must be designed for accessibility by including rails and truncated domes to direct sight-impaired pedestrians along the path of travel.	Benefits of this tool include an increase in the concentration of pedestrians at a crossing and the provision of better traffic views for pedestrians. Additionally, motorists are better able to see pedestrians as they walk through the staggered refuge.	Best used on multi-lane roads with obstructed pedestrian visibility or with off-set intersections.
Curb Extension	Also known as a pedestrian bulb-out, this traffic-calming measure is meant to slow traffic and increase driver awareness. It consists of an extension of the curb into the street, making the pedestrian space (sidewalk) wider.	Curb extensions narrow the distance that a pedestrian has to cross and increases the sidewalk space on the corners. They also improve emergency vehicle access and make it difficult for drivers to turn illegally.	Due to the high cost of installation, this tool would only be suitable on streets with high pedestrian activity, on-street parking, and infrequent (or no) curb-edge transit service. It is often used in combination with crosswalks or other markings.
Reduced Curb Radii	The radius of a curb can be reduced to require motorists to make a tighter turn.	Shorter radii narrow the distance that pedestrians have to cross; they also reduce traffic speeds and increase driver awareness (like curb extensions) but are less difficult and expensive to implement.	This measure would be beneficial on streets with high pedestrian activity, on-street parking, and no curb-edge transit service. It is more suitable for wider roadways and roadways with low volumes of heavy truck traffic.

Pedestrian Improvement Measures			
Measure	**Description**	**Benefits**	**Application**
Curb Ramps	Curb ramps are sloped ramps that are constructed at the edge of a curb (normally at intersections) as a transition between the sidewalk and a crosswalk.	Curb ramps provide easy access between the sidewalk and roadway for people using wheelchairs, strollers, walkers, crutches, handcarts, bicycles, and also for pedestrians with mobility impairments who have trouble stepping up and down high curbs.	Curb ramps must be installed at all intersections and mid-block locations where pedestrian crossings exist, as mandated by federal legislation (1973 Rehabilitation Act and 1990 Americans with Disabilities Act). Where feasible, separate curb ramps for each crosswalk at an intersection should be provided rather than having a single ramp at a corner for both crosswalks.
Raised Crosswalk	A crosswalk whose surface is elevated above the travel lanes.	Attracts drivers' attention; encourages lower travel speeds by providing visual and tactile feedback when approaching the crosswalk.	Appropriate for multi-lane roadways, roadways with lower speed limits that are not emergency routes, and roadways with high levels of pedestrian activity, such as near schools, shopping malls, etc.
Improved Right-Turn Slip-Lane Design	Right-turn slip lanes (aka channelized right-turn lanes) are separated from the rest of the travel lanes by a pork chop-shaped striped area. This measure separates right-turning traffic and streamlines right-turning movements. Improved right-turn slip lanes would provide pedestrian crossing islands within the intersection and be designed to optimize the right-turning motorist’s view of the pedestrian and of vehicles to his or her left.	This measure reduces the pedestrian's crossing distance and turning vehicle speeds.	Appropriate for intersections with high volumes of right-turning vehicles.

Pedestrian Improvement Measures			
Measure	**Description**	**Benefits**	**Application**
Chicanes	A chicane is a sequence of tight serpentine curves (usually an S-shape curve) in a roadway, used on city streets to slow cars.	This is a traffic-calming measure that can improve the pedestrian environment and pedestrian safety.	Chicanes can be created on streets with higher volumes, given that the number of through lanes is maintained; they can also be created on higher-volume residential streets to slow traffic. Chicanes may be constructed by alternating parallel or angled parking in combination with curb extensions.
Pedestrian Access and Amenities			
Marked Crosswalk	Marked crosswalks should be installed to provide designated pedestrian crossings at major pedestrian generators, crossings with significant pedestrian volumes (at least 15 per hour), crossings with high vehicle-pedestrian collisions, and other areas based on engineering judgment.	Marked crosswalks provide a designated crossing, which may improve walkability and reduce jaywalking.	Marked crosswalks alone should not be installed on multi-lane roads with more than about 10,000 vehicles/day. Enhanced crosswalk treatments (as presented in this table) should supplement the marked crosswalk.
Textured Pavers	Textured pavers come in a variety of materials (for example, concrete, brick, and stone) and can be constructed to create a textured pedestrian surface such as a crosswalk or sidewalk. Crosswalks are constructed with the pavers or can be made of stamped concrete or asphalt.	Highly visible to motorists, this measure provides a visual and tactile cue to motorists and delineates a separate space for pedestrians, as it provides a different texture to the street for pedestrians and motorists. It also aesthetically enhances the streetscape.	Appropriate for areas with high volumes of pedestrian traffic and roadways with low visibility and/or narrow travel ways, as in the downtown area of towns and small cities.
Anti-Skid Surfacing	Surface treatment is applied to streets to improve skid resistance during wet weather. This is a supplementary tool that can be used to reduce skidding in wet conditions.	Improves driver and pedestrian safety.	Appropriate for multi-lane roadways and roadways with higher posted speed limit and/or high vehicle volumes or collision rates.

