TOOLE DESIGN

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HUNTINGTON BEACH MOBILITY IMPLEMENTATION PLAN (MIP)

TOOLBOX: BICYCLE, PEDESTRIAN, AND BEACH PATH

This section provides information on a series of treatments that improve bicycle, pedestrian, and beach path conditions. The treatments featured here are not an extensive list of every available option to improve bicycle pedestrian experiences, but rather a tailored list of common tools that have a demonstrated history of improving safety and access. The City of Huntington Beach can consider both rapid implementation and permanent projects in their Toolkit. Rapid implementation projects can include lower cost solutions and may be installed temporarily before a permanent or more costly solution is provided. Rapid implementation projects should include data collection on the effectiveness of the treatment to inform improvements as part of a permanent solution.

Crash Modification Factor (CMF): "A CMF estimates a safety countermeasure's ability to reduce crashes and crash severity. Transportation professionals frequently use CMF values to identify countermeasures with the greatest safety benefit for a particular crash type or location." For more information, see: http://www.cmfclearinghouse.org/

Proven Safety Countermeasures: Specific countermeasures are highlighted by the Federal Highway Administration (FHWA) for their safety effectiveness and benefits. For more information, see: https://safety.fhwa.dot.gov/provencountermeasures/

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BICYCLE TREATMENTS

CLASS I – SHARED-USE PATH

Class I bikeways (also known as bike paths or shared-use paths) are facilities with exclusive right of way for bicyclists and pedestrians, away from the roadway and with minimized cross flows by vehicle traffic. These facilities support both recreational and commuting opportunities, especially along rivers, shorelines, canals, utility rights-of-way, railroad rights-of-way, within school campuses, or within and between parks.

***CMF / CRF**: Unavailable.*

CLASS II – BIKE LANE / BUFFERED BIKE LANE

Also known as bike lanes, Class II Bicycle Facilities are established along streets, defined by pavement striping and signage to delineate a portion of a roadway for bicycle travel. Bike lanes are one-way facilities, typically striped adjacent to vehicle traffic traveling in the same direction. Buffered bike lanes provide greater separation from an adjacent traffic lane or on-street parking by using painted chevrons or diagonal markings. Buffered bike lanes may be desirable on streets with higher vehicle speeds or volumes.

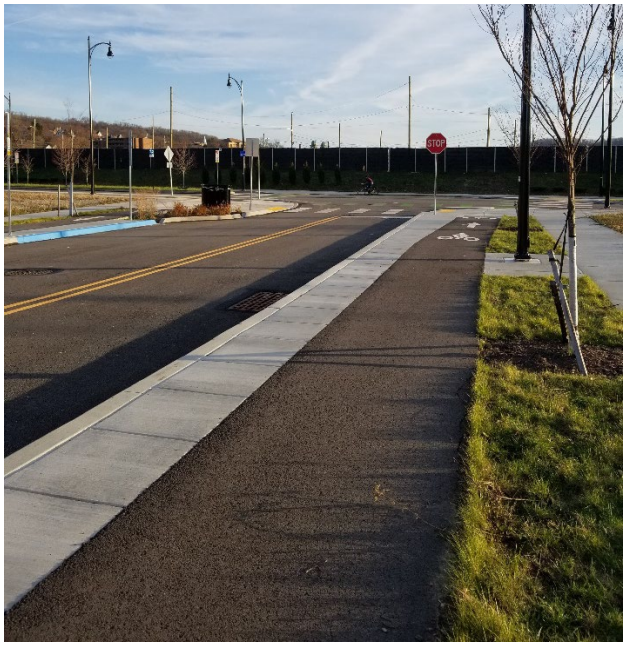
***CMF / CRF**: Bike Lanes are a Proven Safety Countermeasure with a 30% to 49% crash reduction* [1].

CLASS III – BIKE BOULEVARD

Class III Bicycle Facilities, also known as bike boulevards, bike routes or shared lanes, are designated streets for bicycle travel shared with vehicles but not served by dedicated bikeways. Bike routes are established by placing signage and/or shared lane markings (i.e., “sharrows”) along roadways and are therefore generally not appropriate for roadways with high vehicle speeds or volumes. In some cases, additional treatments such as traffic circles, curb extensions, chicanes, diverters, speed humps or cushions can be added to further support speed and volume reductions. A Bicycle Boulevard or a Neighborhood Greenway is a type of bike route where bicycle travel is prioritized. These facilities are typically placed on residential streets where biking or walking is the primary mode of transportation. Traffic speed and non-local vehicle access is reduced for the safety of bicyclists and pedestrians.

***CMF / CRF**: Installing a Class III bicycle facility can result in a 63% crash reduction* [2].

CLASS IV – PROTECTED BIKEWAY



Class IV Bicycle Facilities (also known as separated bikeways, protected bikeways, or cycle tracks) are for the exclusive use of bicycles and are physically separated from vehicle traffic, parking lanes, and sidewalks with a vertical and/or horizontal feature. These features include flexible posts, inflexible physical barriers, planters, parked vehicles, and curbs. Separated bikeways may be one-way or two-way and may be at street level or sidewalk level. The separation width can vary for these facilities according to roadway geometry. Near transit stops, separated facilities can be incorporated with the use of transit boarding islands.

***CMF / CRF**: Bike Lanes are a Proven Safety Countermeasure with a 30% to 49% crash reduction* [1].

BICYCLE SIGNAL

A bicycle signal is a traffic signal with a green, yellow, and red display intended to control bicycle movements. The display may include arrows or a bicycle symbol shape. Bicycle signals are necessary to indicate a leading or protected phase for bicycle movements. This may sometimes require an additional phase be added to the traffic signal cycle. Initial studies of bicycle signals indicate that their presence may increase signal compliance and improve safety. In 2013, the treatment has been given interim approval to use by Federal Highway Administration (FHWA) if used for protected bicycle phases but is not included in the 2009 Manual on Uniform Traffic Control Devices (MUTCD). This was adopted by California in 2015. FHWA requires an agency to request permission to experiment if using a bicycle signal to apply a leading phase.

Bicycle signals can be activated actively or passively. Active detection requires bicyclists to use a push button. Push buttons should be placed in such a way that bicyclists do not have to leave the roadway to activate the signal.

***CMF / CRF**: Unavailable.*

BICYCLE DETECTION AND ACTUATION

Properly designed detection can deter unsafe behaviors, such as disregarding red signal indications, by reducing delay at signalized intersections. Bicycle signal detection also increases the convenience of bicycling. Passive detection (i.e., when the signal system automatically detects the presence of the user), is considered best practice where feasible. Loop detectors, commonly used for motor vehicle detection, can also be used to detect bicyclists. Other passive detection devices include video and microwave detection. Bicycle detection devices can be used to call a phase or to prolong the phase to allow a bicyclist to clear an intersection. This is particularly important at locations where the minimum green has been established to serve motorists and may not be long enough to serve bicyclists, especially older bicyclists, children, or those towing bicycle trailers. Pavement markings and/or signs should be used to notify bicyclists of the proper bicycle detection location. Combining passive bicycle detection with detection confirmation lights or active detection (push buttons) may improve compliance by assuring bicyclists that they have been detected.

***CMF / CRF**: Unavailable.*

BIKE BOX

Bike boxes provide space for bicyclists to position themselves in front of vehicles while stopped at a signalized intersection. This treatment provides a predictable place for bicyclists to stop and wait at a signal, allowing them to get out ahead of traffic at the onset of a green signal. Bike boxes are intended to reduce the likelihood of a right- or left-hook collision at the on-set of a green signal. In addition to increasing the visibility and predictability of bicyclists, bike boxes provide priority for bicyclists by allowing them to come to the front of the queue. A “No Right Turn on Red” sign can be installed to prevent vehicles from entering the bike box. Bike boxes can also be helpful for bicyclists making left turns who are uncomfortable or unable to merge to a left turn lane. This treatment has been given interim approval to use by FHWA but is not included in the 2009 MUTCD.

***CMF / CRF**: Unavailable.*

TWO-STAGE BICYCLE TURN QUEUE BOX

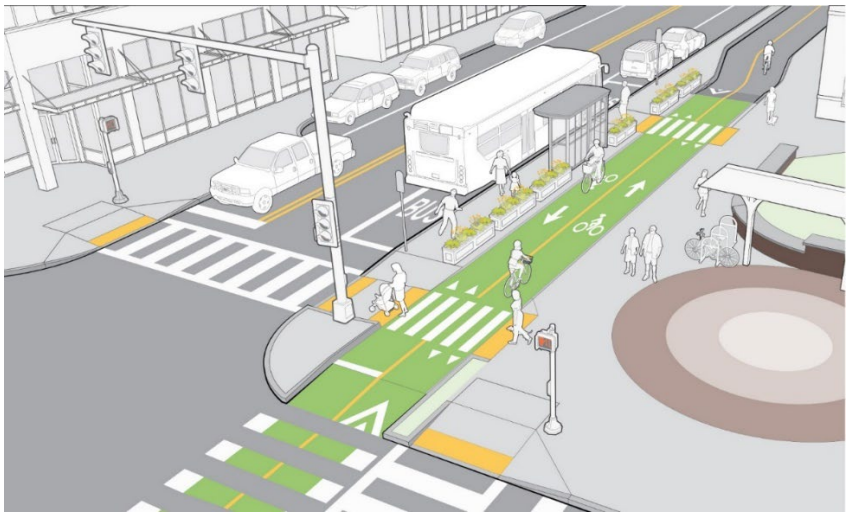
A two-stage turn queue box (also known as a Copenhagen-Left or jug-handle turn) designates an area outside of vehicle conflicts for bicyclists to wait for traffic to clear before proceeding in a different direction of travel. It may be used for left or right turns. They may be useful at locations where bicyclists would have to merge across multiple lanes of traffic, would have to wait in a shared travel lane with motorists to turn, or at locations with separated bike lanes or side paths where it is not possible for bicyclists to merge into motor vehicle lanes in advance of the intersection. This can be advantageous on roadways with higher volumes of vehicular traffic or high operating speeds to reduce conflicts between motorists and turning bicyclists. Bicycle symbol and turn arrow pavement markings indicating the appropriate direction for bicyclists to turn and wait within the box are recommended, as well as the prohibition of right turns on red if turning vehicles would travel through the area of the two-stage bicycle turn box.

An agency needs to request permission from FHWA to experiment to use this treatment. The California Department of Transportation has received interim approval (IA).

Caltrans and the California Traffic Control Device Committee (CTCDC) have agreed to review each IA issued by FHWA at their earliest convenience for its application in California. If the IA is recommended for use in California, then Caltrans will request FHWA's approval for its use on a blanket basis statewide, eliminating the need for individual agencies to seek FHWA approval. If the IA is not recommended for use in California, then Caltrans will publicize the status of the particular IA on this web site.

***CMF / CRF**: Unavailable.*

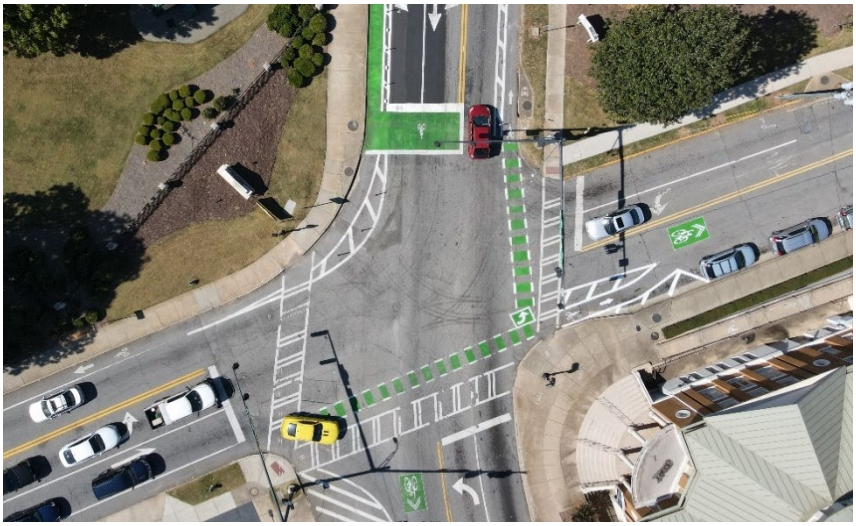
GREEN PAVEMENT



Green pavement within a bicycle facility increases its visibility to all roadway users and reinforces the priority to bicyclists in conflict areas and in areas where motorists may park in the bike facility. The green pavement can be used either as a corridor treatment along the length of the facility, or as a spot treatment, such as a bike box, conflict area, or intersection conflict marking. Consistent application of green paint across a bike network is important to promote clear understanding for all users. The green color may be applied with paint, Durable Liquid Pavement Markings (DLPM), thermoplastic, or colored asphalt

***CMF / CRF**: Unavailable.*

BICYCLE INTERSECTION CROSSING MARKINGS

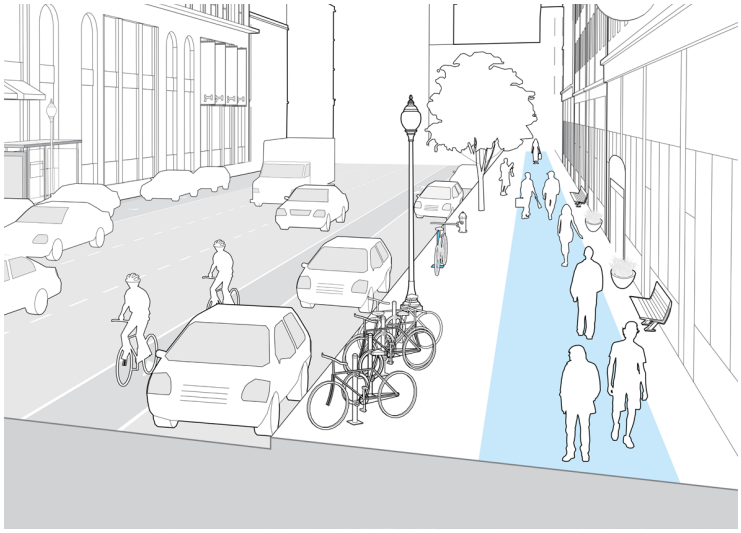


Bicycle lane intersection crossing markings are intended to provide bicyclists with a clear, highly visible pathway through an intersection. They also help to alert motorists to the presence of bicycle through-traffic and encourage turning motorists to yield to through moving bicyclists. The pavement within the bicycle lane extension can include green color.

***CMF / CRF**: Unavailable.*

PEDESTRIAN TREATMENTS

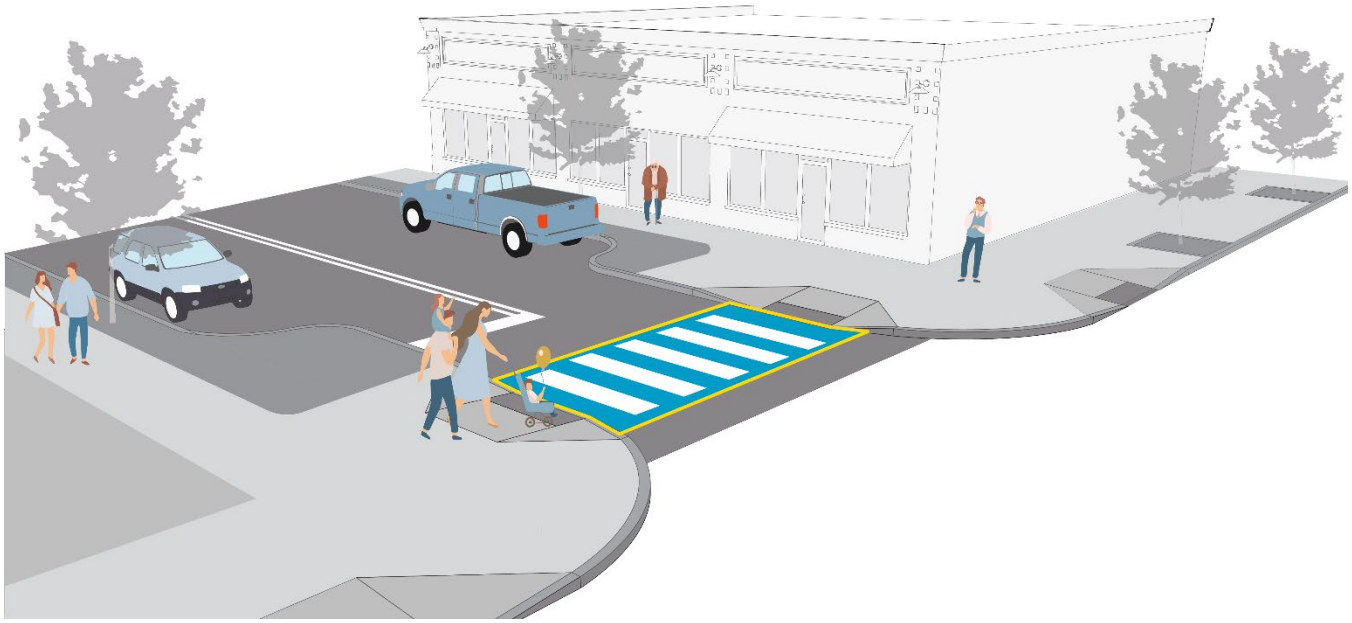
SIDEWALK



Sidewalks provide space along a street for pedestrian travel and are the backbone of a city's pedestrian network. For sidewalks to function, they must be kept clear of any obstacles and be wide enough to comfortably accommodate expected pedestrian volumes and different types of pedestrians, including those using mobility assistance devices like wheelchairs, pushing strollers, or pulling carts.

***CMF / CRF**: Sidewalks are a Proven Safety Countermeasure with a 65% to 89% crash reduction* [1].

HIGH VISIBILITY CROSSWALK (CONTINENTAL CROSSWALK, LADDER CROSSWALK, ARTISTIC CROSSWALK)



High-visibility crosswalk markings, such as continental or ladder-style, are preferred over parallel line markings to improve visibility to approaching motorists. High-visibility crosswalk markings reinforce legal crosswalks at intersections and create legal crossings at non-intersection locations. These crosswalk markings warn motorists to expect pedestrian crossings and clarify that motorists are expected to yield right-of-way to crossing pedestrians. At uncontrolled locations, high-visibility crosswalk markings identify a preferred crossing location for pedestrians.

***CMF / CRF**: High Visibility Crosswalks are a Proven Safety Countermeasure with a 40% crash reduction* [1].

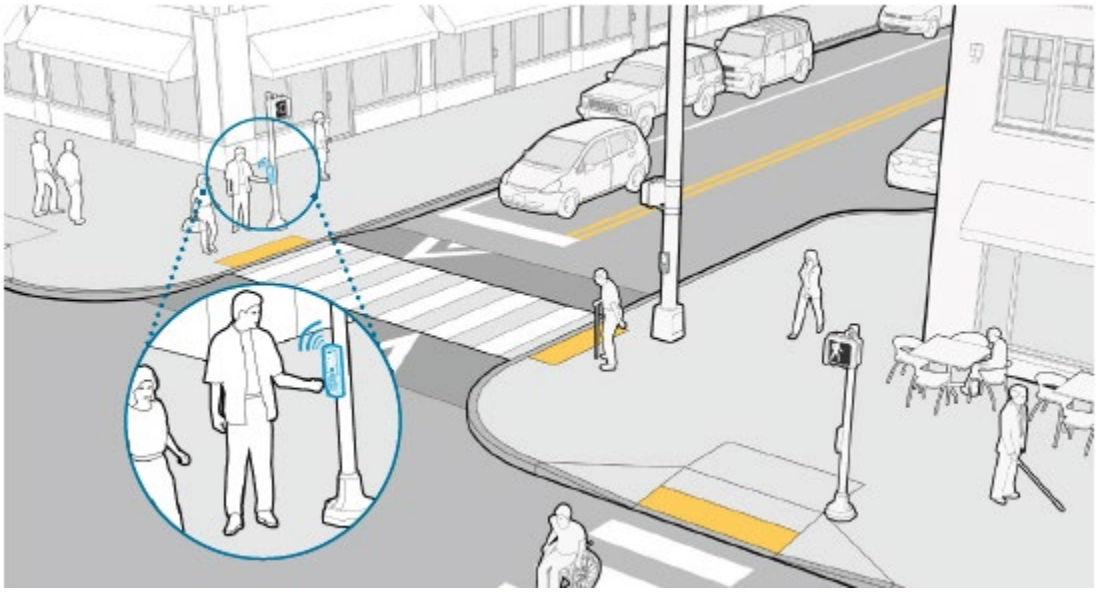
UNIDIRECTIONAL CURB RAMP - DETECTABLE WARNING SURFACE

The transition for pedestrians from the sidewalk to the street is provided by a curb ramp. The design of curb ramps is critical for all pedestrians, particularly for persons with disabilities. The Americans with Disabilities Act (ADA) standards require all pedestrian crossings be accessible by providing curb ramps with detectable warning surfaces at all locations where pedestrians can be expected to cross the street. In addition to people with disabilities, curb ramps also benefit people pushing strollers, grocery carts, suitcases, or bicycles. At intersections, directional curb ramps should be installed to orient pedestrians toward the desired line of travel.

Detectable warning surfaces are a hazard warning for pedestrians with low or no vision. Comprised of truncated domes and produced in colors that contrast the sidewalk or curb ramp in which they are placed, detectable warning surfaces function like a pedestrian stop line, alerting persons with vision disabilities to the presence of the street or other vehicular travel way.

***CMF / CRF**: Unavailable.*

ACCESSIBLE PEDESTRIAN SIGNAL



Accessible Pedestrian Signals (APS) and accessible detectors are devices that communicate information in non-visual formats about the pedestrian crossing to people with visual and/or hearing disabilities. They may include features such as audible tones, speech messages, detectable arrow indications, and/or vibrating surfaces.

