Section 7
TOOLBOX

The purpose of this section is to present the reference sheets for each toolbox element. The information contained in this section is intended to serve as a tool for agencies to help determine the types of improvements available for the Project Corridor.

Each reference sheet includes the following 11 items and a legend sheet is also provided for reference:

- The name of the toolbox element.
- An icon that notes whether the toolbox element would be a local/city-specific project or one that would need to be studied and implemented across multiple cities or along the entire corridor as a regional project.
- An icon that notes which mode of travel the toolbox element applies to.
- Photos or diagrams showing applications of the toolbox element.
- A section describing the toolbox element and the potential strategies and benefits of applying the toolbox element.
- The study analyzed potential corridor segmentation options, resulting in a recommendation of six corridor segments based on physical roadway characteristics. They are as follows:

  1 - Pacific Coast Highway to Yorktown Avenue

  2 - Yorktown avenue to McFadden Avenue

  3 - McFadden Avenue to La Palma Avenue

  4 - La Palma Avenue to Malvern Avenue

  5 - Malvern Avenue to Imperial Highway

  6 - Imperial Highway to Whittier Boulevard

  A location key map is provided showing which of the six segments the toolbox element could be applied in. See Appendix for a detailed map of corridor segmentation.
- A section outlining how the toolbox element addresses each of the Project goals. Many of the toolbox elements may affect multiple modes of travel and thus support several Project goals. As such, the primary and secondary benefits and impacts have been identified for each element. Goals that are primarily by the element either positively (red) or negatively (green) would have two highlighted bars and

secondary effects would be shown with a single bar highlighted. Should the goals not be affected by the element, the bars would show in grey.

- A design considerations section that documents plans and guidelines and implementation issues to consider for the toolbox element.
- An applications section which documents where each toolbox element could be applied. This section distinguishes either specific or typical applications of the toolbox element. Specific applications are provided for elements with identified locations, whereas typical applications are provided for elements that can be applied at locations throughout the corridor.
- A cost range section which provides a visual representation of the cost ranges for each toolbox element. Detailed cost estimates were developed per mile or per location for each element in order to determine the cost range.
- A coordination needed section which provides a visual representation coordination needed to implement each toolbox element. The coordination types are broken down to coordination with utility provider (U), adjacent private property owners should right-of-way be needed (P), OCTA transit for all transit related improvements (O), and adjacent businesses for those elements that may affect access and operations of businesses along the corridor (B).

A summary figure of the components of each element is provided below for reference.

The toolbox elements are organized in the same order as the refined list of elements in Section 5 and 6. The sheets are grouped by mode as follows:

- Transit – reference sheets 1-5
- Pedestrians – reference sheets 6-16
- Bicycles – reference sheets 17-20
- Vehicles – reference sheets 21-28

This icon notes whether the toolbox element would be a local/city-specific project or one that would need to be studied and implemented across multiple cities or along the entire corridor as a regional project.

This icon notes which mode of travel the toolbox element applies to.

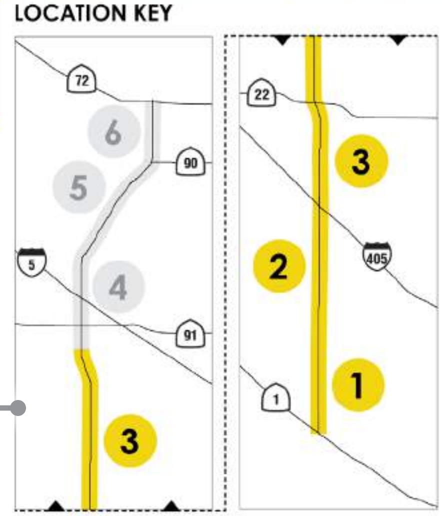
LOCAL PROJECT | Pedestrians

NAME OF TOOLBOX ELEMENT

Photos or diagrams showing applications of toolbox elements.

This section provides a description of the toolbox element and potential strategies and benefits of applying the toolbox element.

LOCATION KEY



The Project Corridor was segmented into six segments. This map outlines which segments the toolbox element could be applied to.

This section outlines how the toolbox element addresses each of the Project goals. Many of the toolbox elements may affect multiple modes of travel and thus support several Project goals. As such, the primary and secondary benefits and impacts have been identified for each element. Goals that are primarily by the element either positively (red) or negatively (green) would have two highlighted bars and secondary affects would be shown with a single bar highlighted. Should the goal not be affected by the element, the bars would show in grey.

MEETING GOALS

1 Improve travel time, reliability and convenience of transit.

2 Reduce impediments to walking and biking along and across corridor.

3 Maintain vehicular throughput and access to and from regional freeways network.

4 Provide a safe and accessible environment for all user groups.

5 Support local land use planning with improved mobility options.

DESIGN CONSIDERATIONS

/ This section documents plans and guidelines and implementation issues to consider for the toolbox element.

APPLICATIONS

/ This section documents where each toolbox element could be applied. The section distinguishes either specific or typical applications of the toolbox element. Specific applications are provided for elements with identified specific locations whereas typical applications are provided for elements that can be applied at locations throughout the corridor.