Pedestrian Improvement Measures			
Measure	**Description**	**Benefits**	**Application**
Accessibility Upgrades	Treatments such as audible pedestrian signals, accessible push buttons, and truncated domes should be installed at crossings to accommodate disabled pedestrians.	Improves accessibility of pedestrian facilities for all users.	Accessibility upgrades should be provided for all pedestrian facilities following a citywide ADA Transition Plan.
Pedestrian Countdown Signal	Displays a “countdown” of the number of seconds remaining for the pedestrian crossing interval. In some jurisdictions the countdown includes the walk phase. In other jurisdictions, the countdown is only displayed during the flashing don’t walk phase.	Increases pedestrian awareness and allows them the flexibility to know when to speed up if the pedestrian phase is about to expire.	The forthcoming 2009 MUTCD is expected to require all pedestrian signals to incorporated countdown signals within ten years. The signals should be prioritized for areas with pedestrian activity, roadways with high volumes of vehicular traffic, multi-lane roadways, and areas with elderly or disabled persons (who may walk slower than others may).
Transit			
High-Visibility Bus Stop Locations	This measure should include siting bus stops on the far side of intersections, with paved connections to sidewalks where landscape buffers exist.	Provides safe, convenient, and inviting access for transit users; can improve roadway efficiency and driver sight distance.	Appropriate for all bus stops subject to sight distance and right-of-way constraints.
Transit Bulb	Transit bulbs or bus bulbs, also known as nubs, curb extensions, or bus bulges are a section of sidewalk that extends from the curb of a parking lane to the edge of the through lane.	Creates additional space at a bus stop for shelters, benches, and other passenger amenities.	Appropriate at sites with high patron volumes, crowded city sidewalks, and curbside parking.
Enhanced Bus Stop Amenities	Adequate bus stop signing, lighting, a bus shelter with seating, trash receptacles, and bicycle parking are desirable features at bus stops.	Increase pedestrian visibility at bus stops and encourage transit ridership.	Appropriate at sites with high patron volumes.

APPENDIX B: GLOSSARY OF BICYCLING IMPROVEMENT MEASURES

Bicycling Improvement Measures			
Measure	**Description**	**Benefits**	**Application**
LINKS /ROADWAY SEGMENTS			
A. Road Design and Operations to Slow Traffic			
Traffic Calming	There are a variety of measures too numerous to list here. See ITE Institute of Transportation Engineers, "Traffic Calming: State of the Practice".	Reduces motor vehicle speeds, which improves safety for all modes and increases bicyclist's comfort.	Urban and suburban settings; suggested for urban major streets with prevailing speeds of 35 mph and higher and for suburban major streets with prevailing speeds 45 mph or higher; and for all local streets with speeds of 30+ mph.
Bicycle Boulevard	A minor street on which traffic control devices are designed and placed to encourage cycling; these include unwarranted stop signs along bike route are removed; crossing assistance at major arterials is provided (see examples in Nodes-Section E below).	Allows cyclists to maintain their travel speeds, significantly reducing their travel time; provides cyclists with a low volume, low speed street where motorists are aware that it is a bicycle-priority street.	On minor streets with less than 3000 vehicles per day especially useful when Bike Blvd is parallel to and within ¼ mile of a major arterial with many desirable destinations.
Signal Coordination at 15 -25 mph	The signal timing along a corridor is set so that traffic which receives a green light at the first intersection will subsequently receive a green light at all downstream intersections if they travel at the design speed; aka a "green wave."	Encourages motorists to travel at slower speeds, provides a more comfortable experience for cyclists and increases overall traffic safety; also allows cyclists to hit the green lights, so that they can maintain their travel speeds, significantly reducing their travel time.	Urban settings, typically downtown and other areas with relatively short blocks and with traffic signals at every intersection.
Woonerf/Shared Space	A shared space concept where the entire public right of way is available for all modes, often with no sidewalks, and with no lane striping, and little if any signage.	Access for motor vehicles is maintained, unlike a pedestrian zone, but motor vehicle speeds are constrained to 5 mph by design and the presence of other modes. Safety for all modes is improved.	Low volume residential streets where families can gather and children are encouraged to play; also commercial areas with high pedestrian volumes, bicyclists and transit.