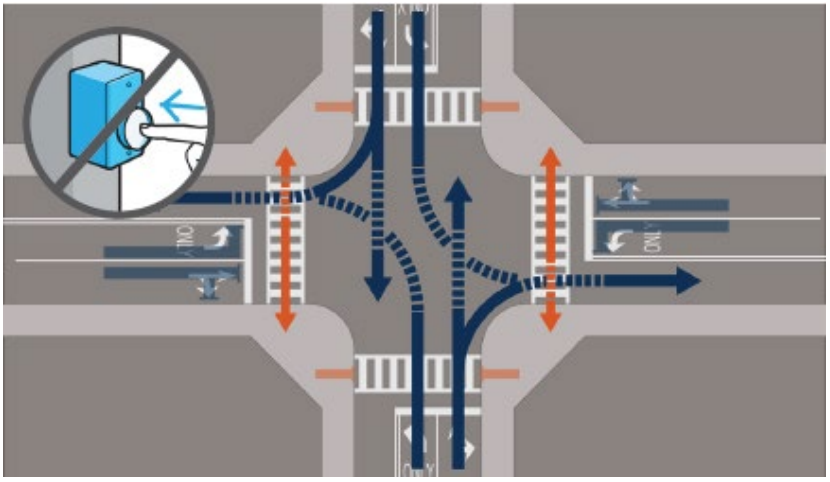
***CMF / CRF**: Unavailable.*

PEDESTRIAN COUNTDOWN

Pedestrian signals and countdown signals provide guidance to pedestrians regarding the permitted signal interval to cross a street and prohibit pedestrian crossings when conflicting traffic may impact pedestrian safety. Ideally, every signalized intersection should have a pedestrian signal head. Countdown signals are indications designed to begin counting down at the beginning of the clearance interval (flashing “DON’T WALK”) and can be set to fixed-time, push button operation, or passive pedestrian detection. They indicate to the pedestrian how much time is left in the crossing phase. The California MUTCD requires countdown pedestrian indications for all newly installed traffic signals where pedestrian signals are installed.

***CMF / CRF**: Installing a pedestrian countdown signal can result in an 8.8% crash reduction* [3].

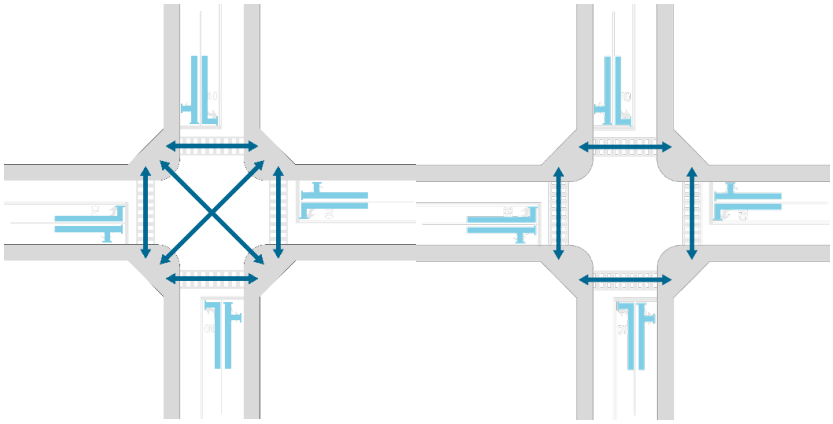
PEDESTRIAN RECALL



Pedestrian recall is when a signal is set to automatically allow pedestrians to cross the street without the need to push a button during a green interval. It causes the WALK signal to activate on every cycle of the intersection traffic signal. In areas and locations where pedestrian demand is high, pedestrian recall should be considered to minimize crossing delays and provide convenience and comfort for pedestrians.

***CMF / CRF**: Unavailable.*

PEDESTRIAN SCRAMBLE / EXCLUSIVE PEDESTRIAN PHASE



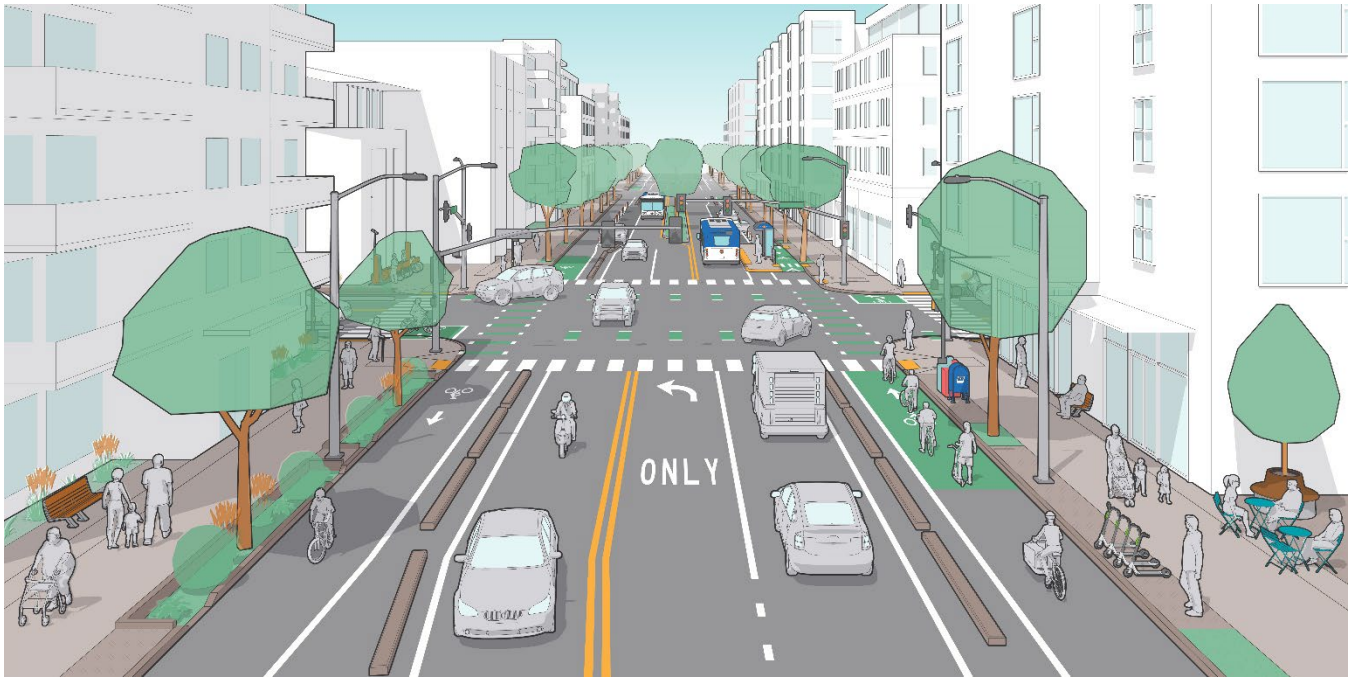
An exclusive pedestrian phase stops all motor vehicles at the intersection to allow people to cross the street at every crosswalk. It minimizes exposure of people walking and rolling, minimizes delay for people waiting to cross the street, and provides accessibility benefits to people with disabilities.

Like the exclusive pedestrian phase, a pedestrian scramble, or “Barnes Dance”, stops all vehicle movements at the intersection to give priority to pedestrians looking to cross the street. Scrambles also provide diagonal crosswalks in the middle of the intersection to allow for more direct crossing movements, eliminating the need to cross two crosswalks to get to an opposite corner.

***CMF / CRF**: Installing an exclusive pedestrian phase can result in a 35% crash reduction* [4].

BICYCLE & PEDESTRIAN TREATMENTS

TREE CANOPY AND SHADING



Street trees provide shade and visual softness to make walking and the use of sidewalks feel more pleasant. Trees can help reduce peak temperatures during summer months and mitigate air pollution. Tree placement will vary based on type of tree species and amount of space in the right-of-way but should be typically used along sidewalks and trails and in public plazas and parks.

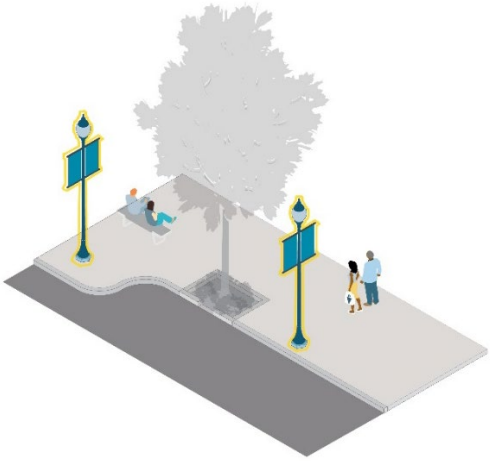
CMF / CRF: *Unavailable.*

STREET FURNITURE

Street furniture includes an array of elements, including benches, trash and recycling receptacles, bollards, transit stops and shelters, decorative planters and more. Seating is an essential component to each street and includes temporary and permanent fixtures such as chairs, benches, seat walls, steps, public art, and raised planters. The location and type of seating element should respond to adjacent land uses, available shade from either structures or street trees, the presence of parallel parking buffering the seating area from traffic and the width of the amenity zone.

CMF / CRF: *Unavailable.*

STREET LIGHTING



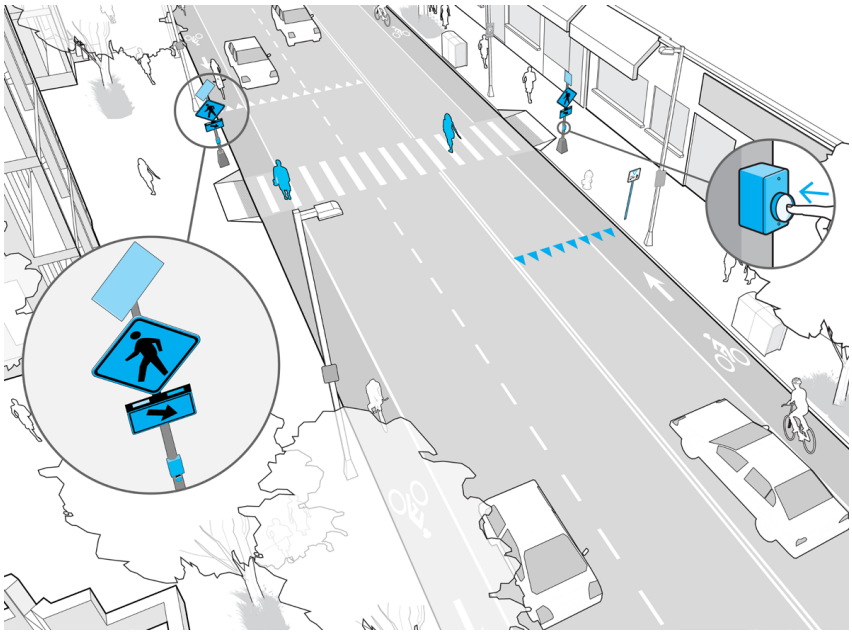
Illumination at crosswalks and along the roadway can help increase visibility for pedestrians and bicyclists, particularly at approaches to crossings. Studies show that increasing or adding lighting to crosswalks, road segments, and intersections improves pedestrian and bicyclist safety by reducing crashes, increasing yielding and compliance with traffic control devices, and improving visibility.

Pedestrian-scale lighting is lighting directed toward the sidewalk and positioned lower than roadway lighting. It is a crucial element in providing a safe multimodal environment and ensures that a pedestrian environment is used frequently and safely, resulting in a safer and healthier community.

Pedestrian-scale lighting should be installed along streets with existing or anticipated high volumes of pedestrian activity and at intersections and crossings.

CMF / CRF: *Lighting is a Proven Safety Countermeasure with a 28% to 42% crash reduction* [1].

PEDESTRIAN-ACTIVATED FLASHING BEACONS / RECTANGULAR RAPID-FLASHING BEACON



Rectangular Rapid Flashing Beacons (RRFBs) are pedestrian actuated beacons that use a rapid, irregular flash frequency. They increase driver yielding, increase pedestrian visibility, and slow down vehicle speeds. RRFBs should be installed on roadways with low to medium vehicle volumes and/or roadways with posted speeds under 40mph.

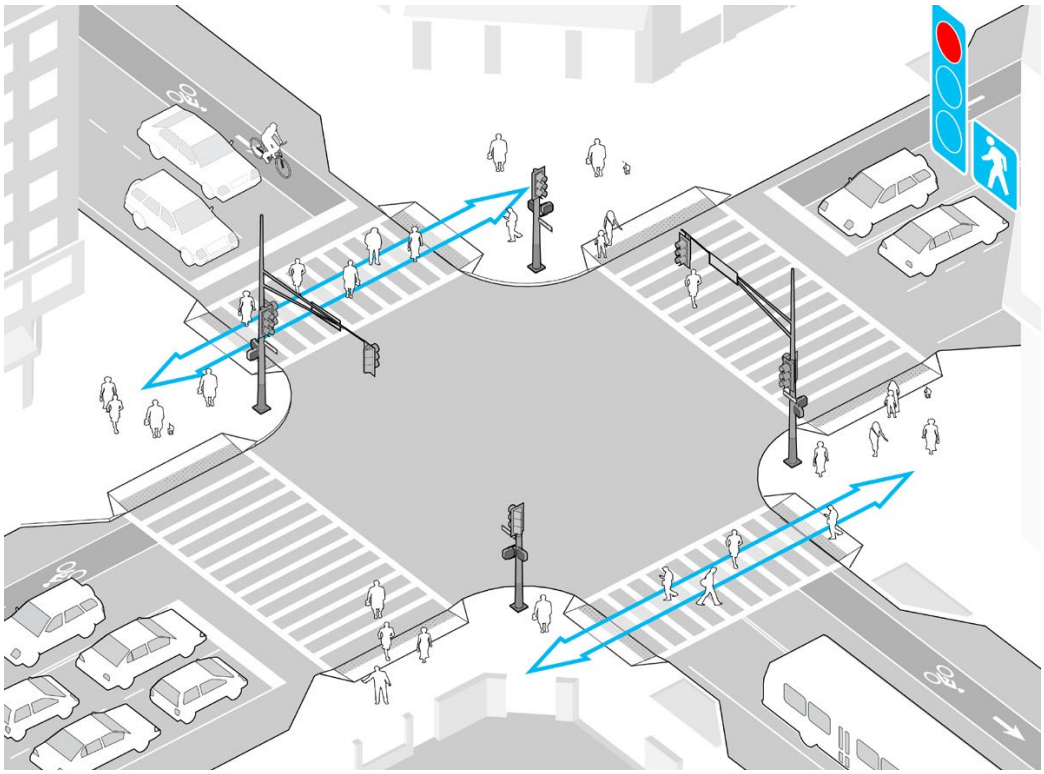
CMF / CRF: *Rectangular Rapid Flashing Beacons are a Proven Safety Countermeasure with a 47% crash reduction* [1].

PEDESTRIAN HYBRID BEACON / HIGH-INTENSITY ACTIVATED CROSSWALK

Pedestrian Hybrid Beacons (PHBs), also called high intensity activated crosswalk (HAWKs), help pedestrians safely cross busy or higher-speed streets at midblock crossings and uncontrolled intersections. The beacon head consists of two red lights above a single yellow light. Once a pedestrian pushes the button to cross, the signal then initiates a yellow to red lighting sequence directing motorists to slow and come to a stop. The pedestrian signal then flashes a WALK display for the pedestrian to cross.

CMF / CRF: *Pedestrian Hybrid Beacons are a Proven Safety Countermeasure with a 15% to 55% crash reduction* [1].

LEADING PEDESTRIAN INTERVAL / LEADING BICYCLE INTERVAL

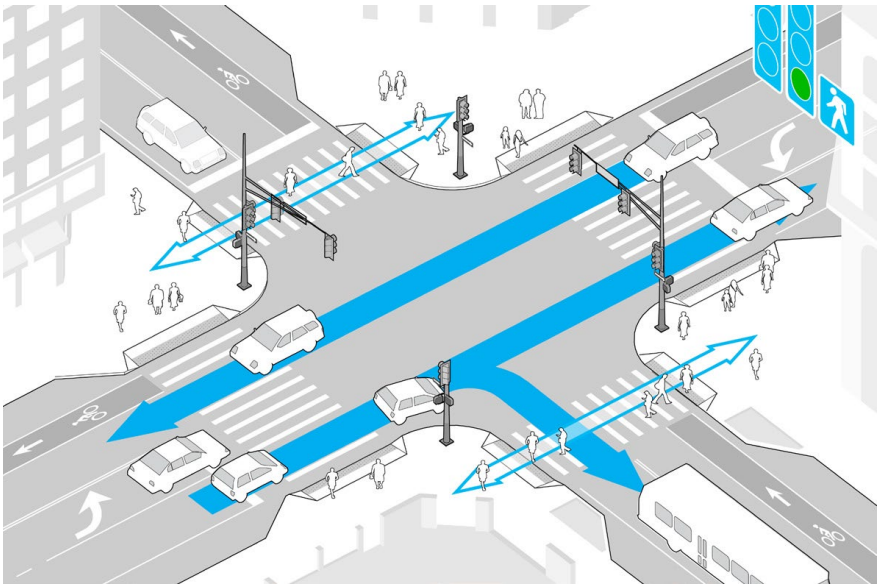


Leading Pedestrian Intervals (LPIs) and Leading Bicycle Intervals (LBIs) give pedestrians and bicyclists a three to seven second head start to establish themselves in the intersection before motorists are given the green light. This allows pedestrians and bicyclists to enter the intersection prior to turning motorists, increasing visibility between all modes. LPIs especially benefit slower pedestrians, including people with disabilities, seniors, and children.

If an LBI is to be used with a bicycle signal, the agency should request permission to experiment from FHWA.

CMF / CRF: *Leading Pedestrian Intervals are a Proven Safety Countermeasure with a 13% crash reduction* [1].

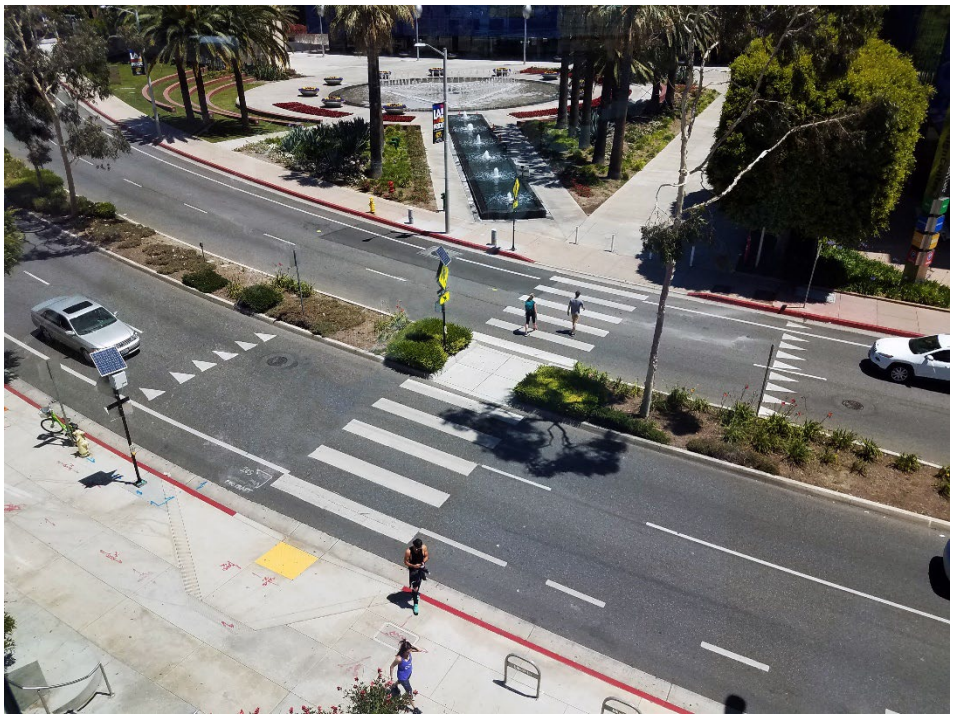
PROTECTED LEFT TURN



A protected left turn provides a red arrow for left turning motorists while allows both on-coming vehicular traffic and pedestrians to cross to eliminate conflicts. It allows pedestrians to cross the intersection at the beginning of a signal cycle, reducing conflicts between pedestrians and motorists,

CMF / CRF: *Protected Left Turn is a Proven Safety Countermeasure with a 28% to 48% crash reduction* [1].

PEDESTRIAN REFUGE ISLAND



Pedestrian refuge islands are raised medians placed in the middle of a street that provide a protected space for people trying to walk across the street. Pedestrian refuge islands improve safety by reducing conflicts with motorists. They are particularly valuable when used at unsignalized crossings along multi-lane streets because they make it easier for pedestrians to find gaps in traffic and allow pedestrians to cross one direction of traffic at a time.

CMF / CRF: *Pedestrian Refuge Islands are a Proven Safety Countermeasure with a 46% crash reduction* [1].

CURB EXTENSION

Curb extensions, also known as bulb-outs, reduce the width of the street by extending the sidewalk at corners or mid-block. They help improve visibility, calm traffic, and provide extra space on sidewalks for walking and gathering. In addition to shortening crossing distances, curb extensions create more compact intersections, resulting in smaller corner radii and slower turns by people driving.

CMF / CRF: *Unavailable.*

CURB RADIUS REDUCTION

Curb radius reductions are a strategy to reduce turning speeds for vehicles by forcing sharper turns; they also create larger waiting areas for crossing pedestrians. All curb radius geometries should be designed to prevent turning vehicles from tracking over the curb which could injure people waiting on the corner. The effective radius is influenced by the presence of on-street parking and bike lanes. A curb radius of 5 to 10 feet on streets with parking can generally result in an effective curb radius of 15 to 20 feet, which can accommodate passenger cars and small trucks. A truck apron can be used to provide a curb radius reduction targeted to slow smaller vehicles while accommodating the needs of larger vehicles.

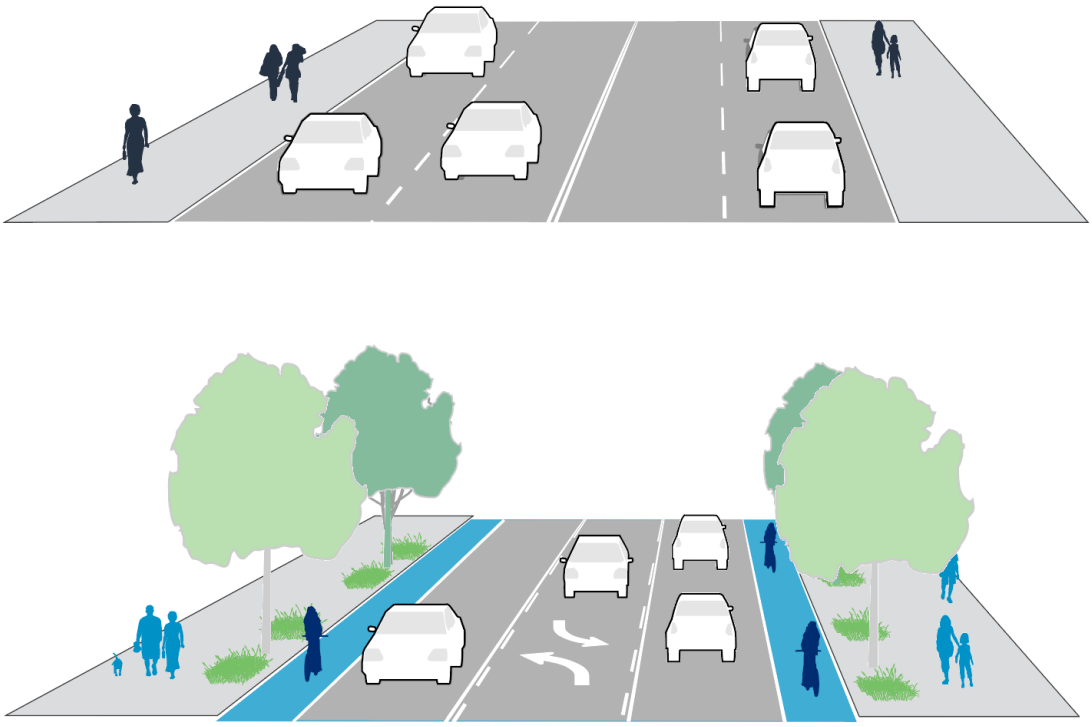
CMF / CRF: *Reducing curb radius can result in an 18% to 59% reduction in pedestrian crashes* [5].

NEW TRAFFIC SIGNAL

Traffic signals create gaps in the traffic flow to allow pedestrians and other users to cross the street at locations where users would otherwise experience long delays or have difficulties crossing the street safely. Warrants in the MUTCD govern the installation of traffic signals, which are based on the number of pedestrians and vehicles crossing the intersection, among other factors. However, judgment must also be used on a case-by-case basis.

CMF / CRF: *Unavailable.*

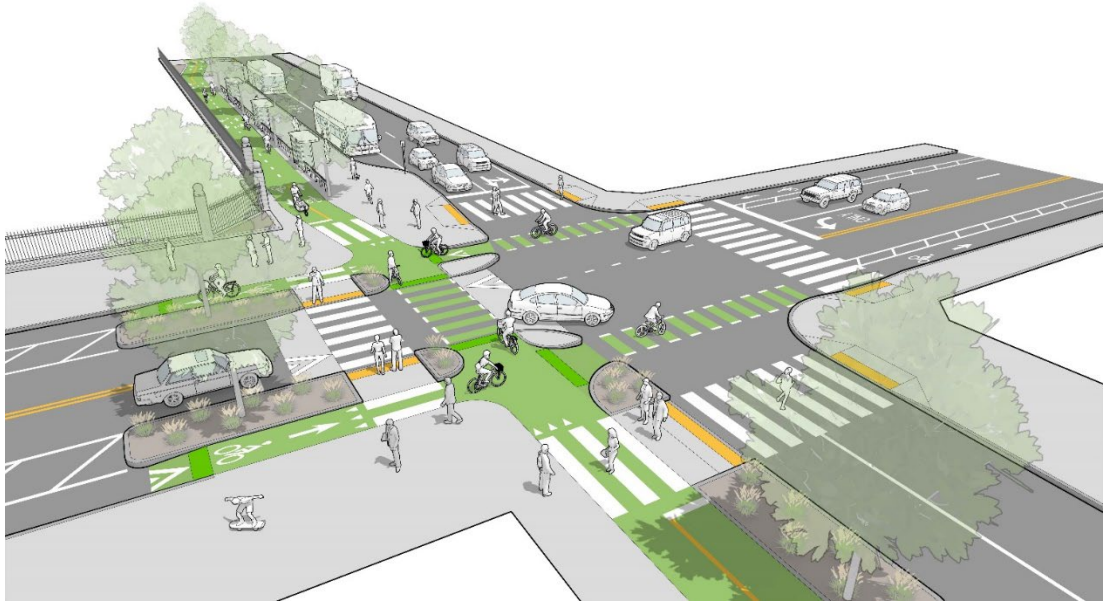
LANE RECONFIGURATION



The number of lanes on a roadway determines how far pedestrians or bicyclists must cross at an intersection and how many conflict points might exist between turning traffic and bicyclists or pedestrians. Efforts have been made to reduce the number and width of lanes through 'road diets' that not only reduce the number of lanes but provide space to implement additional pedestrian and bicyclist safety treatments such as adding bike lanes, pedestrian refuge islands, and reducing travel speed. Road reductions are often completed to improve access management, increase bicycle and pedestrian access, and to enhance roadway safety. The most common road reduction configuration involves converting a four-lane roadway into three lanes, with one travel lane in each direction, a center two-way left-turn lane, and bike lanes in each direction, often supplemented with painted or raised center islands.

CMF / CRF: *Road Reductions (Road Reconfigurations) are a Proven Safety Countermeasure with a 19-47% crash reduction* [1].

PROTECTED INTERSECTION

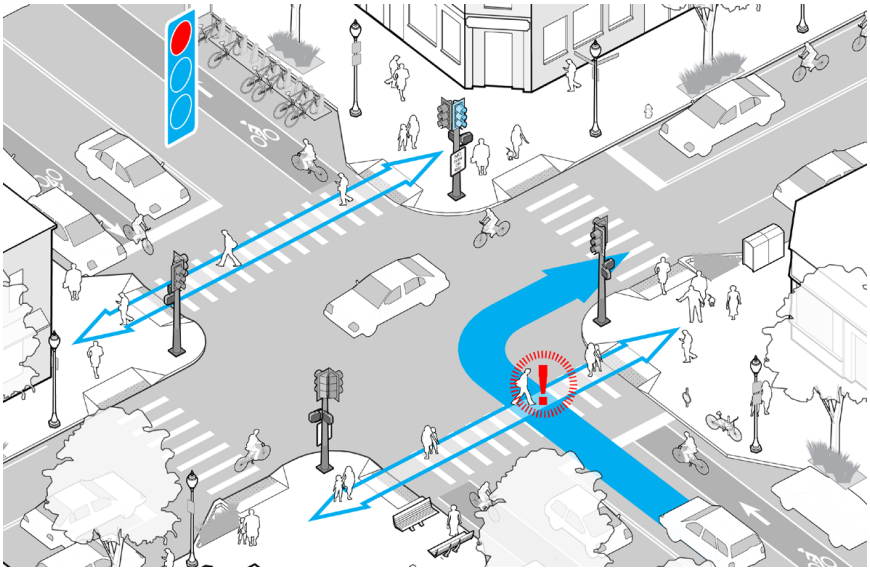


Protected intersections are a type of intersection design that improves safety by reducing the speed of turning traffic, improving sight lines, and designating space for all road users.

Protected intersections reduce conflict points between drivers, sidewalk users, and bicyclists by separating all modes. The separation is achieved through corner islands that reduce vehicle turning speeds and provide an area for vehicles to wait while yielding to bicyclists and pedestrians in the crosswalk. Protected intersections eliminate the merging and weaving movements from vehicles typically found in conventional bike lanes and shared streets. By clearly defining pedestrian and bicyclist spaces and mitigating conflicts between vehicles and vulnerable users, protected intersections provide a safer environment for all modes.

CMF / CRF: *Unavailable.*

RIGHT-TURN-ON-RED RESTRICTION



Right-turn-on-red restrictions prevent motorists from turning right (or left on intersecting one-way streets) while the traffic signal is red. Restricting this movement eliminates conflicts with pedestrians crossing in front of turning motorists.

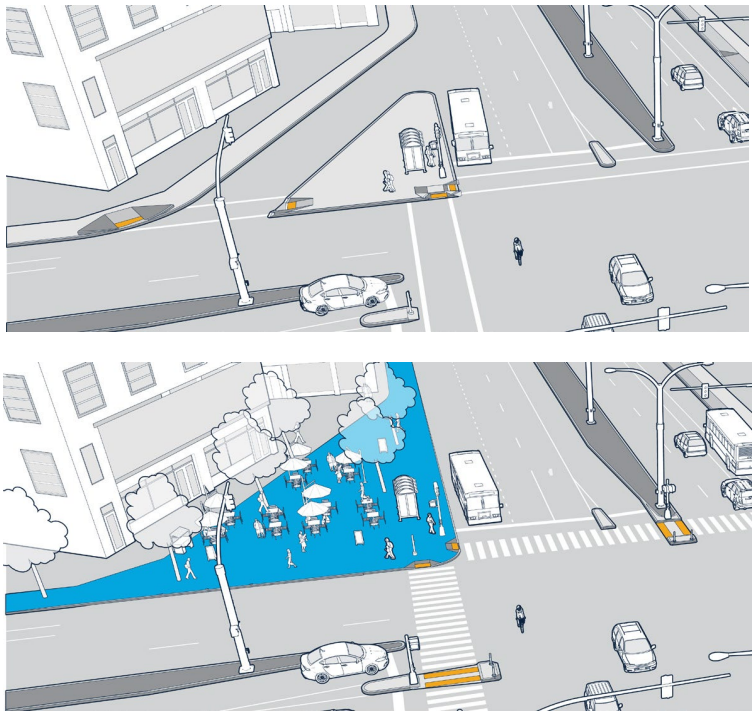
CMF / CRF: *Unavailable.*

SAFETY ZONE (SCHOOL AND SENIOR)

Safety zones, or slow zones, are streets within a jurisdiction that are designated a slower speed limit, typically 15mph to 20mph. These slower speed limits are often used together with traffic calming elements and specific pavement markings. School, park, and senior area slow zones encourage slow speeds in areas with a high concentration of people who are at special risk on the street. Time-of-day school speed limits can be used when the school is an uncharacteristically sensitive place compared with the rest of the street. Safety zones can be implemented on a larger scale as neighborhood slow zones or district speed zones.

CMF / CRF: *Unavailable.*

SLIP LANE CLOSURE



Exclusive right-turn lanes might be desirable at busy intersections, but the design and control of these can have a significant impact on safety for pedestrians. Intersections with right-turns slip lanes (see illustration) are potential candidates for redesign.

When slip lanes are eliminated, they reduce the overall crossing distance for pedestrians and slow the speeds of turning traffic, which in turn improve pedestrian safety.

CMF / CRF: *Unavailable.*

BEACH PATH TRAFFIC CALMING TREATMENTS

RUMBLE STRIPS

Rumble strips are tactile patterns constructed within the bike path to give bicyclists an audible and tactile cue that they are approaching a conflict zone or pedestrian crossing and need to be alert to the presence of pedestrians. The effect of some rumble strip designs on bicyclists can be significant if not properly mitigated, causing the bicycle to shudder violently and/or the bicyclist to lose control. Sinusoidal rumble strips are an emerging design, which may cause less disruption. Unlike milled rumble strips, the continuous surface makes it easier for bicyclists to traverse while maintaining an effective level of vibration and noise. Raised rumble strips, on the other hand, have not been found to be as effective and are not recommended because they can increase crash risks for bicyclists.

CMF / CRF: *Unavailable.*

SIGNS

ICON SPEED FEEDBACK

Icon speed feedback signs inform approaching bicyclists that the speed at which they are traveling is appropriate. When installed in conjunction with a speed limit sign, speed feedback signs are proven to be effective in getting the attention of users. It reminds bicyclists of the speed limit and allows them to compare it with their speed to gain compliance. Icon speed feedback signs help to emphasizes the appropriate etiquette on bike paths by using icons instead of displaying the speed at which they are riding.

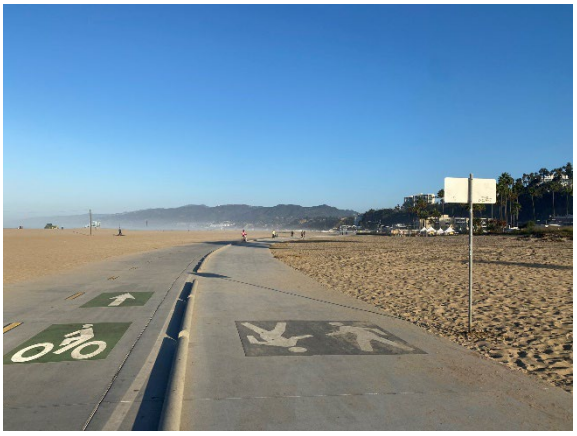
CMF / CRF: *Unavailable.*

SLOW SPEED ZONE, REGULATORY, ETIQUETTE, WAYFINDING

Regulatory, guide and wayfinding signs on beach paths helps to emphasize appropriate user etiquette and inform users of intersecting routes, direct them to important destinations, and generally give information that will help them proceed along their way in a simple, direct and safe manner. Regulatory signs inform bicyclists of the areas to slow down and yield to pedestrians, while wayfinding and guide signs help path users track their locations and can enhance personal security.

CMF / CRF: *Unavailable.*

SEPARATION OF USERS



Pedestrians may be separated from bicyclists and other wheeled users on any path where there is sufficient width, and it is desired to improve comfort and safety for all users by separating faster moving users from slower users. Separation of pedestrians from bicyclists may be appropriate for shared use paths with a high volume of users. Users may be separated using pavement markings, traversable surface delineation and/or physical separators like curbs and delineator posts.

CMF / CRF: *Unavailable.*

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[2] E. Minikel, "Cyclist Safety on Bicycle Boulevards and Parallel Arterial Routes in Berkeley, California," January 2011. [Online]. Available: https://www.cmfclearinghouse.org/study_detail.cfm?stid=221. [Accessed 2023].

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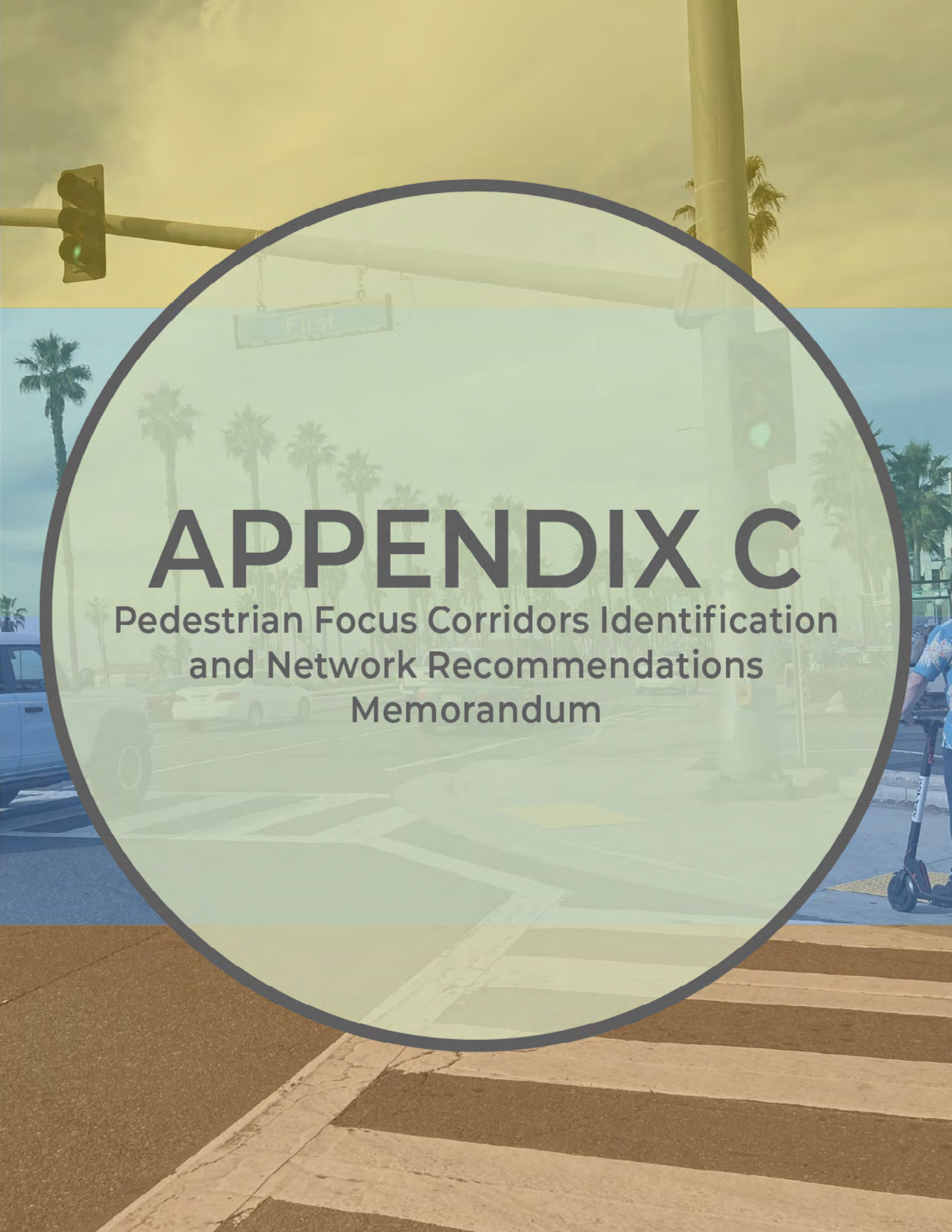
[5] "Crash Modification Factor for Corner Radius, Right-Turn Speed, and Prediction of Pedestrian Crashesat Signalized Intersections," U.S. Department of Transportation Federal Highway Administration, January 2022. [Online]. Available: https://www.fhwa.dot.gov/publications/research/safety/21105/21105.pdf. [Accessed March 2023].



APPENDIX C

Pedestrian Focus Corridors Identification and Network Recommendations Memorandum

TOOLE DESIGN

527 W. 7TH STREET
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MEMORANDUM

June 4, 2024

To: Chau Vu, Deputy Director of Public Works
Organization: City of Huntington Beach
From: Trevor Lien and Peter García
Project: Huntington Beach Mobility Implementation Plan

Re: Pedestrian Focus Corridors Identification and Network Recommendations

---

This memorandum outlines the methodology and factors considered to recommend potential Pedestrian Focus Corridors in Huntington Beach (HB). Table 1 summarizes potential corridors and Figure 1 displays a map visualizing the network. Table 2 and Figure 2 displays recommended phasing of Pedestrian Focus Corridors, with the phasing process lead by City insight and guidance. Table 2 also displays rough order of magnitude costs.

Methodology

The Project Team used a layered data-driven approach to identify potential corridors for the Pedestrian Focus Corridors network in Huntington Beach. This network relied upon a combination of existing conditions spatial analyses, City recommendations, and previous planning efforts. This approach ensures that the identified streets are those where improving pedestrian comfort, safety, and access in the City would be most impactful. City input and guidance on Pedestrian Priority Corridors' phasing ensures implementation feasibility.

The diverse datasets and factors that were used in developing the Pedestrian Focus Corridors network ensure that it includes streets where safety improvements are needed due to high levels of traffic stress as well as existing high pedestrian activity. Datasets were loaded into geographic information systems (GIS) software to analyze and visualize where Pedestrian Focus Corridors are highest. Datasets included analyses of stressful crossing locations, high level of traffic stress (LTS) segments (LTS 3 or LTS 4), land use data, among others, which are described in further detail below. The project team also reviewed pedestrian crashes and high-injury networks identified in the City's recently completed Local Roadway Safety Plan (LRSP). Corridors were then grouped where factors, such as high-stress crossings and/or historical crashes, showed overlapping and concentrated data along a corridor. For example, Corridor D – Beach Boulevard has several high-ridership transit stops, higher LTS segments, and historically high crash locations, while Corridor H – Pacific Coast Highway/17th Street/Main Street has a pattern of high-stress crossings, high population density, and a cluster of popular destinations.

The following factors were used to identify the Pedestrian Focus Corridors. The terms in parentheses are used to summarize descriptions in the spatial dataset export and in Table 1.