B. Road Design to Provide Bicycle Infrastructure			
Bike Lanes	A painted lane for the exclusive use of bicyclists; it is one-way and is 5 feet minimum in width. They can be retrofitted onto an existing street by either a) narrowing existing wide travel lanes; b) removing a parking lane; c) removing a travel lane, or d) widening the roadway. A common method to retrofit bike lanes is described below.	Provides cyclists with their own travel lane so that they can safely pass and be passed by motor vehicles.	Roadways with over 4000 vehicles per day (if less than 4000 vehicles per day see Bicycle Boulevards above).
Road Diet (aka Lane Reduction)	One to two travel lanes are replaced with a bike lane in each direction, and in most cases by also adding left-turn lanes at intersections or a center two-way left-turn lane; variations include widening sidewalks, and replacing parallel parking with angled or perpendicular parking.	Improves traffic safety for all modes by: a) eliminating the double-threat to pedestrians posed by the two or more travel lanes in each direction; b) providing bike lanes for cyclists; c) providing a left-turn pocket for motorists, reducing rear-end collisions and improving visibility to oncoming traffic.	Classic application is a four-lane undivided roadway with less than 15,000 to 17,000 ADT though conversions of four-lane streets may work up to 23,000 ADT. Also applies to three-lane roadways and to 5 or 6-lane undivided roadways
Buffer adjacent to bike lanes	A three to five-foot buffer area is provided on one or both sides of the bike lane.	Right-side buffer (between bike lane and on-street parking): Removes cyclists from the door zone; Left-side (between bike lane and adjacent travel lane): provides greater separation from passing motor vehicle traffic.	This measure is particularly beneficial in the following conditions: Right-side: on streets with parallel on-street parking particularly in cities with a collision history of dooring; Left-side: on streets with traffic with prevailing speeds of 40 mph and higher.
Cycle Tracks	A bikeway within the roadway right of way that is separated from both traffic lanes and the sidewalks by either a parking lane, street furniture, curbs or other physical means.	Reduces sidewalk riding, provides greater separation between motorists and cyclists.	Urban settings with parallel sidewalks and heavy traffic.
C Other Traffic Control Devices			
Except Bicycles placard	A Regulatory sign placard for use with other regulatory signs.	Increases or maintains the access and circulation capabilities of bicyclists.	Used at locations where the restriction in question does not apply to bicyclists, such as No Left Turn or Do Not Enter.

Sharrows	A pavement legend that indicates the location within the travel lane where bicyclists are expected to occupy.	The sharrow encourages cyclists to ride outside of the door zone and studies have shown that sharrows reduce the incidence of cyclists riding on the sidewalk and wrong-way riding.	Two or more lane city streets where the right-most lane is too narrow for a motor vehicle to safely pass a cyclist within the travel lane.
Bike Lanes May Use Full Lane sign (MUTCD R4-11)	Regulatory Sign	Informs motorists and cyclists that cyclists may be travelling in the center of a narrow lane.	Two or more lane city streets where the right-most lane is too narrow for a motor vehicle to safely pass a cyclist within the travel lane.
Share the Road sign (MUTCD W-11/ W16-1p)	Warning sign and placard	Informs motorists to expect cyclists on the roadway.	Two-lane roads particularly in rural areas where shoulders are less than four-feet.
Bike Directional Signs (MUTCD D1 series or similar)	Informational signs indicating place names and arrows, with distances as a recommended option (D1-2C)	Informs bicyclists of the most common destination served by the bike route in question.	Particularly useful to direct cyclists to a facility such as a bike bridge or to use a street to access a major destination that might not otherwise be readily apparent.
D. New infrastructure to improve bicycle connectivity			
Bike Path	A paved pathway for the exclusive use of non-motorized traffic within its own right of way;	Provides additional connectivity and route options that otherwise would not be available to bicyclists.	Wherever a continuous right of way exists, typically found along active or abandoned railroad ROW, shorelines, creeks, and river levees.
Pathway connections	Short pathway segments for non-motorized traffic, for example, that join the ends of two culs-de-sac or provide other connectivity not provided by road network.	Provides short-cuts for bicyclists that reduce their travel distance and travel time.	Varies by community; suggested at the end of every newly constructed cul-de-sac.
Bicycle Overpass/ Underpass	A bicycle overpass or underpass is a bridge or tunnel built for the exclusive use of non-motorized traffic and is typically built where at-grade crossings cannot be provided such as to cross freeways, rivers, creeks and railroad tracks. They can also be built to cross major arterials where, for example, a bike path must cross a major roadway.	A bike bridge / tunnel complement a local roadway system that is discontinuous due to man-made or natural barriers. They reduce the distance traveled by cyclists, and provide a safer conflict-free crossing, particularly if it is an alternative to a freeway interchange.	Grade separation via this measure is most feasible and appropriate when it would provide direct access to major bicyclist destinations such as a school or college, employment site, major transit station or would reduce the travel distance by one mile or more.