- City-recommended priority intersections and corridors (*City Input*)
  - » Source: City of Huntington Beach Public Works Department
- Corridors with high bicycle and pedestrian collisions (*Crashes*)
  - » Source: HB LRSP 2022 Figure 5.2
  - » High collisions indicated by higher density of collision clusters
- Wide gaps between crossing opportunities (*Crossing Distance*)
  - » Source: HB MIP Existing Conditions Report, Pedestrian Crossing Stress Analysis (Map 1)
  - » Wide gap is determined by nearest low stress of signalized crossing is greater than 0.25 miles away
- High pedestrian stress intersections (*LTS*)
  - » Source: HB MIP Existing Conditions Report, Pedestrian Crossing Stress Analysis (Table 1 to Table 5)
  - » High stress intersection (LTS 3 or LTS 4) based on traffic volumes, number of lanes, speed limit, and traffic control type
- High pedestrian stress corridors (*High Pedestrian Stress Corridor*)
  - » Source: HB MIP Existing Conditions Report, Pedestrian Crossing Stress Analysis and GIS repository
  - » High stress pedestrian corridor if all crossings are high stress (LTS 3 or TS 4)
- High ridership transit stops (*Transit*)
  - » Source: HB MIP Existing Conditions Report, Transit Analysis (Figure 14)
  - » High ridership transit stop if transit stop if one of the top ten transit stops by ridership
- Population density by census tract (*Population Density*)
  - » Source: HB MIP Existing Conditions Report and GIS repository (American Communities Survey 2020 data)
  - » Proximal or intersecting an 80th percentile population density census tract (high density)
- Land uses accessed by vulnerable populations such as schools, senior centers, and parks with facilities (*Vulnerable Populations*)
  - » Source: HB MIP Existing Conditions Report and GIS repository
  - » Vulnerable population land use if land use data is school, senior center, and/or park with facilities
- Popular destinations and trip generators, such as supermarkets and commercial land uses (*Destinations*)
  - » Source: HB MIP Existing Conditions Report and GIS repository
  - » Popular destination if land use data is supermarket, commercial, and/or retail

Table 1 below lists Pedestrian Focus Corridors and factors that determined their inclusion. Corridors that experienced multiple issues that affect pedestrian safety and/or generate pedestrian activity have secondary and tertiary factors assigned. Table 2 below groups Pedestrian Focus Corridors by phasing grouping, and also displays the rough order of magnitude cost. Figure 1 shows a map of recommended Pedestrian Focus Corridors in Huntington Beach. Figure 2 shows a map of Pedestrian Focus Corridors and phasing.

Table 1: Pedestrian Focus Corridors

Corridor Name	CORRIDOR GROUPING	From	TO	OVERLAPPING FACTORS
EDINGER AVENUE	A	Bolsa Chica Street	Beach Boulevard	High Pedestrian Stress Corridor, Crashes, Destinations
GOLDENWEST STREET	A	Bolsa Avenue	Edinger Avenue	High Pedestrian Stress Corridor, LTS, Destinations
GOTHARD STREET	A	Center Avenue	Edinger Avenue	Destinations, Transit
ATLANTA AVENUE	B	Lake Street	Magnolia Street	Vulnerable Populations, Destinations, LTS
MAGNOLIA STREET	B	Atalanta Avenue	Pacific Coast Highway	Vulnerable Populations, Destinations, LTS
NEWLAND STREET	B	Pacific Coast Highway	Hamilton Avenue	Destinations, LTS
HAMILTON AVENUE	B	Newland Street	Magnolia Street	Destinations, LTS
BEACH BOULEVARD	C	Edinger Avenue	Garfield Avenue	Transit, Pedestrian High Stress Corridor, Crashes, Population Density, LTS
GOLDENWEST STREET	D	Warner Avenue	Pacific Coast Highway	High Pedestrian Stress Corridor, Vulnerable Populations, Destinations, Crossing Distance
WARNER AVENUE	E	Pacific Coast Highway	Algonquin Street	LTS, Population Density, Crossing Distance
ALGONQUIN STREET	E	Warner Avenue	Heil Avenue	LTS, Population Density, Crossing Distance
HEIL AVENUE	E	Algonquin Street	Saybrook Lane	LTS, Population Density, Crossing Distance
SAYBROOK LANE	E	Heil Avenue	Edinger Avenue	LTS, Population Density, Crossing Distance
BROOKHURST STREET	F	Garfield Avenue	Indianaplos Avenue	High Pedestrian Stress Corridor, Transit, Destinations, Population Density
INDIANAPOLIS AVENUE	F	Brookhurst Street	Lake Street	High Pedestrian Stress Corridor, Transit, Destinations, Population Density
PACIFIC COAST HIGHWAY	G	Huntington Street	17th Street	LTS, Population Density, Destinations, Transit
17TH STREET	G	Pacific Coast Highway	Main Street	LTS, Population Density, Destinations, Transit
MAIN STREET	G	17th Street	Yorktown Avenue	LTS, Population Density, Destinations, Transit

Table 2: Pedestrian Focus Corridors Phasing and Rough Order of Magnitude Cost Estimates

Corridor Name	Corridor Grouping	Phasing	Rough Order of Magnitude Cost Estimates
Edinger Avenue	A	Phase 1	$4,360,000
Atlanta Avenue/Magnolia Street/Hamilton Avenue	B	Phase 1	$3,990,000
Warner Avenue/ Algonquin Street/ Heil Avenue/ Saybrook Lane	E	Phase 1	$4,260,000
Pacific Coast Highway/ 17th Street/ Main Street	G	Phase 1	$1,340,000
Beach Boulevard	C	Phase 2	$600,000
Goldenwest Street	D	Phase 3	$380,000
Brookhurst Street/ Indianapolis Avenue	F	Phase 3	$1,300,000

Figure 1: Map of Recommended Pedestrian Focus Corridors

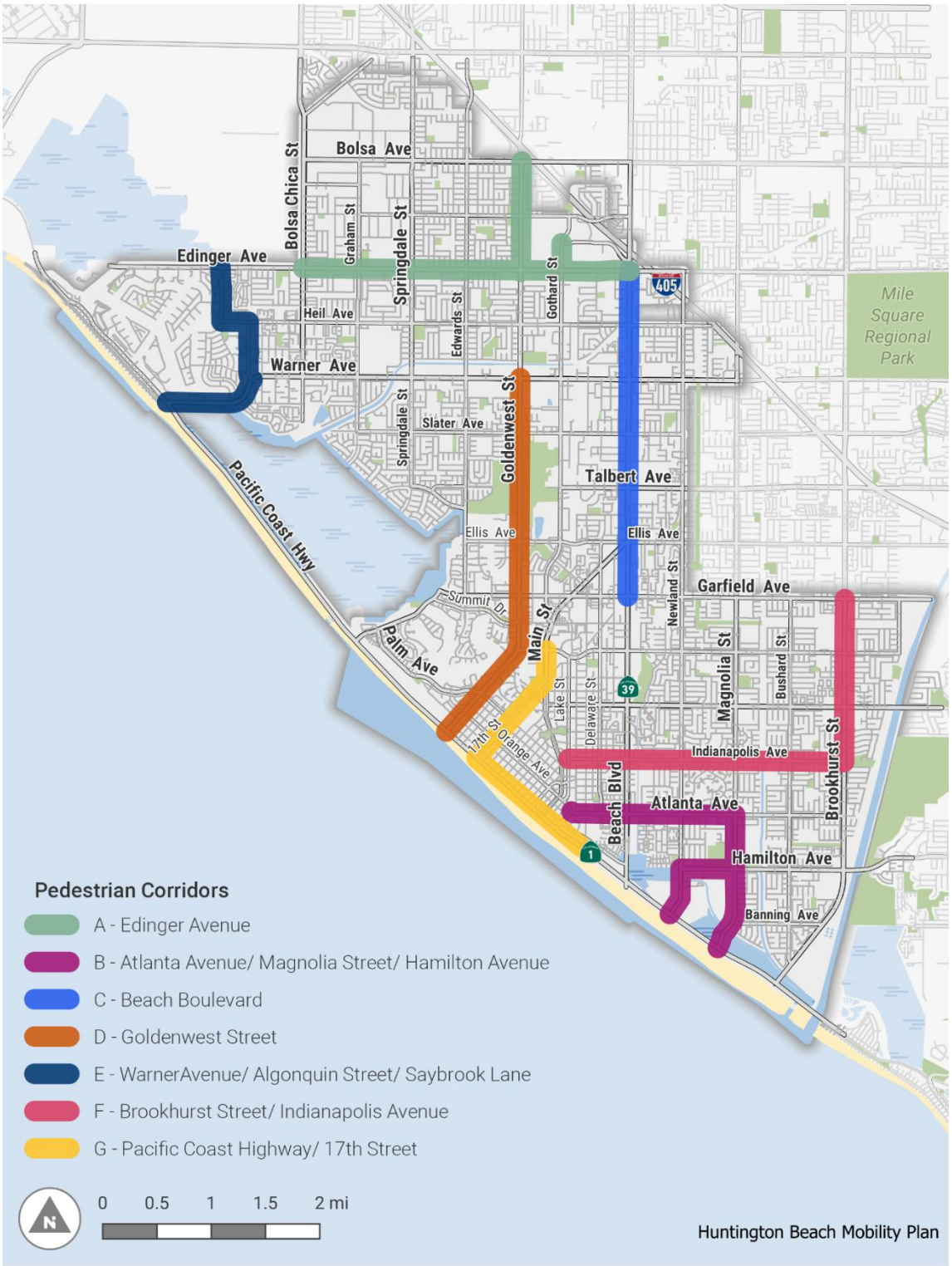
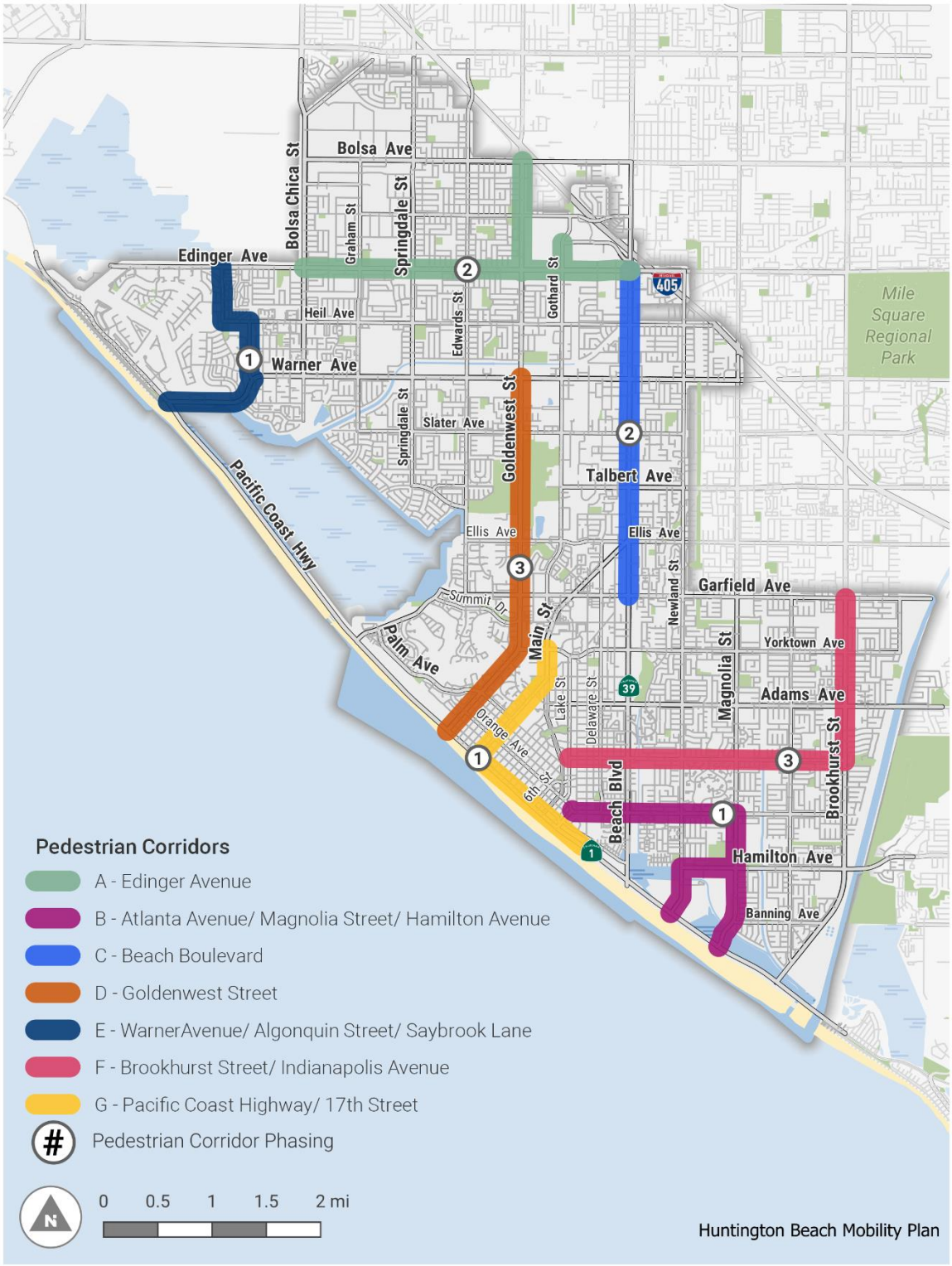
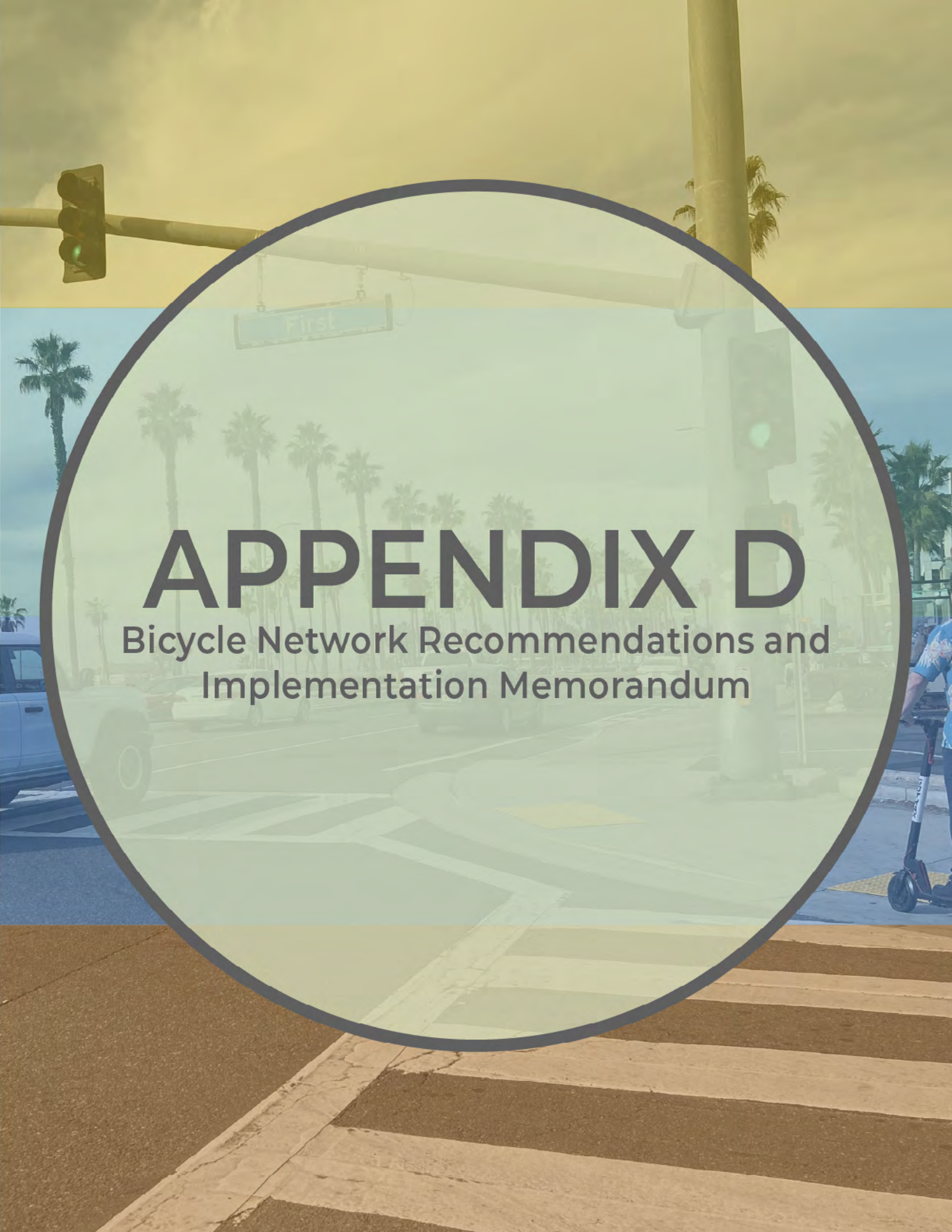


Figure 2: Map of Recommended Phasing of Pedestrian Focus Corridors





APPENDIX D

Bicycle Network Recommendations and Implementation Memorandum

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MEMORANDUM

June 4, 2024

To: Chau Vu, Deputy Director of Public Works
Organization: City of Huntington Beach
From: Trevor Lien, Peter Garcia
Project: Huntington Beach Mobility Implementation Plan

Re: Bicycle Network Recommendations and Implementation Phasing

---

This memorandum summarizes the methodology used to identify future-focused bicycle network improvements in Huntington Beach (HB), as well as a recommended bicycle facility locations, types, and phasing. These recommendations will close existing bicycle network gaps, support a reduction in the level of traffic stress that people bicycling experience on high speed and volume roadways, and support comfort improvements of all users regardless of age or ability. The methodology is based on the Federal Highway Administration's (FHWA) Bikeway Selection Guide, as well as manual recommendations based on local needs (i.e., community needs and existing conditions evaluation) and past plans (i.e., 2017 General Plan – Circulation Element, 2013 Bicycle Master Plan). Included in this memorandum is a map of the existing bicycle network, a map of the proposed bicycle network, phasing strategies, and the total mileage of existing and recommended bicycle facilities.

Methodology

The bicycle network methodology included a data driven approach reinforced by the Project Team's local knowledge of the City. The Project Team used a combination of geographic information systems (GIS) software and Structured Query Language (SQL) to develop logic around the generated network. The generated network used the city's existing roadway conditions (i.e., posted speed limits, street classification, and average daily traffic volumes) to determine the minimum suggested bicycle facility based on the nationally recognized best practice the FHWA's Bikeway Selection Guide.

The FHWA's Bikeway Selection Guide recommends the suitable bikeway facility based on a roadway design, traffic volumes, and speed. Figure 1 shows the recommended bikeway type based on a roadway's traffic volume and speed within an urban context. As the traffic volume and speed on a roadway increases, so does the level of protection needed for people bicycling to feel comfortable in these settings. For instance, shared lanes or bicycle boulevards are most effective when built on slow, low traffic residential streets, but would provide little benefit to lowering the exposure of people bicycling on arterial roadways where separation would be more impactful.

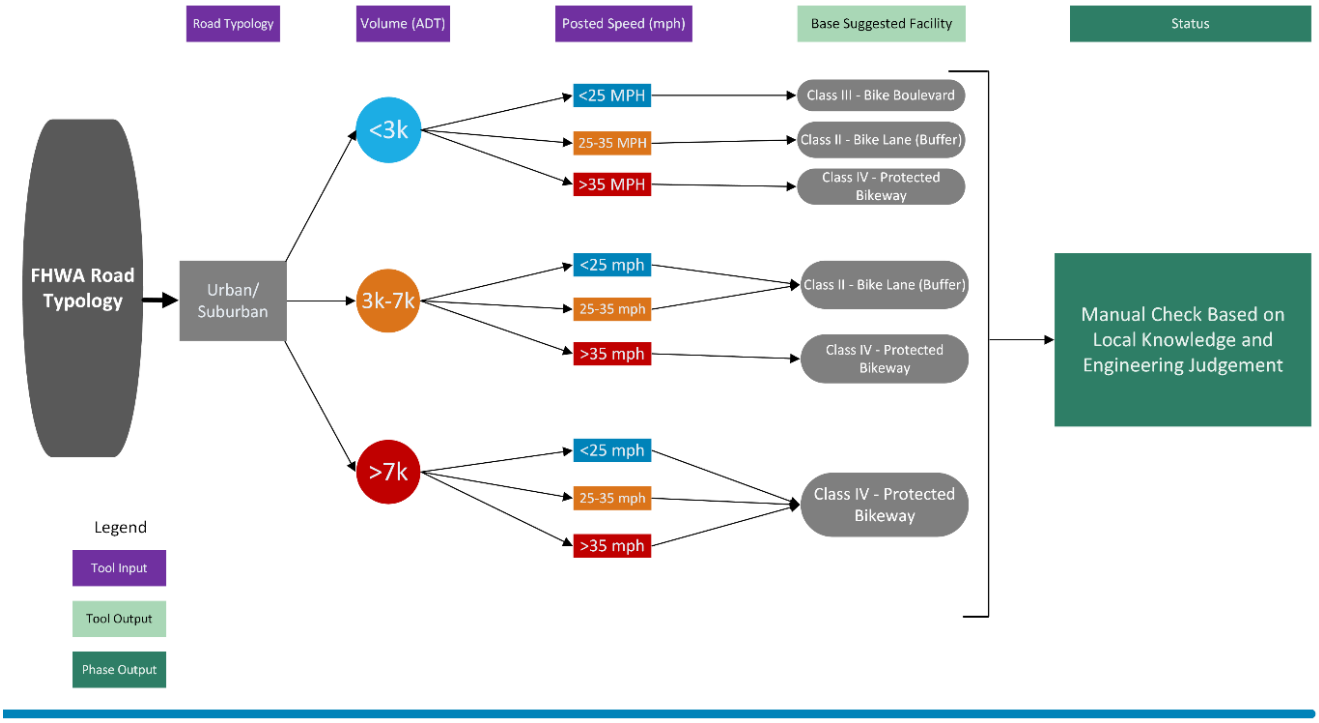

Figure 1: Minimum Suggested Bicycle Facility Using FHWA Best Practice Guidance

The Project Team also made manual additions/edits to the network based on variables not captured in the generated bike network, such as policies and recommendations from previously adopted plans. The first round of adjustments added facilities to roadways that provided low stress intra-neighborhood connections, mid-block improvements, and access to popular destinations (i.e., schools, commerce, recreation areas). Further, the Project Team used Strava heatmaps (Figure 2), a fitness based social media website that provides heatmaps of popular bicycling routes, to incorporate network connections to areas with latent demand for bicycling. Strava data utilizes millions of location-based services (LBS) data points to aggregate daily trips; data visualized in the heatmap is from the last two years, and is updated monthly. The off-street network recommendations, made of paths on trails or along channels, were informed by previously adopted off-street recommendations in the 2017 General Plan (Figure CIRC-5), City insights, and Project Team local insight and engineering judgment.