NODES / INTERSECTIONS			
Measure	**Description**	**Benefits**	**Application**
E. Intersection Design for Motor Vehicles			
Reduced Curb Radii	The radius of a curb is reduced to require motorists to make the turn at slower speeds and to make a tighter turn.	Shorter curb radii reduce the speed of turning traffic thereby enabling a more comfortable weave between through cyclists and right-turning motorists.	This measure is suitable for downtown settings, at all cross streets with minor streets, all residential streets and all roadways that are not designated truck routes.
Remove/Control Free Right-Turn Lanes	Where a separate right-turn lane continues as its own lane after the turn, it may be redesigned to eliminate the free turn. A short-term solution is to control the turning movement with a stop sign or signal control and to redesign the island as discussed below.	Improves bicyclist safety since this design forces through cyclists on the cross street to end up in between two lanes of through motor vehicle traffic.	All locations where there are free right-turn lanes except those leading onto freeway on-ramps.
Remove/Redesign Right-Turn Slip-Lane Design	Right-turn slip lanes (aka channelized right-turn lanes) are separated from the rest of the travel lanes by a pork chop-shaped raised island that is typically designed to facilitate fast right turns, and right-turning vehicles are often not subject to the traffic signal or stop sign.	Improves bicyclist safety by slowing right-turning motorists and facilitates the weave between through bicyclists and right-turning motorists.	All locations with a channelized right-turn.
Remove Optional Right-Turn Lane in Combination with a Right-Turn Only Lane	At locations where there is an optional right-turn lane in combination with a right-turn only lane, convert the optional right-turn lane to a through-only lane.	Improves bicyclist safety since cyclists have no way of knowing how to correctly position themselves in the optional (through /right turn) lane.	All locations where there is an optional right-turn lane in combination with a right-turn only lane per HDM 403.6(1) (except on freeways).
Redesign Ramp Termini	Redesign high speed free flow freeway ramps to intersection local streets as standard intersections with signal control.	Improves bicyclist and pedestrian safety on intersections of local streets with freeway ramps.	All freeway interchanges with high speed ramps

F. Intersection Design Treatments - Bicycle-Specific			
Bicycle Signal Detection and Pavement Marking	Provide signal detectors that also detect bicyclists in the rightmost through lane and in left-turn lanes with left-turn phasing. Provide pavement marking to indicate to cyclists where to position themselves in order to activate the detector.	Enables cyclists to be detected when motor vehicles are not present to trigger the needed signal phase. Improves bicyclists' safety.	Per CA MUTCD 4D.105 and CVC 21450.5, all new and modified traffic detection installations must detect bicyclists; All other traffic-actuated signals may be retrofitted to detect bicyclists as soon as feasible.
Bicycle Signal Timing	Provides signal timing to account for the speed of cyclists to cross an intersection.	Improves bicyclists' safety by reducing the probability of a bicyclist being in an intersection when the phase terminates and being hit by traffic that receives the next green phase.	Signal timing that accounts for cyclists is particularly important for cyclists on a minor street approach to a major arterial which crosses a greater distance due to the width of the arterial, hence requiring a longer time interval.
Bicycle Signal Heads	A traffic signal indication in the shape of a bicycle, with full red, yellow green capability.	Improves bicyclist safety by providing a bicycle -only phase, where appropriate, given the geometry and phasing of the particular intersection.	Where intersection geometry is such that a bicycle-only phase is provided and/or bicycle signal heads would improve safety at the intersection. See also CA MUTCD for warrants for bicycle signal heads.
Widen Bike Lane at Intersection Approach	Within the last 200 feet of an intersection, widen the bike lane and narrow the travel; for example from 5 foot bike lane and 12 feet travel lane would become a 7 foot bike lane and 10 foot travel lane.	Improves cyclist safety by encouraging right-turning motorists to enter the bike lane to turn right, (as required by the CVC), which reduces the chance of a right-turn hook collision in which a through cyclist remains to the right of a right-turning motorist.	On roads with bike lanes approaching an intersection without a right-turn only lane and there is noncompliance with right-turning vehicles merging into the bike lane as required by the CVC and UVC.
Bike Lane inside Right-Turn Only Lane ("Combined Bicycle/Right-Turn Lane")	Provide a bike lane line inside and on the left side of a right-turn only lane.	Encourages cyclists to ride on the left side of the right-turn only lane thus reducing the chance of a right hook collision, where a cyclist remains to the right of a right-turning motorist.	On roads with bike lanes approaching an intersection with a right-turn only lane and there is not enough roadway width to provide a bike lane to the left of the right-turn lane.