This methodology takes into consideration existing conditions and roadway analysis to recommend the minimum suggested bikeway facility for a given roadway context. The proposed recommendations are future-focused, and rooted in best practices to provide the most inclusive treatments for people of all ages and abilities. However, the recommendations need to be assessed further for physical and political feasibility, potential impacts to movement of freight and vehicular traffic, and funding constraints. In instances where the proposed facility is not feasible, the next best facility should be sought, following this hierarchy: Class IV – Protected Bikeways, then Class II – Buffered Bike Lanes, then Class II – Bike Lanes, then Class III – Bike Boulevards. Alternative facilities should still prioritize the comfort and safety of people bicycling and should still align as closely as possible to the Bikeway Selection Guide chart shown in Figure 1.

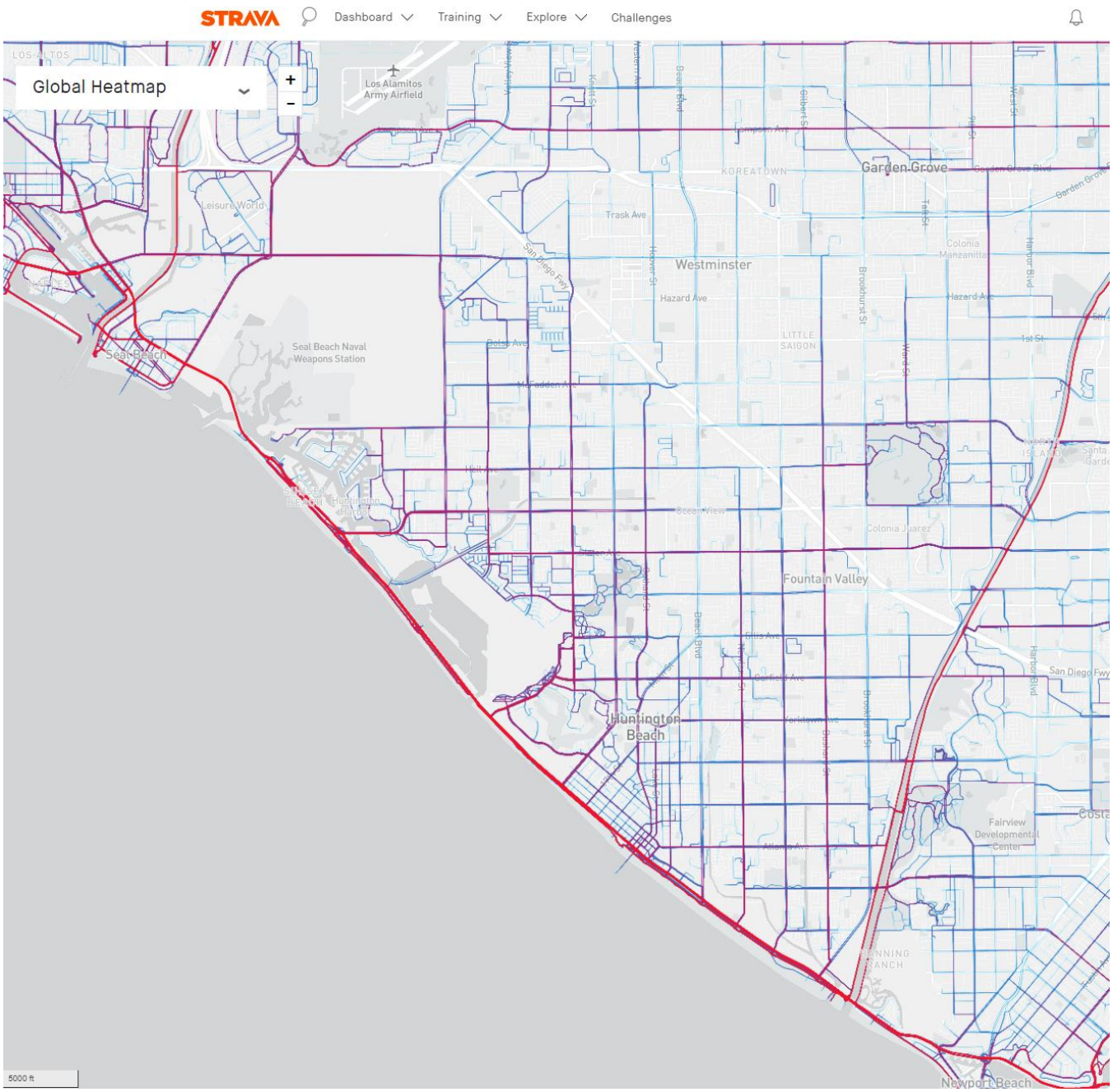

Figure 2: Huntington Beach Strava Heatmap; shows latent cyclist demand for the last two years (2/1/21 – 2/1/23)

Recommendations and Phasing Strategy

The City's existing bike network is made up of 72% Class II Bike Lanes or 73 miles of a total 101.5 miles (Table 1), a map of existing bike facilities is shown in Figure 3. The recommended bike network reflects the on the ground road conditions in HB. Facilities like Class II Bike Lanes or Class III Bike Boulevards are found on roadways where space is a constraint, but vehicle traffic or speeds are not high enough to invest in separation. Recommended Class IV Separated Bike Lanes are predominantly found on high stress roads, such as Edinger Avenue or Atlanta Avenue. Currently there are few buffered or separated facilities existing aside from those found on Delaware Street and Atlanta Avenue. Recommended Class I Shared Use Paths are found along existing City assets, or OC Public Works jurisdiction that could be transformed, such as abandoned/disused railways and flood control channels.

Table 1: Total Existing Bicycle Network Miles

Facility Type	Existing (Miles)	Existing %
Class I Shared Use Path	20	19%
Class II Bike Lane	73	72%
Class II Buffered Bike Lane	6	5%
Class III Shared Lane	2.5	2%
Class III Bicycle Boulevard	-	-
Class IV Separated Bike Lane	3	2%
TOTAL	**101.5 Miles**	

The bike network recommendations are segmented into two implementation phases. Phasing is intended to progress existing bike facilities toward more comfortable facilities that are suitable for all ages and abilities or installing new bike facilities if none exist. This can mean upgrading a Class II Bike Lane to a Buffered Class II Bike Lane as space permits in Phase 1, and potentially in Phase 2 a further upgrade to a Class IV Separated Bike Lane.

- *Phase 1 Bike Network* – projects that can be considered for implementation in the next one to five years
    - Easily implemented (sign/stripe) projects within existing roadway section
- *Phase 2 Bike Network* – projects that can be considered for implementation in the next five to ten years
    - Expansions and/or upgrades to the existing bike network, but may require more planning or further analysis; can be part of the City's ten-year repaving capital program for an efficient use of resources

The Phase 1 bike network recommends a total of 26.8 miles of new or upgraded facilities. Along the Phase 1 corridors, 2.3 miles of Class IV Separated Bikeways exist. Planned mileage is shown in Table 2. The Phase 2 bike network recommends an additional 36.2 miles of bike facilities. Less than one mile of the Phase 2 corridors is a Class IV Separated Bikeway (0.7 miles). In total, both phases represent 63 miles of proposed bike network improvements. There are 20.7 miles of Class I Off-Street Shared Use Paths independent of the on-street phasing mileage; full details listed in Table 2.

Table 2: Phase Recommendation Summary Mileage and Costs

Totals for Phase 1		
Planned	**Miles**	**Rough Order of Magnitude Cost**
Class II - Buffered Bike Lane	0.6	$ 210,625
Class III - Bike Boulevard	2.5	$ 705,462
Class IV - Separated Bikeway	23.6	$ 11,337,000
TOTAL	26.8	$ 12,253,087
Existing		
Class IV - Separated Bikeway	2.3	*N/A*
Total for Phase 2		
Planned	**Miles**	**Rough Order of Magnitude Cost**
Class II - Buffered Bike Lane	0.0	$ 0
Class III - Bike Boulevard	0.5	$ 172,625
Class IV - Separated Bikeway	35.7	$ 17,124,000
TOTAL	36.2	$ 17,296,625
Existing		
Class IV - Separated Bikeway	0.7	*N/A*
Total for Phase 1 and Phase 2		
Planned	**Miles**	**Rough Order of Magnitude Cost**
Class II - Buffered Bike Lane	0.6	$ 210,625
Class III - Bike Boulevard	3.0	$ 878,087
Class IV - Separated Bikeway	59.3	$ 28,461,000
TOTAL	63.0	$ 29,549,712
Existing		
Class IV - Separated Bikeway	3.0	N/A
Proposed Off-Street (Phasing Independent)	**Miles**	**Rough Order of Magnitude Cost**
Class I – Off-Street Multi-Use Path	20.7	$ 40,423,500

Figure 4 shows the Phase 1 bike network corridors, and Figure 6 shows the Phase 1 corridors relative to what is existing and proposed based on the methodology describe above. Similarly, Figure 5 and Figure 7 show the Phase 2 bike network corridors and recommendations. Table 2 lists the miles of proposed bike corridors for Phase 1 and Phase 2. The bike network future-focused recommendations recommend 35.7 miles and 59.3 miles of Class IV Separated Bikeways in Phase 1 and Phase 2 respectively. These represent a majority of network upgrades for each of the two phases. These recommendations are not prescriptive, but intended to be targets to strive for. In some cases, the installation and/or upgrade of bike facilities along the proposed corridors may not be feasible. However, as need, priority, and political will changes these can be re-considered for implementation. The highest possible protective facility should be sought as projects are assessed.

Rough order of magnitude cost estimates presented in Table 2 are based on the per mile costs assumptions listed in Table 3. These assumptions are based on 2023 adjusted numbers for each of the facility types and provide a high-level overview. More detailed cost estimates will need to be developed for specific facility designs.

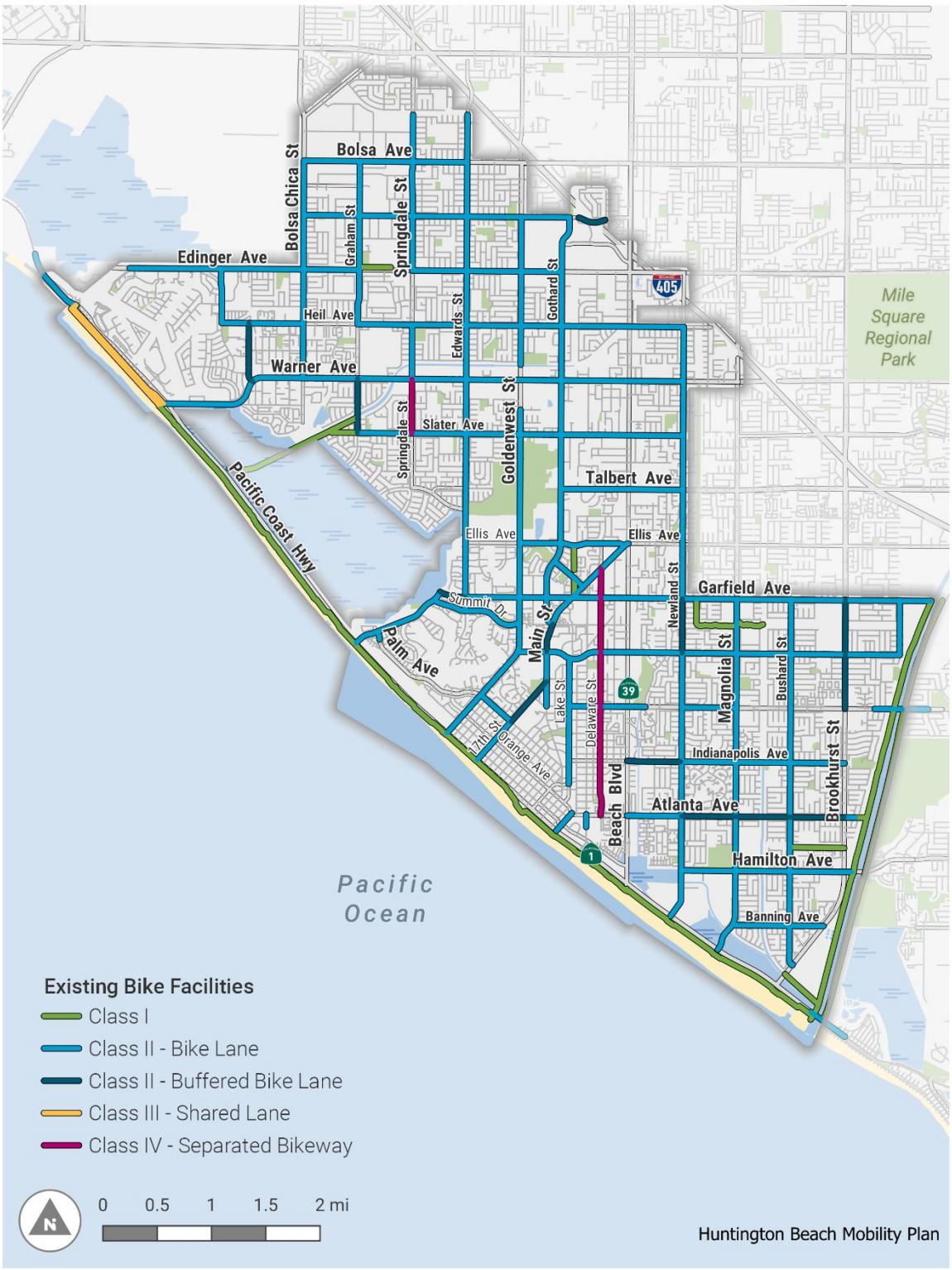

Figure 3: Map of Existing Bike Facilities (Source: City of HB; 2023)

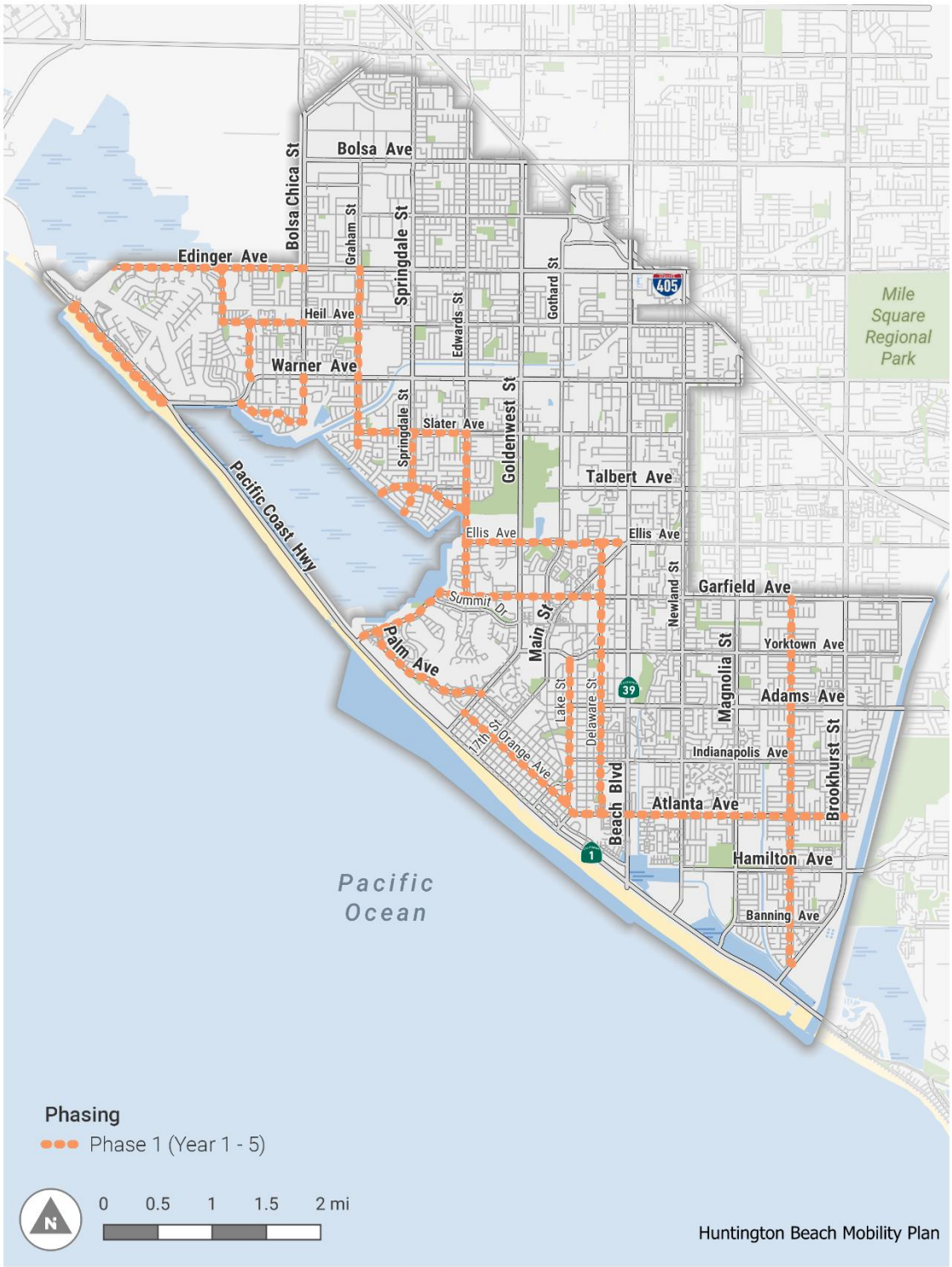

Figure 4: Phase 1 (one to five years) Bike Network Corridors

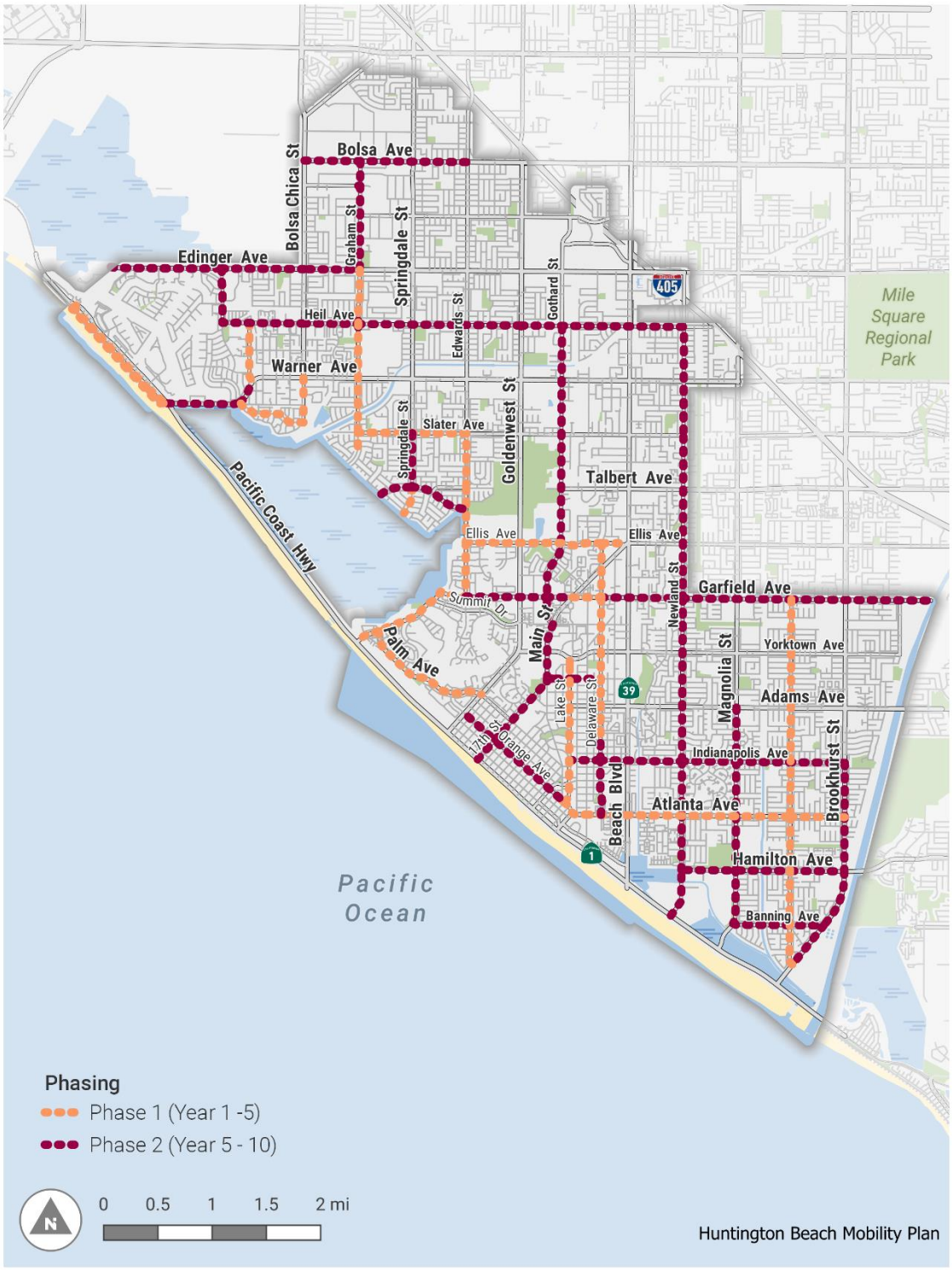

Figure 5: Phase 1 (one to five years) and Phase 2 (five to ten years) Bike Network Corridors

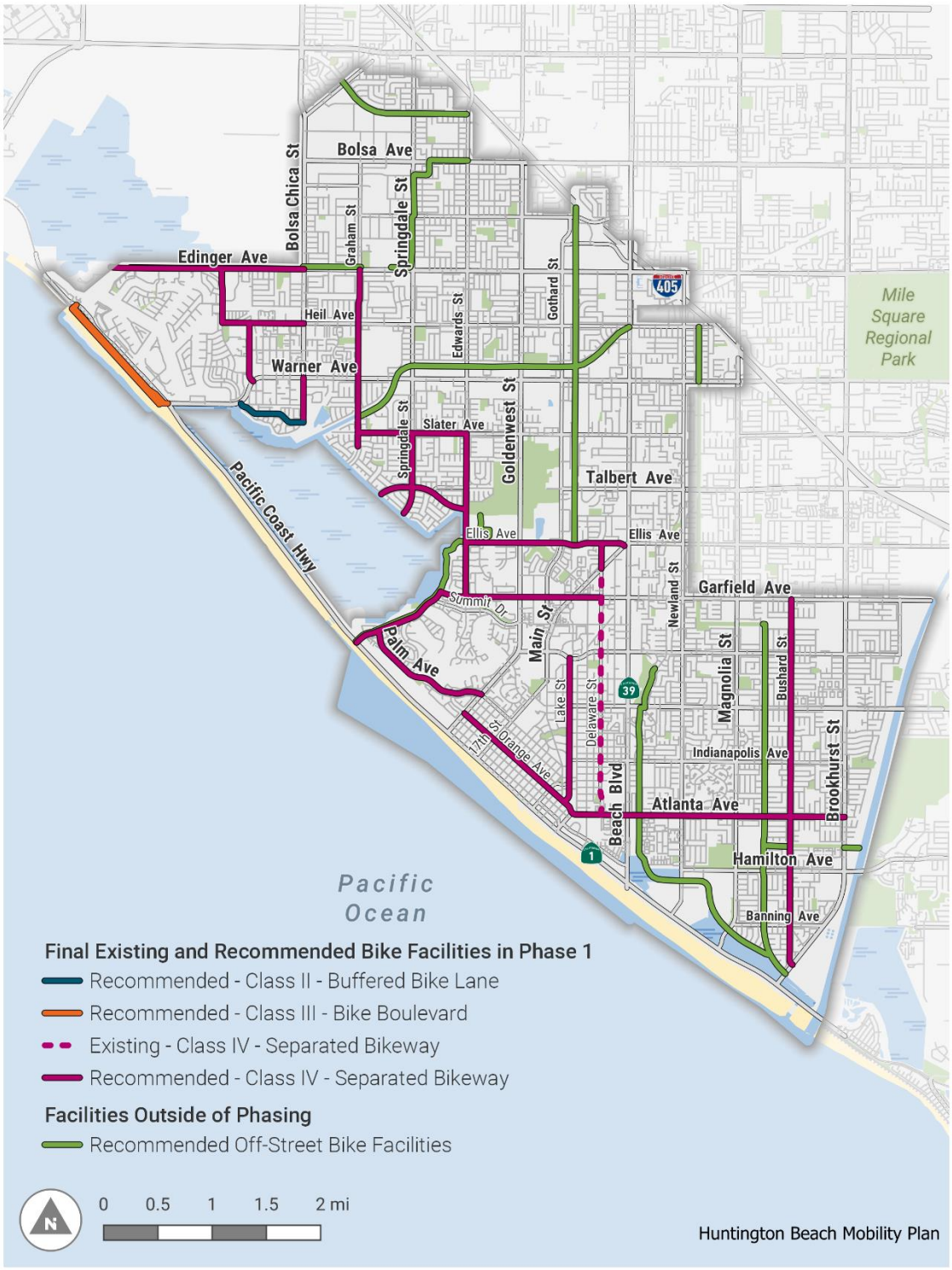

Figure 6: Map of Existing and Phase 1 (one to five years) Bike Network Recommendations

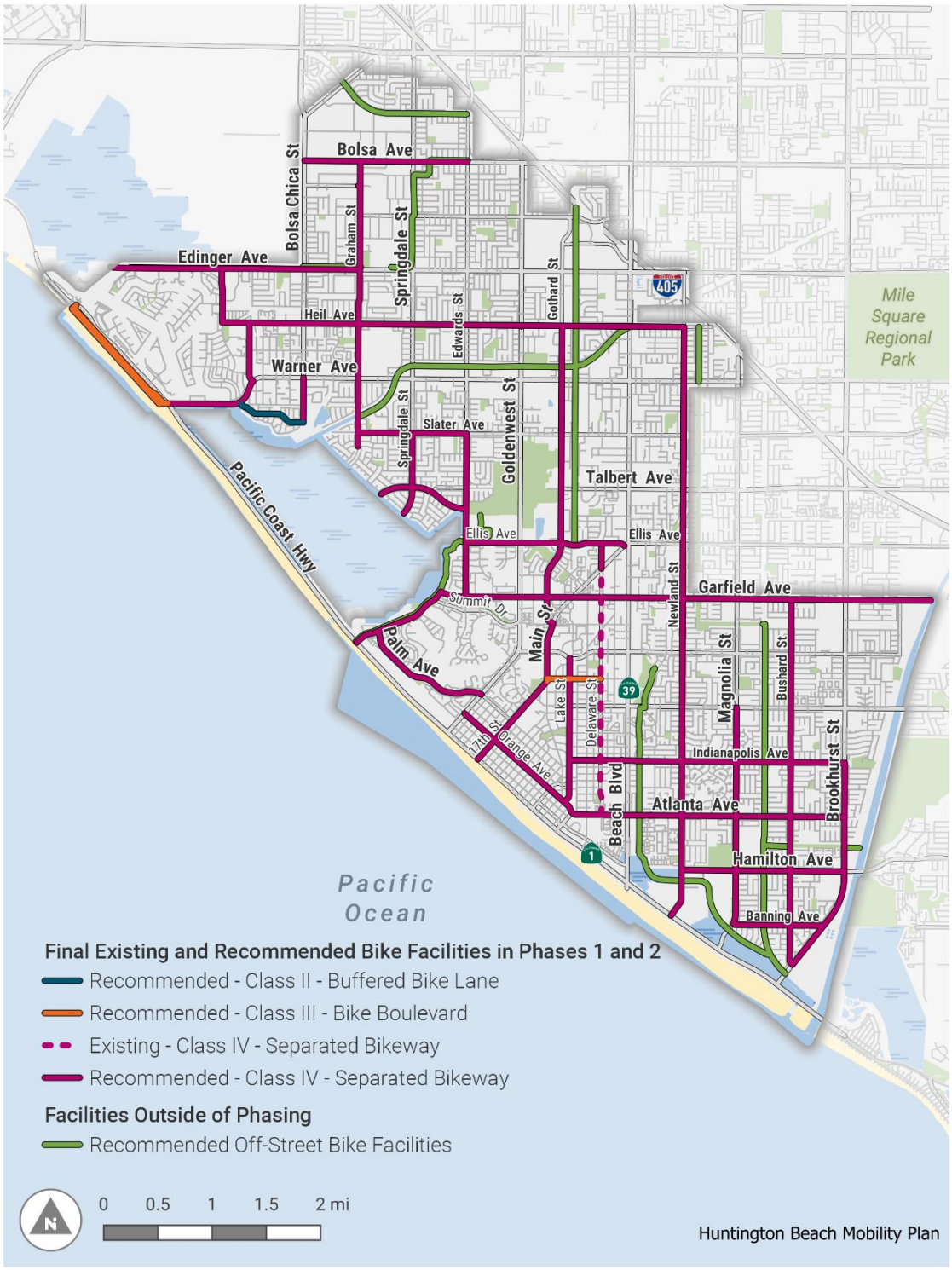

Figure 7: Map of Existing, and Phase 1 (one to five years) and Phase 2 (five to ten years) Bike Network Recommendations

Table 3: Cost Assumptions per Bike Facility Type per Mile

Bike Facility	Rough Order of Magnitude Cost Assumptions per Mile
Class I Off-Street Shared Use Path	$ 1,950,000
Class II Bike Lane	$ 290,000
Class II Buffered Bike Lane	$ 330,000
Class IV Separated Bikeway	$ 480,000
Class III Bike Boulevard (traffic circles, and paint and post for curb extensions)	$ 280,000

The following images (Figure 8 to Figure 13) provide examples of each bikeway facility type. Refer to the Huntington Beach Mobility Implementation Plan's (MIP) Bicycle, Pedestrian, and Beach Path Toolkit for further information on each bikeway facility.

Figure 8: Class I – Off-Street Shared Use Path
(Huntington Beach Shared Use Path)

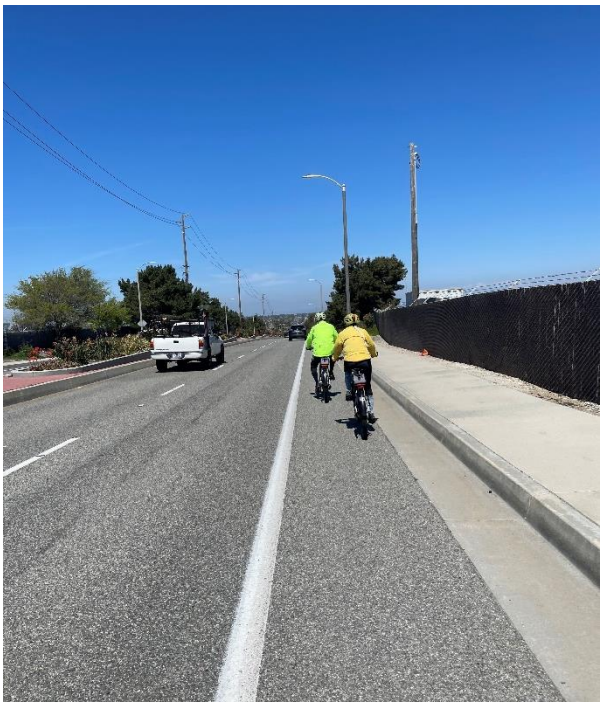

Figure 9: Class II – Bike Lane
(Huntington Beach, Edwards Street)

Figure 10: Class II – Buffered Bike Lane
(Huntington Beach, Algonquin Street)

Figure 11: Class III – Bicycle Boulevard
(Huntington Beach, South Pacific Avenue)

Figure 12: Class IV – One-Way Separated Bikeway (Huntington Beach, Delaware Street)

Figure 13: Class IV – Two-Way Separated Bikeway (Outside of Huntington Beach)

APPENDIX E

Beach Path Observations and Recommendations Memorandum

TOOLE DESIGN

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MEMORANDUM

June 4, 2024

To: Chau Vu, Deputy Director of Public Works
Organization: City of Huntington Beach
From: Trevor Lien, Peter García, Toole Design
Project: Huntington Beach Mobility Plan

Re: Beach Path Observations & Recommendation

This memorandum includes a review of existing issues and opportunities on the Huntington Beach Bike Path identified during field visits. It also includes recommendations to improve the comfort and user experience of rolling and walking on the Beach Path. Some issues identified include inconsistent signage that may be confusing to the user and problematic mixing of various modes at high-traffic crossings. The recommendations in this memorandum focus on improving the user experience, while ensuring the path is comfortable for users of all ages and abilities. Rough order of magnitude cost estimates are included in Appendix 3.

The Project Team separated the Beach Path into the following segments based on path characteristics and for ease of organizing challenges and opportunities, as shown in Table 1. Exhibit 1 includes a map of the segments.

Table 1: Study Segment Breakdown

Segment Number	From	To
Segment 1	Seapoint Street	Goldenwest Street
Segment 2	Goldenwest Street (Upper Path)	11th Street (Upper Path)
Segment 3	Goldenwest Street (Lower Path)	11th Street (Lower Path)
Segment 4	11th Street	1st Street
Segment 5	1st Street	Beach Boulevard

Exhibit 1: Map of Study Segments

Issues and Opportunities

Field Observations

The Project Team conducted a field visit of the Beach Path on August 19, 2022 and recorded observed existing issues and constraints. Key issues and opportunities were categorized for consistency and normalization across the different segments of the paths. The major categories, as found in Appendix 1, are:

- Speed
- Volume
- Width
- Comfort
- Special Zone
- Separation
- Intersection
- Suitability
- Line of Sight
- Usage Typology
- Path Alignment
- Signage
- Condition
- Traffic Control Devices

On-site observations are documented in the Field Observation Table (Appendix 1). Observations were also documented via photographs. Exhibit 2, Exhibit 3, and Exhibit 4 show a spectrum of typical scenes along the path.

Exhibit 2: Segment 2 - Upper Bluff Path Bicycle and Pedestrian Separation (August 2022); credit Toole Design Group

Exhibit 3: Segment 3 - Peak Hour Traffic Proximal to Pier Plaza (August 2022); credit Toole Design Group

Exhibit 4: Segment 5 - Diversity of Users (August 2022); credit Toole Design Group

Key Issues and Opportunities

Table 2 summarizes common issues observed along the Beach Path. Issues ranged from modal mixing at pinch points to signage and visual communication inconsistencies that may result in user confusion. Example segments are provided as reference.

Table 2: Common issues found in the Beach Path

Issue	Description	Example Segment
Sight line issues	Blind spots created by garbage cans, building protrusion, vendors / amenities spill onto path	Segment 4 – 11th Street to 1St Street
Traffic mixing	Potential crash conflicts may arise from areas in the path where there is no demarcation to keep pedestrian and bicyclist traffic separate; width is not sufficient	Segment 4 – 11th Street to 1St Street
Inconsistent signage	Posted signs on the path communicate inconsistent information, causing confusion among Beach Path users. For example, different posted speeds within a short distance of each other may confuse users	Segment 1 – Seapoint Street to Goldenwest Street
Constrained space	Path reaches capacity during peak season, limiting available space for users and increasing conflict risks	Segment 3 – Goldenwest Street to 11th Street (Lower Path)
Confusing pavement markings	Particularly in mixing zones, pavement markings poorly communicate whether pedestrians or bicyclists are allowed in that segment of the path	Segment 3 – Goldenwest Street to 11th Street (Lower Path)
Pedestrian and vendor activity spills onto path	In popular areas where people congregate, pedestrians and vendors tend to encroach onto the path, creating a potential crash risk	Segment 4 – 11th Street to 1st Street
Lack of Centerline and Separation	Lack of centerline or delineation makes it unclear to bicyclists where to remain to prevent head on crashes with other bicyclists	Segment 3 – Goldenwest Street to 11th Street (Lower Path)

Recommendations

The following recommendations aim to improve the overall user experience by enhancing comfort. These treatments will build upon previous and planned Beach Path improvements, ensuring a future-focused Beach Path that is suitable and welcoming to users of all ages and abilities. A seamless user experience, with minimal conflicts arising between bicyclists and pedestrians, will lay the foundation for a positive social experience and a culture that embraces active transportation and suitable Beach Path travel speeds.

Table 3 summarizes some treatments represented in the recommendations found in Appendix 2 that seek to improve the user experience on the Beach Path. Maps with more detailed recommendations are provided in Appendix 2. The Huntington Beach Mobility Implementation Plan Toolkit (Bicycle, Pedestrian, Beach Path) is a resource that provides more details on additional treatments.

Table 3: Common treatment recommendations

Treatment	Description	Example Segment
Centerline	Striping a centerline or striping that separates modes, will help users understand where to travel along the path	Segment 3 – Goldenwest Street to 11th Street (Lower Path)
Pedestrian crossings	Clear and visible pedestrian crossings, such as artistic crosswalks, will alert bicyclists to reduce their speed as they approach a crossing	Segment 1 – Seapoint Street to Goldenwest Street
Intersection improvements in mixing zones	Improvements at mixing zones, such as signalization or traffic calming treatments, will reduce conflict risk in areas where pedestrians and bicyclists share the Beach Path	Segment 3 – Goldenwest Street to 11th Street (Lower Path)
Establish uniform speed limit	A singular display of speed limit expectations will help all users travel at the desired speed	Segment 4 – 11th Street to 1st Street

TOOLE DESIGN

527 W. 7TH STREET
SUITE 701
LOS ANGELES, CA 90014

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TOOLEDESIGN.COM

APPENDIX

Appendix 1 – Beach Path Audit (collected on August 19, 2022 from 10:30am to 2:30pm)

Category	Specification	Segment 1 (Seapoint Street to Goldenwest Street)	Segment 2 (Goldenwest Street to 11th Street – Upper Path)	Segment 3 (Goldenwest Street to 11th Street – Lower Path)	Segment 4 (11th Street to 1st Street)	Segment 5 (1st Street to Beach Boulevard)
Speed						
	No posted speed limit					
	Posted speed limit	5 mph, 10 mph	5 mph, 10 mph	5 mph, 10 mph; when peds are present	10 mph	10 mph
	Observed average speed	7-11 mph	8-12 mph	5-10mph	7-11mph	8-12 mph
	Observed maximum speed	20-25mph	20-25mph	10-15mph	20-25mph	15-20mph
Volume						
	At capacity (very slow movement)					
	High volumes (movement consistent)				X	
	Medium volumes (movement consistent)	X	X	X		X
	Low volumes (movement consistent)	X		X		

Category	Specification	Segment 1 (Seapoint Street to Goldenwest Street)	Segment 2 (Goldenwest Street to 11th Street – Upper Path)	Segment 3 (Goldenwest Street to 11th Street – Lower Path)	Segment 4 (11th Street to 1st Street)	Segment 5 (1st Street to Beach Boulevard)
Width						
	Maximum width	20 feet	18 feet	12 feet (some short segments 24 feet)	25 feet (some short areas 40 feet+)	25 feet (some short areas 30 feet)
	Narrowest point (minimum)	10 feet	12 feet	11 feet	12 feet	20 feet
Comfort						
	Lane width allows for side-by-side travel	X	X	Narrow		
	Lane width does not always allow for side-by-side travel					X
	Lane width does not allow for side-by-side travel			X	X	
Separation						
	Shared two way with no separation between bicycles and pedestrians	X		X	X	X
	Separated on same path (Bicycle two way + pedestrian single lane two way)	X	X			
	Separated by buffer/barrier (Bicycle two way + pedestrian lane two way)	X				
Special zone						
	Sign Display	"Slow Ped Zone 5 mph; 10 mph maximum"	"Slow Ped Zone 5 mph; 10 mph maximum"	"Slow Ped Zone 5 mph; 10 mph maximum"	"Slow Ped Zone 5 mph; 10 mph maximum"	"Slow Ped Zone 5 mph; 10 mph maximum"
	Walk Zone (time of day or permanent)				X	
	No regulations					

Category	Specification	Segment 1 (Seapoint Street to Goldenwest Street)	Segment 2 (Goldenwest Street to 11th Street – Upper Path)	Segment 3 (Goldenwest Street to 11th Street – Lower Path)	Segment 4 (11th Street to 1st Street)	Segment 5 (1st Street to Beach Boulevard)
Intersections (conflicts)						
	Bicycle and pedestrian conflicts controlled (stop, yield); and/or no intersections	X	X			
	Some controlled intersections (bicycle and pedestrian), some uncontrolled					X
	No controlled intersections between bicycle and pedestrian	Some	Some	X	X	X
Suitability (Appropriate for all ages and abilities)						
	Environment is suitable for people of all ages and abilities		X			
	Environment is somewhat suitable for people of all ages and abilities	X	X			X
	Environment is less suitable for people of all ages and abilities			X	X	X
	Environment is not suitable for people of all ages and abilities				X	
Condition						
	New surface and in good condition		X	Old pathway but in good condition	Old pathway but in good condition	Old pathway but in good condition
	New surface with some cracks or debris			X	X	X
	New surface mixed with faded or deteriorating (rough) surface	New path, some old pedestrian pathways				
	Faded or deteriorating (rough) surface					

	Missing significant sections of pavement; significant deteriorating along segment					
Category	**Specification**	**Segment 1 (Seapoint Street to Goldenwest Street)**	**Segment 2 (Goldenwest Street to 11th Street – Upper Path)**	**Segment 3 (Goldenwest Street to 11th Street – Lower Path)**	**Segment 4 (11th Street to 1st Street)**	**Segment 5 (1st Street to Beach Boulevard)**
Line of sight						
	Clear line of sight with no interruptions		X	X		
	Some obstructions in line of sight (landscape or hardscape)	X			People are line of sight obstructions	X
	Frequent line of sight obstructions (landscape or hardscape)					
Path alignment						
	No abrupt linear alignments (straight path)		X	X		
	Some changes in alignment	X			X	X
	Constant changes in alignment					
Signage						
	List out	Regulatory; speed; advisory	Directional; speed; advisory	Regulatory; speed	Special flashers; speed; directional; advisory	Speed; advisory
Traffic control devices						
	List out	Pavement arrow markings; conflict zone; bollard chicane	Pavement arrow markings; conflict zone	None	Flashing Beacons	None