Bike Boxes	Area between an Advance Stop Line and a marked crosswalk designated as the queue space for cyclists to wait for a green light ahead of queued motor vehicle traffic; sometimes painted green.	Primary benefits are to reduce conflicts between bicyclists and right-turning traffic at the onset of the green signal phase, and to reduce vehicle and bicyclist encroachment in a crosswalk during a red signal phase.	Locations where there are at least three cyclists at the beginning of the green phase and moderate to high pedestrian volumes.
Marked Crosswalk with Distinct Marked Area for Bicyclists separate from Pedestrians	A marked crosswalk that has two distinct areas, one for pedestrians and one for bicyclists.	Reduces conflicts between bicyclists and pedestrians by indicating the part of the crosswalk intended for the two different modes.	At a typical intersection, cyclists would not be riding within the crosswalk, so this measure is intended for those few locations where the intersection design is such that bicyclists are tracked into a crosswalk such as at a midblock bike path crossing or possibly a cycle track.
Pedestrian Countdown Signal	Displays a “countdown” of the number of seconds remaining for the pedestrian crossing interval. In some jurisdictions the countdown includes the walk phase. In other jurisdictions, the countdown is only displayed during the flashing don’t walk phase.	While designed for pedestrians, this measure also assists bicyclists in knowing the time remaining to cross the intersection.	The 2012 MUTCD requires all pedestrian signals to incorporated countdown signals within ten years
Measure	**Description**	**Benefits**	**Application**
G. Geometric Countermeasures to Assist crossing a Major Street			
Median Refuge Island	A raised island placed in the center of a roadway, separating opposing lanes of traffic, with ramps for cyclists and ADA accessibility	This measure allows bicyclists to cross one direction of traffic at a time; it allows drivers to see bicyclists crossing from the center more easily.	Suggested for multilane roads at uncontrolled crossings where an 8-foot (min.) wide by 15-foot (min.) long median can be provided.
Staggered Refuge Pedestrian Island	This measure is similar to traditional median refuge islands; the only difference is that the crosswalk is staggered such that a pedestrian crosses one direction of traffic street and then must turn to their right facing oncoming to reach the second part of the crosswalk. This measure must be designed for accessibility by including rails and truncated domes to direct sight-impaired pedestrians along the path of travel.	Benefits of this measure include forcing the bicyclists and pedestrians to face the oncoming motorists, increasing their awareness of the impending conflict. Additionally, can improve motorists’ visibility to those persons in the crosswalk.	Best used on multilane roads with obstructed pedestrian visibility or with off-set intersections

Raised Crosswalk/Speed Table	A crosswalk whose surface is elevated above the travel lanes at the same level as the approaching sidewalk. For bicyclists, a typical location would be at a bike path crossing, where the bike path elevation would remain constant while roadway cross traffic would experience a speed-hump type effect.	Attracts drivers' attention to the fact there will be non-motorized users crossing the roadway, and slows traffic by providing a speed-hump effect for motorists approaching the crosswalk.	Appropriate for multi-lane roadways, roadways with lower speed limits that are not emergency routes, and roadways with high levels of pedestrian activity, such as near schools, shopping malls, etc.
Measure	**Description**	**Benefits**	**Application**
H. Traffic Control Countermeasures to Assist Crossing a Major Street			
Traffic Signal or All-Way Stop Sign	Conventional traffic control devices with warrants for use based on the Manual on Uniform Control Devices (MUTCD)	Provides the gap needed in traffic flow so that cyclists can cross the street, reducing bicycle-vehicle conflicts and risk-taking by cyclists to	Must meet warrants based on traffic/ pedestrian / bicycle volumes, collision history, and/ or other factors.
Modern Roundabout	A traffic circle combined with splitter island on all approaches and entering traffic must YIELD to traffic within the roundabout; typically designed for traffic speed within the roundabout of between 15 and 23 mph.	Slows traffic on cross street so that cyclists can more easily cross.	Roundabouts are a better alternative than an All-Way Stop signs when the side street volume is approximately 30 % of the total intersection traffic volume and total peak hour volume is less than 2300 vehicles per day.
Hawk Beacon Signal	HAWK (High Intensity Activated Crosswalks) are pedestrian-bicyclist actuated signals that are a combination of a beacon flasher and a traffic control signal. When actuated, HAWK displays a yellow (warning) indication followed by a solid red light. During the cross street phase, the driver sees a flashing red “wig-wag” pattern until the clearance interval has ended and the signal goes dark.	Provides the need gaps in traffic so bicyclists can safely cross the street, can be timed separately for bicycles and pedestrians. Reduces pedestrian-vehicle conflicts and slows traffic speeds	Useful in areas where it is difficult for bicyclists /pedestrians to find gaps in automobile traffic to cross safely, but where normal signal warrants are not satisfied. Appropriate for multilane roadways.
Rectangular Rapid Flashing Beacon (RRFB/Stutter Flash)	A warning sign that also contains rapid flashing LED lamps. The beacon may be push-button activated or activated with pedestrian detection.	Initial studies suggest the stutter flash is very effective as measured by increased driver yielding behavior. Solar panels reduce energy costs associated with the device.	Locations not controlled by any measures listed above. Appropriate for multi-lane roadways.

In-Roadway Warning Lights	Both sides of a crosswalk are lined with pavement markers, often containing an amber LED strobe light. The lights may be push-button activated or activated with pedestrian detection.	This measure provides a dynamic visual cue of the uncontrolled crosswalk and is especially effective at night and in bad weather.	Locations not controlled by any measures listed above. Best in locations with low bicycle ridership on the cross street, as the raised markers may present difficulty to bicyclists. May not be appropriate in areas with heavy winter weather due to high maintenance costs. May not be appropriate for locations with bright sunlight.
Bicycle Crossing Sign (MUTCD W11-1) or Trail Crossing sign (MUTCD W11-15/W11-15p)	Warning Sign and placard.	Alerts motorists to a location where bicyclists or bicyclists and pedestrians will be crossing the roadway at an uncontrolled location.	Typical application is at bike path crossing of a roadway. (At a typical pedestrian crosswalk at an intersection, use the Pedestrian warning sign W11-2)
In-Street Pedestrian Crossing Signs (MUTCD R1-6)	This measure involves posting this regulatory sign on road centerlines that read, “YIELD for Pedestrians in crosswalk”. (Depending on state law, the word STOP may replace the word YIELD).	This measure improves the visibility of the crossing to motorists and has a positive impact on pedestrian safety at crosswalks.	Mid-block crosswalks, unsignalized intersections, low-speed areas, and two-lane roadways.
Advanced Yield Lines	Standard white stop or yield limit lines are placed 20-50 feet in advance of marked, uncontrolled crosswalks.	This measure increases the pedestrian’s visibility to motorists, reduces the number of vehicles encroaching on the crosswalk, and improves general pedestrian conditions on multi-lane roadways. It is also an affordable option.	Useful in areas where pedestrian visibility is low and in areas with aggressive drivers, as advance limit lines will help prevent drivers from encroaching on the crosswalk. Addresses the multiple-threat collision on multi-lane roads.
Transit			
Bike Racks on Buses	A rack on the front of the bus that typically holds two or three bicycles.	Increases the trip length distance that a person can make.	Appropriate for all buses; most urban transit agencies have already implemented this measure.
Bikes allowed inside buses when bike rack is full	A policy adopted by a transit agency that allows passengers to bring bicycles inside the bus when the bike rack is full and there is room inside.	Prevents cyclists from needless being left behind to wait for the next bus if the bike rack is full yet there is room inside the bus.	Appropriate for all buses; most urban transit agencies have already implemented this measure.

Folding bikes allowed inside buses	A policy adopted by a transit agency that treats a folding bicycle as luggage, thereby allowing it inside the bus at all times.	Removes cyclists' uncertainty as to whether they will be able to fit their bike either on the bike rack or inside the bus; thus they can reliably plan on being able to catch their intended bus.	Appropriate for all buses; most urban transit agencies have already implemented this measure.

APPENDIX C: RESOURCE LIST AND REFERENCES

Resource List and References	
➔ Pedestrian and Bicycle Information Center ("PBIC") http://www.bicyclinginfo.org	Along with walkinginfo.org, a resource site maintained by UNC Highway Safety Research Center (UNC-HSRC)
➔ Pedestrian and Bicycle Crash Analysis Tool ("PBCAT") http://www.walkinginfo.org/facts/pbcat/index.cfm	Crash typing software product intended to assist planners and engineers with improving walking and bicycling safety through the development and analysis of a database containing details of crashes between motor vehicles and pedestrians or bicyclists
➔ FHWA On-Demand Bicycle Safety Training Courses http://www.bicyclinginfo.org/training/ondemand-training.cfm	FHWA University Course on Bicycle and Pedestrian Transportation National Highway Institute Bicycle Facility Design Course Safe Routes to School National Course APBP National Complete Streets Workshops
➔ FHWA University Course on Bicycle and Pedestrian Transportation, Report No. FHWA-HRT-05-085 http://www.tfhrc.gov/safety/pedbike/pubs/05085	A detailed 24-lesson course in planning and design for non-motorized transportation.
➔ FHWA Official Rulings website http://mutcd.fhwa.dot.gov/orsearch.asp	List of FHWA communications regarding experiments, and interpretation of documents (Requests To Experiment / RTEs, response letters, progress reports, final reports, changes).
➔ FHWA Interim Approvals webpage http://mutcd.fhwa.dot.gov/res-interim_approvals.htm	List of all Interim Approvals granted by FHWA. Interim Approvals enable states and local agencies to request approval to use a new device without experimentation before the device is incorporated into a future edition of the MUTCD.
➔ FHWA "Bicycle Facilities and the Manual on Uniform Traffic Control Devices" webpage http://www.fhwa.dot.gov/environment/bicycle_pedestrian/guidance/design_guidance/mutcd_bike.cfm	Status in the 2009 US MUTCD of various bicycle-related signs, markings, signals, and other treatments (e.g., can be implemented, Interim Approval, currently experimental).
➔ FHWA DRAFT Accessibility Guidance for Bicycle and Pedestrian Facilities, Recreational Trails, and Transportation Enhancement Activities (2008) http://www.fhwa.dot.gov/environment/recreational_trails/guidance/accessibility_guidance/guidance_accessibility.cfm	Summary of current accessibility standards, pending standards, guidelines under development, program accessibility, accessibility design criteria for sidewalks, street crossings and shared use paths and trails
➔ FHWA Bollards, Gates and other Barriers (webpage) http://www.fhwa.dot.gov/environment/recreational_trails/guidance/accessibility_guidance/bollards_access.cfm	Current guidance on the hazards of bollards, gates, fences and other barriers to restrict unauthorized use of paths. Alternatives to bollards and gates.
➔ California Traffic Control Devices Committee (CTCDC) http://www.dot.ca.gov/hq/traffops/signtech/newtech/	Committee agendas, minutes, annual reports, experiment status and reports, experimentation guidelines and requests, implementation of FHWA-issued Interim Approvals.
➔ *Caltrans Complete Streets webpage http://www.dot.ca.gov/hq/tpp/offices/ocp/complete_streets.html*	*Complete Intersections guide and other resources*