Typical users (aside from pedestrian and bicycle use)					
List out	Dogs on leashes; e-bikes	Pedestrian access from Pacific Coast Highway (PCH); vehicular parking; e-bikes	Dogs on leashe; pedestrian access from PCH; tourists	Tourists; food and amenities; e-bikes	Food and amenities; pedestrian access from parking lots; e-bikes

SEGMENT 1
SEAPOINT STREET TO GOLDENWEST STREET

Issues & Opportunities

1. (Issue) Inconsistent use of signage – multiple signs with different speeds and/or directions may cause confusion
2. (Issue) Bicycle and pedestrian movement expectations confusing for travel to/from upper and lower paths
3. (Opportunity) Pedestrian and bicycle path separation segment-wide

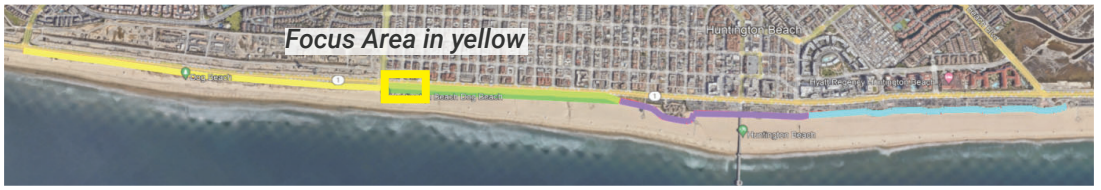
- (Opportunity) Radar speed feedback

SEGMENT 1
SEAPOINT STREET TO GOLDENWEST STREET

Recommendations

1. Remove old speed limit signs; establish 10 mph speed limit with singular sign display
2. Install rumble strips near high-traffic areas / access points along path; Enhance pedestrian crossing visibility and conflict zone markings through the use of artistic, continental, or diagonal crosswalks
3. Install signage to clarify preferential pedestrian / bicycle travel along upper and lower paths

SEGMENT 2
GOLDENWEST STREET TO 11TH STREET (UPPER PATH)

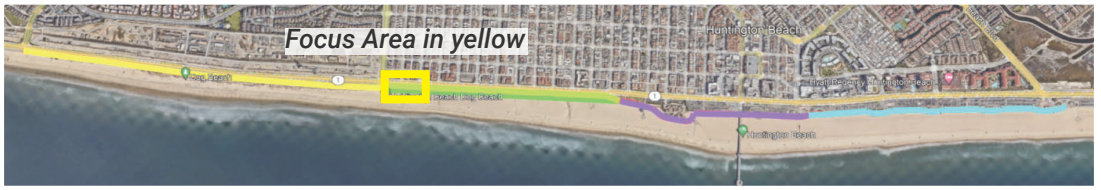


Segment Boundaries

Issues & Opportunities

1. (Issue) Bicycle and pedestrian movement expectations confusing for travel to/from upper and lower paths
2. (Issue) Inconsistent use of signage – multiple signs with different speeds and/or directions may cause confusion
3. (Opportunity) Pedestrian and bicycle path separation segment-wide

SEGMENT 2
GOLDENWEST STREET TO 11TH STREET (UPPER PATH)

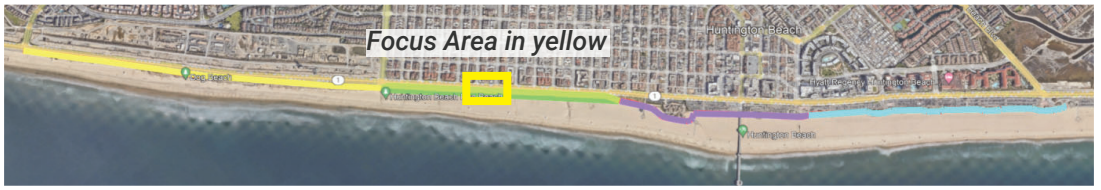


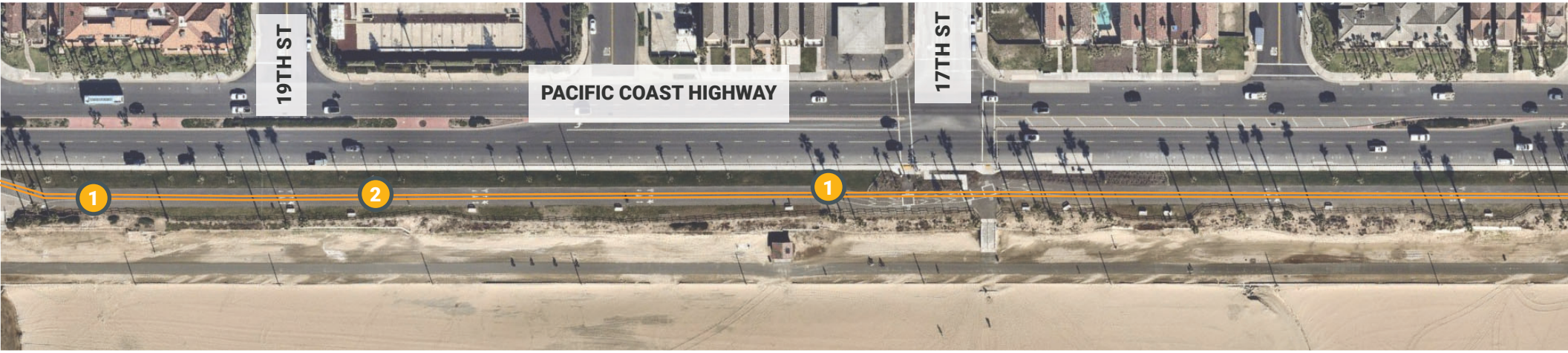
Segment Boundaries

Recommendations

1. Install rumble strips near highly trafficked areas / access points along path; Enhance pedestrian crossing visibility and conflict zone markings through the use of artistic, continental, or diagonal crosswalks
2. Establish 10 mph speed limit with singular sign display
3. Install access gate for traffic calming and/or square off access approach to encourage slower speeds

SEGMENT 2
GOLDENWEST STREET TO 11TH STREET (UPPER PATH)
between 19th Street and 17th Street





Issues & Opportunities

1. (Issue) Inconsistent use of signage – multiple signs with different speeds may cause confusion

2. (Opportunity) Pedestrian and bicycle path separation segment-wide

Segment Boundaries

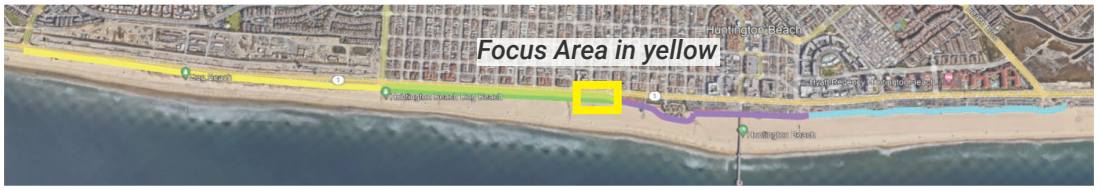
SEGMENT 2
GOLDENWEST STREET TO 11TH STREET (UPPER PATH)
between 19th Street and 17th Street

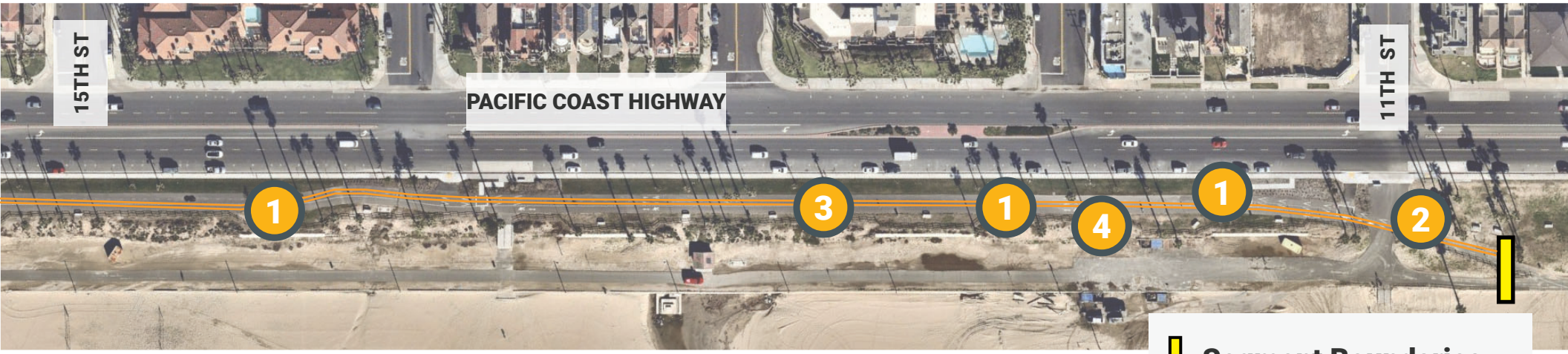
Recommendations

1. Install rumble strips near high-traffic areas / access points along path; Enhance pedestrian crossing visibility and conflict zone markings through the use of artistic, continental, or diagonal crosswalks

2. Establish 10 mph speed limit with singular sign display

SEGMENT 2
GOLDENWEST STREET TO 11TH STREET (UPPER PATH)
between 15th Street and 11th Street

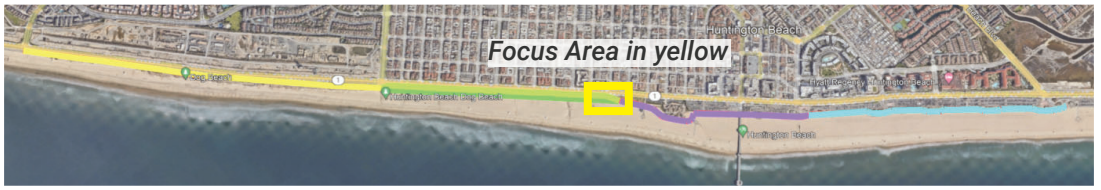




Issues & Opportunities

1. (Issue) Inconsistent use of signage – multiple signs with different speeds may cause confusion
2. (Issue) Minimal signage near path split to/from to indicate where bicyclists are allowed and/or preferred
3. (Opportunity) Pedestrian and bicycle path separation segment-wide
4. (Opportunity) Radar speed feedback

SEGMENT 2
GOLDENWEST STREET TO 11TH STREET (UPPER PATH)
between 15th Street and 11th Street



Recommendations

1. Install rumble strips near high-traffic areas / access points along path; Enhance pedestrian crossing visibility and conflict zone markings through the use of artistic, continental, or diagonal crosswalks
2. Establish 10 mph speed limit with singular sign display
3. Clarify preferential bicycle access signage / markings
4. Install access gate for traffic calming and/or square off access approach to encourage slower speeds

SEGMENT 3
GOLDENWEST STREET TO 11TH STREET (LOWER PATH)
between Goldenwest Street and 20th Street

Segment Boundaries

Issues & Opportunities

1. (Issue) Bicycle and pedestrian movement expectations confusing for travel to/from upper and lower paths
2. (Issue) High volumes of traffic and constrained path width leading to/from dog beach
3. (Issue) Pedestrian use of amenities encroaches onto path
4. (Issue) Path does not have separation between users; no centerline
5. (Issue) No sand walls to keep path clear
6. (Opportunity) Provide sufficient unobstructed space along path (will require feasibility and environmental review)

SEGMENT 3
GOLDENWEST STREET TO 11TH STREET (LOWER PATH)
between Goldenwest Street and 20th Street

Recommendations

Segment Boundaries

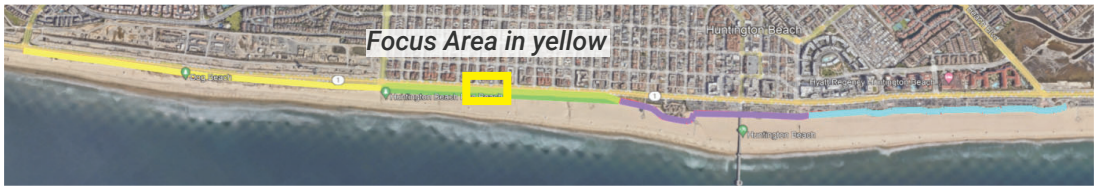
Point Improvements

1. Install access gate for traffic calming and/or square off access approach to encourage slower speeds
2. Install rumble strips near high-traffic areas / access points along path; Enhance pedestrian crossing visibility and conflict zone markings through the use of artistic, continental, or diagonal crosswalks
3. Install speed feedback sign (numerical or icon)

Corridor Improvements

4. Widen path and include user separation; install centerline striping
5. Install sand walls
6. Establish 10 mph speed limit with singular sign display

SEGMENT 3
GOLDENWEST STREET TO 11TH STREET (LOWER PATH)
between 19th Street and 17th Street



Issues & Opportunities

1. (Issue) Inconsistent speed limit signage throughout lower path
2. (Issue) High e-bike/bike speeds along path/segment
3. (Issue) Pedestrian use of amenities encroaches onto path
4. (Issue) Path does not have separation between users; no centerline
5. (Issue) No sand walls to keep path clear
6. (Opportunity) Provide sufficient unobstructed space along path (will require feasibility and environmental review)

SEGMENT 3
GOLDENWEST STREET TO 11TH STREET (LOWER PATH)
between 19th Street and 17th Street

Recommendations

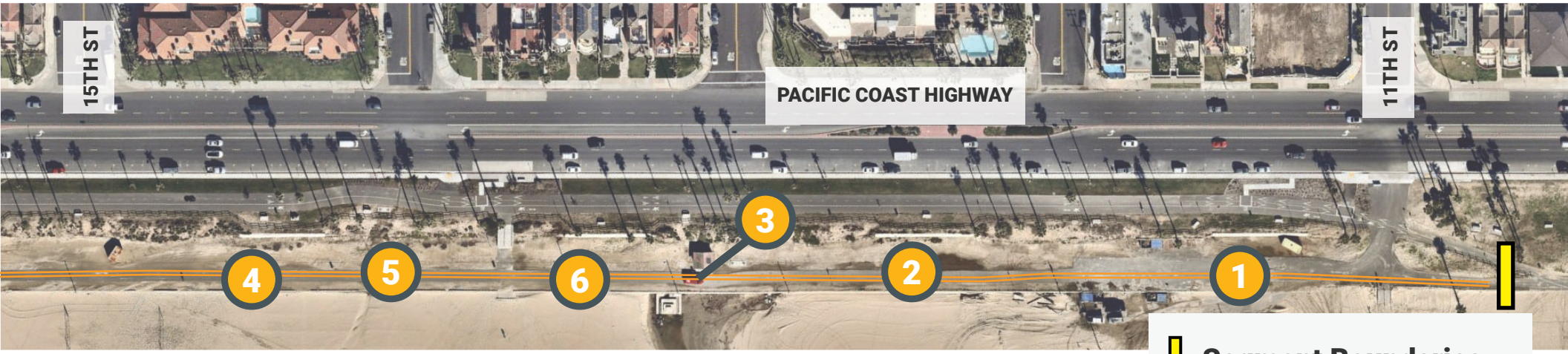
Point Improvements

1. Establish 10 mph speed limit with singular sign display
2. Install rumble strips near high-traffic areas / access points along path; Enhance pedestrian crossing visibility and conflict zone markings through the use of artistic, continental, or diagonal crosswalks

Corridor Improvements

3. Install centerline striping
4. Widen path and include user separation
5. Install sand walls

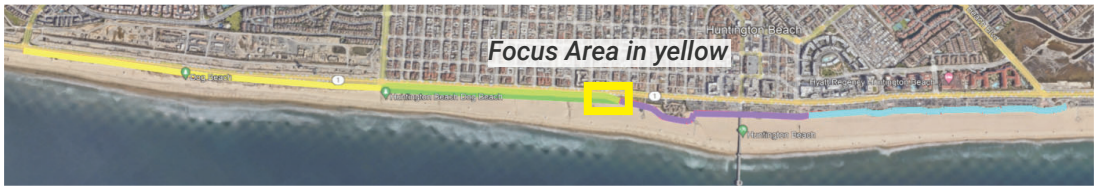
SEGMENT 3
GOLDENWEST STREET TO 11TH STREET (LOWER PATH)
between 15th Street and 11th Street

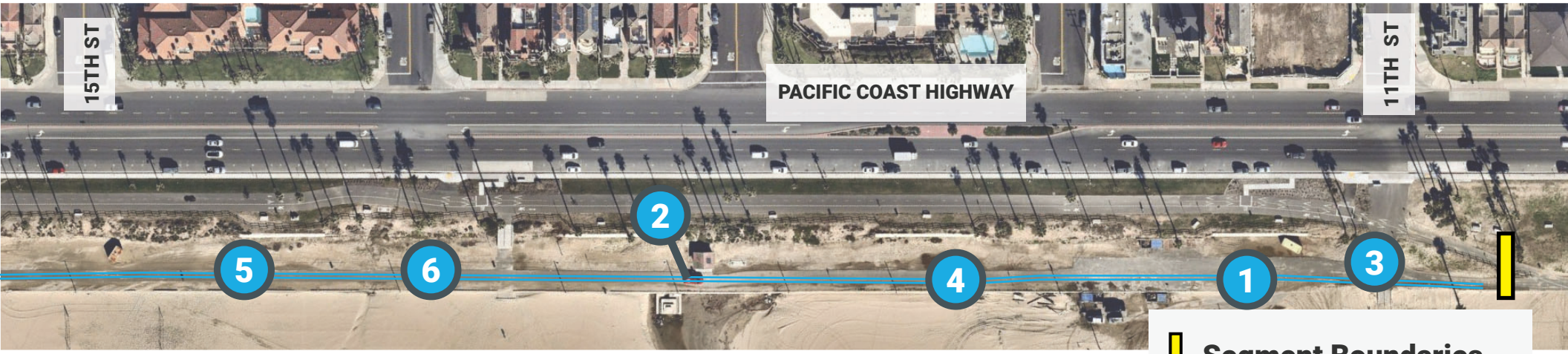


Issues & Opportunities

1. (Issue) Inconsistent speed limit signage throughout lower path
2. (Issue) High e-bike speeds along path/segment
3. (Issue) Pedestrian use of amenities encroaches onto path
4. (Issue) Path does not have separation between users; no centerline
5. (Issue) No sand walls to keep path clear
6. (Opportunity) Provide sufficient unobstructed space along path (will require feasibility and environmental review)

SEGMENT 3
GOLDENWEST STREET TO 11TH STREET (LOWER PATH)
between 15th Street and 11th Street





Recommendations

Point Improvements

1. Establish 10 mph speed limit with singular sign display
2. Install rumble strips near high-traffic areas / access points along path; Enhance pedestrian crossing visibility and conflict zone markings through the use of artistic, continental, or diagonal crosswalks
3. Install access gate for traffic calming and/or square off access approach to encourage slower speeds

Corridor Improvements

4. Install centerline striping
5. Widen path and include user separation
6. Install sand walls

SEGMENT 4

11TH STREET TO 1ST STREET

between 10th Street and 6th Street

Issues & Opportunities

1. (Issue) Constrained path width along segment
2. (Issue) No sand walls (10th Street to 7th Street)
3. (Issue) Outdated flashing beacons near 6th Street
4. (Issue) Pedestrian / bicycle mixing zone does not include sufficient warning of potential conflicts
5. (Issue) Inconsistent speed limit signage
6. (Issue) Pedestrian use of amenities encroaches onto path
7. (Issue) Path does not have separation between users; no centerline
8. (Opportunity) Provide sufficient unobstructed space along path (will require feasibility and environmental review)

SEGMENT 4

11TH STREET TO 1ST STREET

between 10th Street and 6th Street

Recommendations

Point Improvements

1. Establish Slow Zone beginning at 6th Street towards the pier; replace old flashing beacons
2. Install rumble strips near high-traffic areas / access points along path; Enhance pedestrian crossing visibility and conflict zone markings through the use of artistic, continental, or diagonal crosswalks
3. Establish 10 mph speed limit with singular sign display

Corridor Improvements

4. Install centerline striping; widen path horizontally and include user separation
5. Install sand walls

Segment Boundaries

SEGMENT 4

11TH STREET TO 1ST STREET

between Main Street and 1st Street

Issues & Opportunities

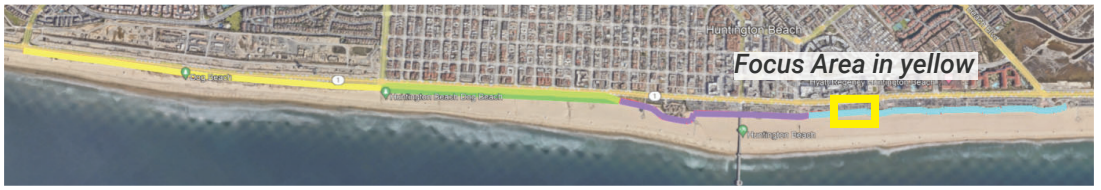
1. (Issue) Narrow path width along segment
2. (Issue) Outdated flashing beacons near 1st Street
3. (Issue) Pedestrian / bicycle mixing zone does not include sufficient warning of potential conflicts
4. (Issue) Inconsistent speed limit signage
5. (Issue) Ramp is a blind spot for users going northbound
6. (Issue) Pedestrian and vendor activity encroach onto path
7. (Issue) Path does not have separation between users; no centerline
8. (Issue) Lack of secure bike storage along path and under pier
9. (Opportunity) Provide sufficient unobstructed space along path (will require feasibility and environmental review)