➔ *Road Safety Audits: Case Studies (FHWA-SA-06-17)* *http://safety.fhwa.dot.gov/rsa/rsa_cstudies.htm*	
➔ *Bicycle Road Safety Audit Guidelines and Prompt Lists FHWA-SA-12-018* *http://safety.fhwa.dot.gov/ped_bike/tools_solve/fhwasa12018/*	
➔ *National Center for Safe Routes to School* *http://www.saferoutesinfo.org/*	*Resources for Infrastructure (engineering, safety, planning, design) and non-infrastructure (education, promotion, outreach) in support of Active Transportation in school commutes*

Adapted from FHWA Pedestrian Road Safety Audit Guidelines and Prompt Lists

Resources for Experimentation and Interim Approvals	
➔ FHWA "Bicycle Facilities and the Manual on Uniform Traffic Control Devices" webpage http://www.fhwa.dot.gov/environment/bicycle_pedestrian/guidance/design_guidance/mutcd_bike.cfm	Status in the 2009 US MUTCD of various bicycle-related signs, markings, signals, and other treatments (e.g., can be implemented, Interim Approval, currently experimental). Start here to determine whether a device requires experimentation.
➔ FHWA Interim Approvals webpage http://mutcd.fhwa.dot.gov/res-interim_approvals.htm	List of all Interim Approvals granted by FHWA. Interim Approvals enable states and local agencies to request approval to use a new device without experimentation before the device is adopted in a future edition of the MUTCD.
➔ FHWA Official Rulings website http://mutcd.fhwa.dot.gov/orsearch.asp	List of FHWA communications regarding experiments, and interpretation of documents (Requests To Experiment / RTEs, response letters, progress reports, final reports, changes).
➔ California Traffic Control Devices Committee (CTCDC) http://www.dot.ca.gov/hq/traffops/signtech/newtech/	Committee agendas, minutes, annual reports, experiment status and reports, experimentation guidelines and requests, implementation of FHWA-issued Interim Approvals.
➔ FHWA (U.S.) Manual on Uniform Traffic Control Devices (MUTCD) (2009), Section 1A.10 http://mutcd.fhwa.dot.gov/ *NOTE: All US MUTCD content appears in-line in the California MUTCD, with California differences shown in blue, and California tables and figures identified with (CA).*	Section 1A10 Interpretations, Experimentations, Changes and Interim Approvals covers the design, application and placement of traffic control devices other than those adopted in the MUTCD. Figure 1A.1 Process for Requesting and Conducting Experimentation for New Traffic Control Devices is a flowchart of the federal (FHWA) process. Figure 1A.2 Process for Incorporating New Traffic Control Devices into the MUTCD is a flowchart of the process after successful experimentation, a research study, or a request from a jurisdiction or interested party
➔ California Manual on Uniform Traffic Control Devices (MUTCD) (2012), Section 1A.10 http://www.dot.ca.gov/hq/traffops/signtech/mutcdsupp/ca_mutcd2012.htm NOTE: All US MUTCD content appears in-line in the California MUTCD	Figure 1A.1 (CA) Process for Requesting and Conducting Experimentation for New Traffic Control Devices in California is a flowchart of the California (CTCDC) process. Figure 1A.101 (CA) Process for the Use of Traffic Control Devices Approved as Interim Approval (IA) by FHWA is a flowchart of additional steps in California before a device granted Interim Approval by FHWA may be used.

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> *From the CROW English website, http://www.crow.nl/English*
>
> *CROW is The Netherlands technology platform for transport, infrastructure and public space. It is a not-for-profit organization in which the government and businesses work together in pursuit of their common interests through the design, construction and management of roads and other traffic and transport facilities. Active in research and in issuing regulations, CROW focuses on distributing knowledge products to all target groups.*

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APPENDIX D: STREET CONNECTIVITY

Importance of Street Connectivity

Providing direct paths for bicyclists and pedestrians via well-connected street networks is important for encouraging bicycling and walking by helping people overcome real and perceived senses of distance.

Street connectivity is also associated with public health benefits. The SMARTRAQ Project analysis in Atlanta, Georgia, found that doubling the current regional average intersection density, from 8.3 to 16.6 intersections per square kilometer was associated with a reduction in average per capita vehicle mileage of about 1.6 percent. Furthermore, the Frank et al. (2006) study of King County, Washington, found that per-household VMT declines with increased street connectivity, all else held constant.

Policies for Street Connectivity

A network of safe, direct, and comfortable routes and facilities: A 2004 PAS report recommends that pedestrian (and bicycle) path connections be every 300 to 500 feet; for motor vehicles, they recommend 500 to 1,000 feet.[3,4] For new development, such standards can be implemented through ordinances, like those of the regional government of Portland Oregon, Metro, which requires street connectivity in its Regional Transportation Plan and in the development codes and design standards of its constituent local governments.[5]

Measuring Connectivity

The following discussion of measuring street connectivity is provided as a resource and not officially a part of regular BSA processes. However, individuals are certainly encouraged to make such calculations.

[3] Susan Handy, Robert G. Paterson, and Kent Butler, 2004, *Planning for Street Connectivity: Getting from Here to There,* PAS Report #515 (Chicago: APA Planners Press).

[4] For more information on this topic, see American Association of State Highway and Transportation Officials (AASHTO), *AASHTO Guide for the Design of Pedestrian Facilities* (Washington, D.C., AASHTO, 2004); *AASHTO Guide for the Development of Bicycle Facilities* (Washington, D.C., AASHTO, 1999; updated 2009); Institute of Traffic Engineers (ITE), Traffic Calming Guidelines and ITE *Context-Sensitive Solutions in Designing Major Urban Thoroughfares for Walkable Communities*? (Washington, D.C.: ITE, 2006), http://www.ite.org/bookstore/RP036.pdf (accessed September 3, 2008).

[5] The regional government of Portland Oregon, Metro, requires street connectivity in its Regional Transportation Plan and in the development codes and design standards of its constituent local governments as follows: local and arterial streets be spaced no more than 530 feet apart (except where barriers exist), bicycle and pedestrian connections must be made (via pathways or on road right of ways) every 330 feet, Culs-de-sac (or dead-end streets) are discouraged and can be no longer than 200 feet, and have no more than 25 dwelling units.

Jennifer Dill (2004) presents the following measures of street connectivity:

- Intersection density
- Street density
- Average block length
- Link/node ratio
- Connected node ratio = intersections/ (intersections + culs-de-sac)
- Alpha index = number of actual circuits/ maximum number of circuits

  Where a circuit is a finite, closed path starting and ending at a single node
- Gamma index = number of links in the network/ maximum possible number of links between nodes
- Effective walking area = number of parcels within a one-quarter mile walking distance of a point/ total number of parcels within a one-quarter mile radius of that point
- Route directness = route distance/ straight-line distance for two selected points

Dill suggests that route directness (RD) is perhaps the best connectivity measure to reflect minimizing trip distances, but may be difficult to use in research and policy. However, it may be applied in practice by randomly selecting origin-destination pairs and calculating a sample for the subject area.

Berkeley SafeTREC

SAFE TRANSPORTATION RESEARCH AND EDUCATION CENTER

(SAFETREC)

UNIVERSITY OF CALIFORNIA, BERKELEY

About the Safe Transportation Research and Education Center (SafeTREC)

Founded in 2000, SafeTREC is part of the University of California, Berkeley, affiliated with the School of Public Health and the Institute of Transportation Studies, with additional partnerships with the Department of City and Regional Planning, Public Policy, and Transportation Engineering. SafeTREC helps the California Office of Traffic Safety (OTS) administer its Community Pedestrian and Bicycle Safety Training workshops and support various safety initiatives from other California agencies, including the California Department of Transportation (Caltrans), by providing programs such as:

- Community Pedestrian and Bicycle Safety Program
- Complete Streets Safety Assessments
- Global Road Safety
- Tribal Road Safety
- Collaborative Sciences Center for Road Safety

SafeTREC's mission is to reduce transportation-related injuries and fatalities through research, education, outreach, and community service.

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