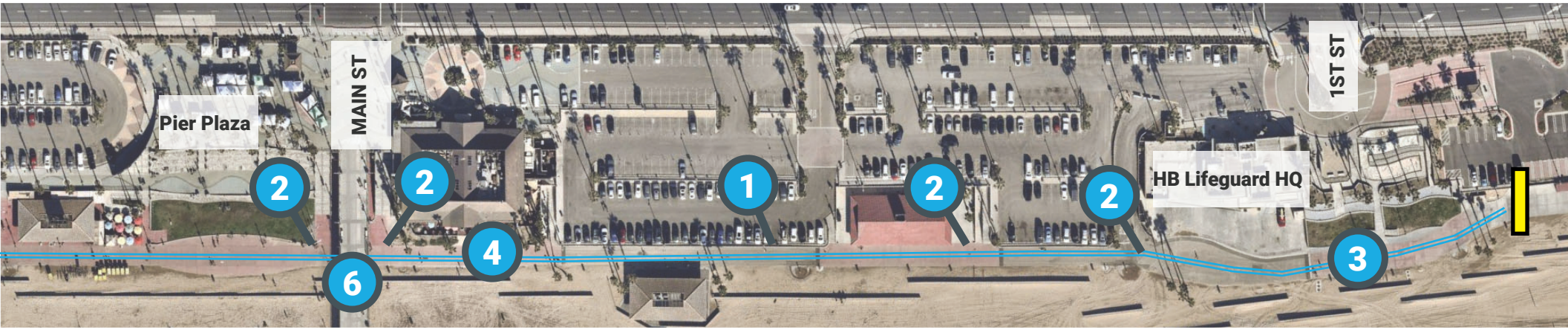
Segment Boundaries

SEGMENT 4

11TH STREET TO 1ST STREET

between Main Street and 1st Street





Recommendations

Point Improvements

1. Establish Slow Zone beginning at 1st Street and extending towards the pier; replace flashing beacons
2. Install rumble strips near high-traffic areas / access points along path; Enhance pedestrian crossing visibility and conflict zone markings through the use of artistic, continental, or diagonal crosswalks
3. Establish 10 mph speed limit with singular sign display

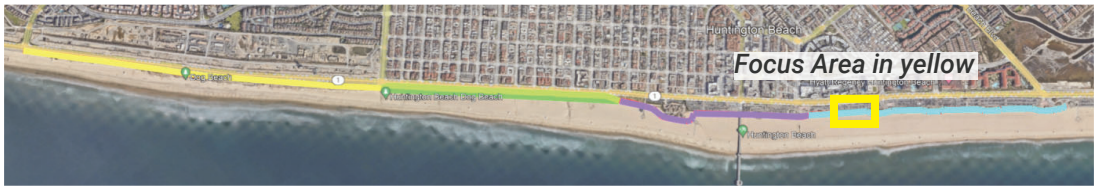
Corridor Improvements

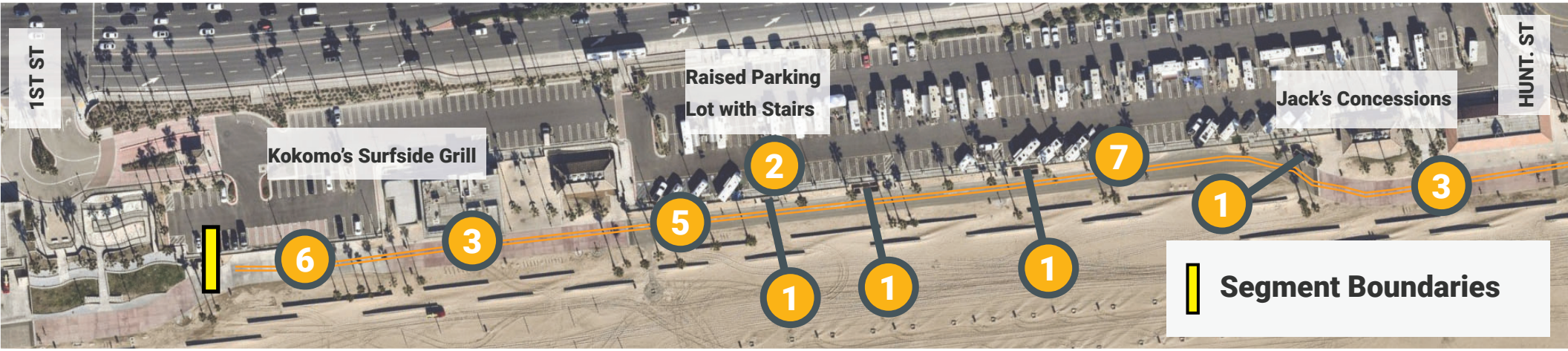
4. Install centerline striping; widen path and include user separation
5. Upgrade bike racks to be more secure
6. Consider placemaking elements entering slow zone and within the slow zone

SEGMENT 5

1ST STREET TO BEACH BOULEVARD

between 1st Street and Huntington Street





Issues & Opportunities

1. (Issue) Line of sight obstructed from parking lot to sand; trash bays block view of pedestrians traveling across path from those traveling along the path
2. (Issue) Constrained path width adjacent to the grade separated parking lot wall
3. (Issue) Inconsistent speed limit signage
4. (Issue) Pedestrian and vendor activity encroach onto path
5. (Issue) Path does not have separation between users; no centerline
6. (Opportunity) Provide sufficient unobstructed space along path (will require feasibility and environmental review)
7. (Opportunity) Radar speed feedback

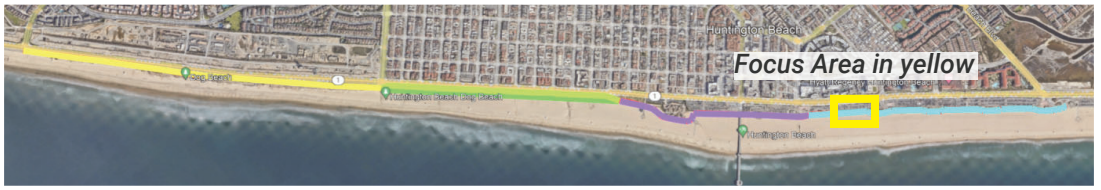
Segment Boundaries

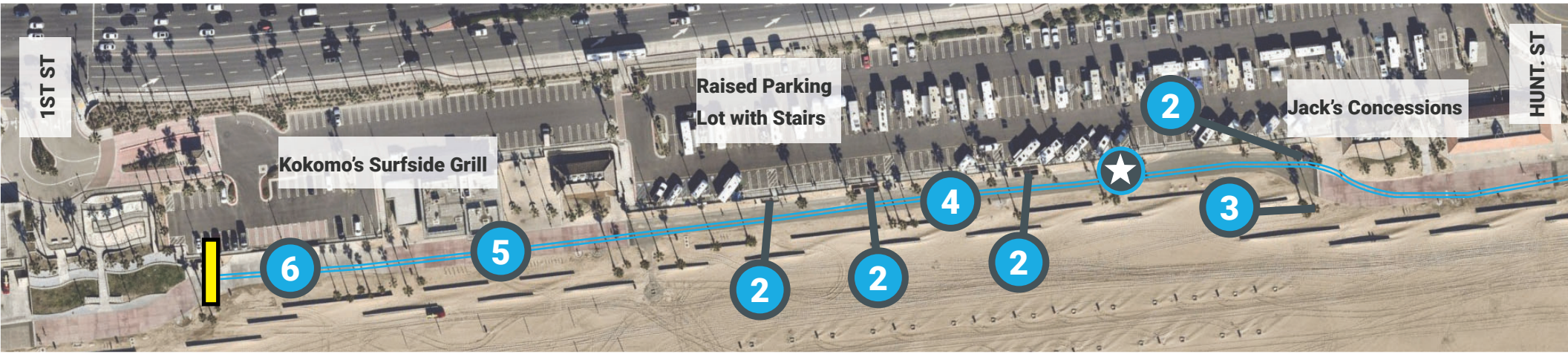
Radar Feedback Signs

SEGMENT 5

1ST STREET TO BEACH BOULEVARD

between 1st Street and Huntington Street





Recommendations

Point Improvements

1. Install rumble strips near high-traffic areas / access points along path; Enhance pedestrian crossing visibility and conflict zone markings through the use of artistic, continental, or diagonal crosswalks
2. Reduce height of trash bays to improve line of sight
3. Move showers farther from path to prevent queuing on path

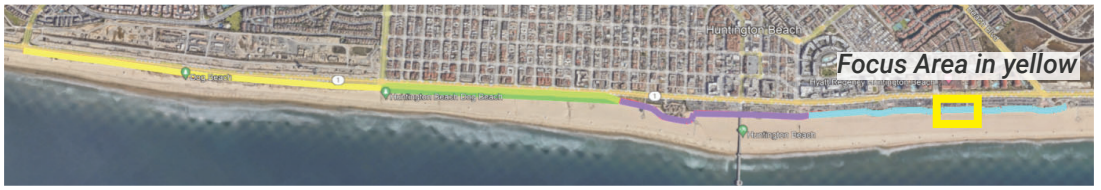
Corridor Improvements

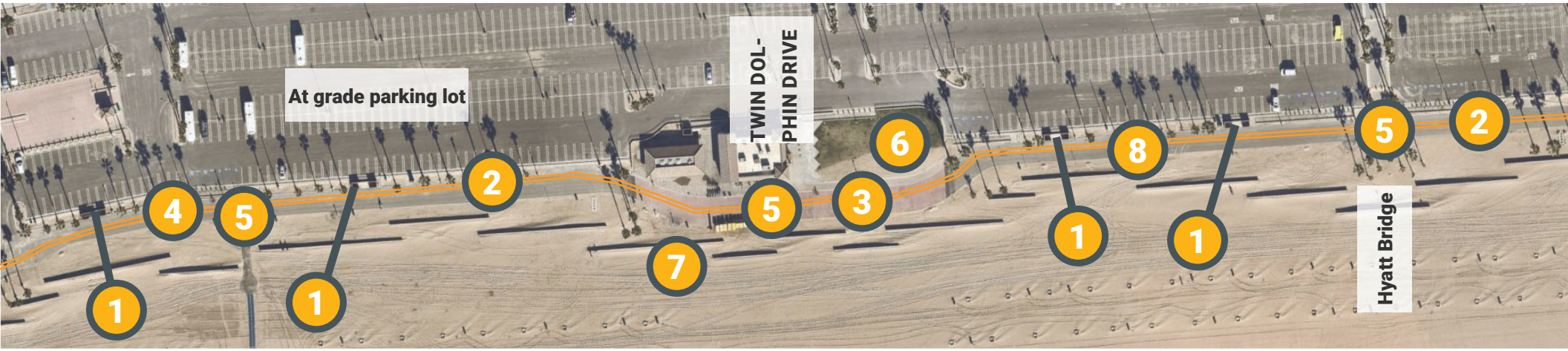
4. Install centerline striping; widen path and include user separation
5. Upgrade bike racks to be more secure
6. Establish 10 mph speed limit with singular sign display

SEGMENT 5

1ST STREET TO BEACH BOULEVARD

between Huntington Street and Hyatt Bridge





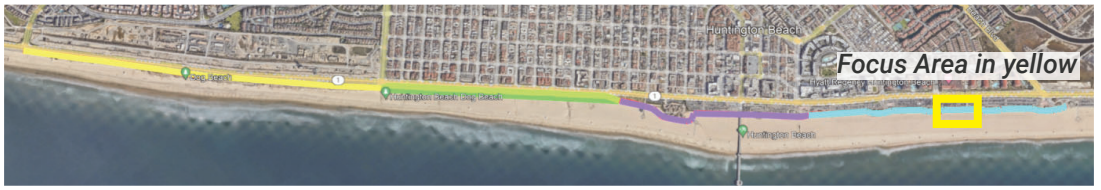
Issues & Opportunities

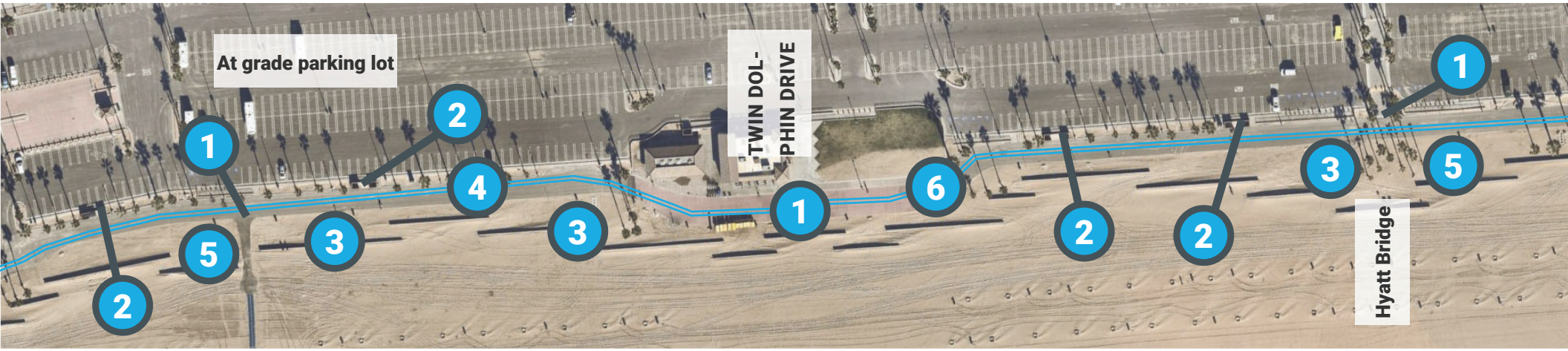
1. (Issue) Line of sight obstructed from parking lot to sand; trash bays block view of pedestrians traveling across path from those traveling along the path
2. (Issue) At grade parking lots have no clear access points - steady stream of pedestrians across path
3. (Issue) Inconsistent speed limit signage
4. (Issue) Path does not have separation between users; no centerline
5. (Issue) Pedestrian and bicycle mixing zone does not include sufficient warning of potential conflicts
6. (Issue) Lack of secure bike storage along path
7. (Opportunity) Sand walls prevent sand build up on path
8. (Opportunity) Provide sufficient unobstructed space along path (will require feasibility and environmental review)

SEGMENT 5

1ST STREET TO BEACH BOULEVARD

between Huntington Street and Hyatt Bridge





Recommendations

Point Improvements

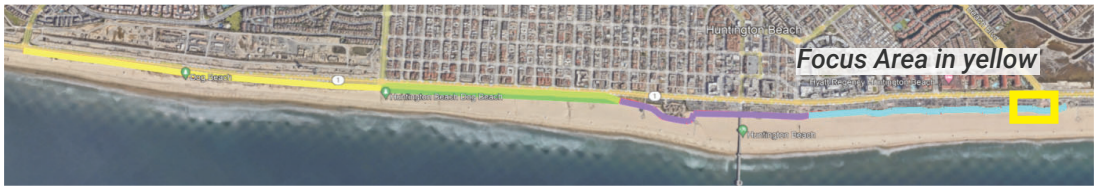
1. Install rumble strips near high-traffic areas / access points along path; Enhance pedestrian crossing visibility and conflict zone markings through the use of artistic, continental, or diagonal crosswalks
2. Reduce height of trash bays to improve line of sight
3. Move showers farther away from path to prevent queuing on path

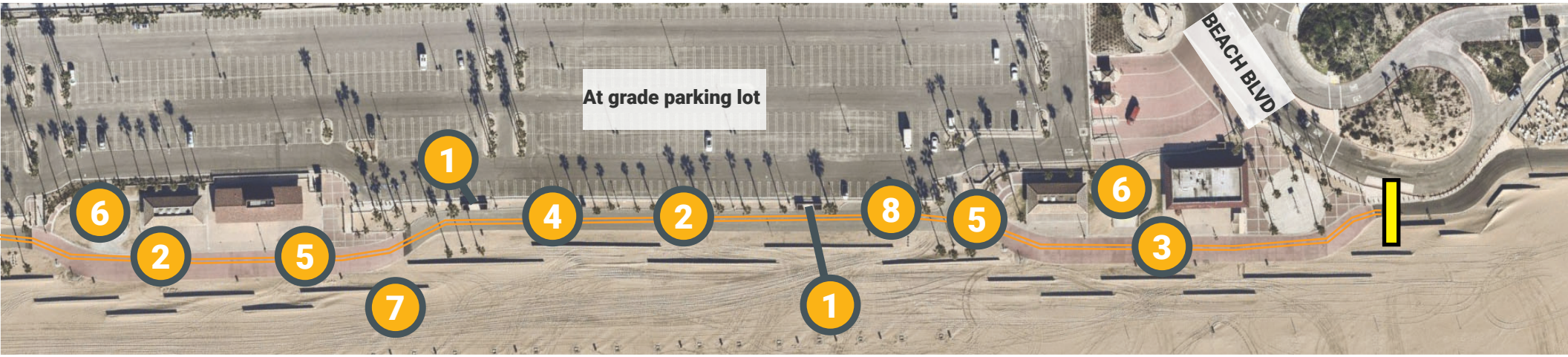
Corridor Improvements

4. Install centerline striping; widen path and include user separation
5. Upgrade bike racks to be more secure
6. Establish 10 mph speed limit with singular sign display

SEGMENT 5
1ST STREET TO BEACH BOULEVARD
between Hyatt Bridge and Beach Boulevard

Segment Boundaries



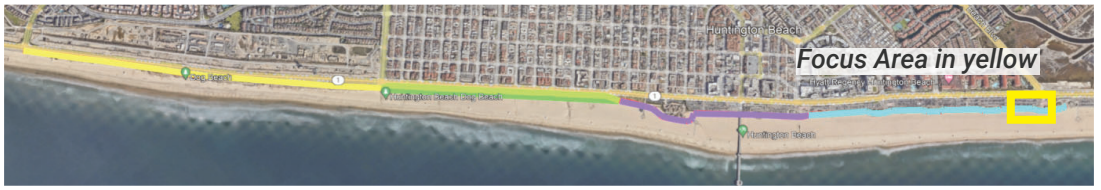


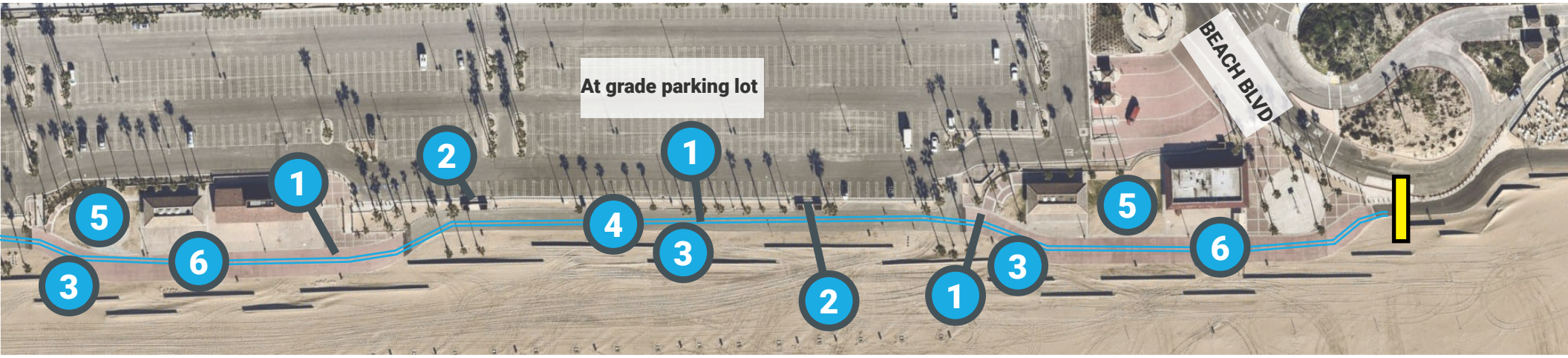
Issues & Opportunities

1. (Issue) Line of sight obstructed from parking lot to sand; trash bays block view of pedestrians traveling across path from those traveling along the path
2. (Issue) At grade parking lots have no clear access points - steady stream of pedestrians across path
3. (Issue) Inconsistent speed limit signage
4. (Issue) Path does not have separation between users; no centerline
5. (Issue) Pedestrian and bicycle mixing zone does not include sufficient warning of potential conflicts
6. (Issue) Lack of secure bike storage along path
7. (Opportunity) Sand walls prevent sand build up on path
8. (Opportunity) Provide sufficient unobstructed space along path (will require feasibility and environmental review)

Segment Boundaries

SEGMENT 5
1ST STREET TO BEACH BOULEVARD
between Hyatt Bridge and Beach Boulevard





Recommendations

Point Improvements

1. Install rumble strips near high-traffic areas / access points along path; Enhance pedestrian crossing visibility and conflict zone markings through the use of artistic, continental, or diagonal crosswalks
2. Reduce height of trash bays to improve line of sight
3. Move showers farther away from path to prevent queuing on path

Corridor Improvements

4. Install centerline striping; widen path and include user separation
5. Upgrade bike racks to be more secure
6. Establish 10 mph speed limit with singular sign display

Appendix 3 – Cost Estimates

Segment	Total Corridor Miles	Estimated Total Cost
Segment 1 – Seapoint Street to Goldenwest Street	1.18	$154,000
Segment 2 – Goldenwest Street to 11th Street (Upper Path)	0.78	$101,000
Segment 3 – Goldenwest Street to 11th Street (Lower Path)	0.78	$2,660,000
Segment 4 – 11th Street to 1st Street	0.64	$1,129,000
Segment 5 – 1st Street to Beach Boulevard	0.85	$939,000
	Total Cost	**$4,983,000**