This section provides a visual representation coordination needed to implement each toolbox element. The icons are as follows:

U = The toolbox element may affect utilities and would require coordination with the various utility providers

P = The toolbox element may require additional right-of-way and would require coordination with adjacent private property owners

O = The toolbox element would affect transit and would require coordination with OCTA transit

B = The toolbox element may affect access and operations of business along the corridor and would require coordination with adjacent businesses

COST RANGE

$$$$$

COORDINATION NEEDED

U	P	O	B
Utilities	Adjacent Private Property Owners	OCTA Transit	Adjacent Businesses

3

This section provides a visual representation of the cost ranges for each toolbox element. Detailed cost estimates were developed per mile or per location for each element. The cost ranges are presented as follows:

$ - Low Cost ($0 to $500,000)

$$ - Low-Medium Cost ($500,001 to $1,000,000)

$$$ - Medium Cost ($1,000,001 to $2,000,000)

$$$$ - Medium-High Cost ($2,000,001 to $5,000,000)

$$$$$ - High Cost (>$5,000,001)

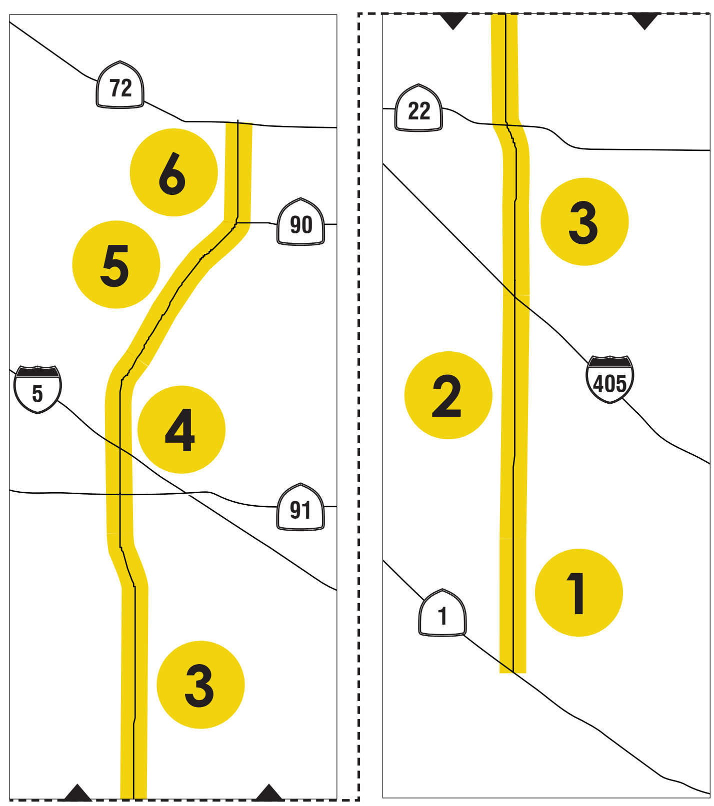
TOOLBOX ELEMENTS SUMMARY TABLE

MODE OF TRAVEL	TOOLBOX ELEMENT	LOCAL/REGIONAL PROJECT	AFFECTED SEGMENTS	PROJECT GOALS: TRANSIT	PROJECT GOALS: ACTIVE TRANSPORTATION	PROJECT GOALS: VEHICULAR TRAFEL	PROJECT GOALS: SAFETY	PROJECT GOALS: NEIGHBORHOOD CONNECTIVITY	COST RANGE	COORDINATION NEEDED
TRANSIT	Bus stops and stations amenities	L	123456	▲	△	--	△	△	$	UPOB
TRANSIT	First/last mile improvements at major stops	L	234	▲	△	--	△	△	$	UPOB
TRANSIT	Transit signal priority treatments	R	234	▲	△	--	△	△	$$$	UPOB
TRANSIT	Transit preferential treatments	R	234	▲	△	--	△	△	$$$$	UPOB
TRANSIT	Dedicated transit lanes (for BRT)	R	234	▲	△	--	△	△	$$	UPOB
PEDESTRIAN	Close gaps in sidewalk network	L	1356	--	▲	--	△	△	$$	UPB
PEDESTRIAN	High-visibility crosswalks	L	123456	--	△	--	▲	--	$	-
PEDESTRIAN	Realigned crosswalks at freeway ramps	R	234	--	△	▽	▲	--	$	U
PEDESTRIAN	Pedestrian countdown signal heads	L	123456	--	△	--	▲	--	$$	-
PEDESTRIAN	Sidewalk amenities	L	123456	--	△	--	▲	--	$	UPB
PEDESTRIAN	Remove sidewalk obstructions	L	23456	--	▲	--	△	△	$	UPO
PEDESTRIAN	Pedestrian scrambles	L	12456	--	▲	--	△	△	$	-
PEDESTRIAN	Pedestrian refuge islands	L	12456	--	△	△	▲	△	$$$	UP
PEDESTRIAN	Corner/sidewalk bulbs	L	123456	▲	△	--	△	△	$$	UPOB
PEDESTRIAN	Mid-block signalized pedestrian crossings	L	123456	▲	△	--	△	△	$$	U
PEDESTRIAN	On-street parking or loading zones	R	123456	▽	--	▽	△	▲	$	UB
BICYCLE	Bike on sidewalk treatments	L	123456	--	▲	--	▼	△	$	UPB
BICYCLE	Close gaps in bicycle network (on parallel streets)	L	123456	--	▲	--	▼	△	$	UPB
BICYCLE	Bicycle preferential treatments	L	123456	▽	△	△	▲	△	$	UP
BICYCLE	Protected bike lanes (on Beach Boulevard)	R	123456		△	△	▲	△	$$$	OB
VEHICLES	On-street parking or loading zones removal	L	1456	△	△	△	▽	▽	$	B
VEHICLES	Advanced traffic signal timing/ITS	R	123456	▲	△	--	△	△	$$$$	U
VEHICLES	Consolidate mid-block unsignalized intersections	L	123456	△	--	▲	△	--	$$	UPB
VEHICLES	Access management	L	123456	▲	△	▲	△	--	$	PB
VEHICLES	Active traffic management	R	123456	△	△	--	△	△	$$$$	U
VEHICLES	Pedestrian bridges	L	1234	△	△	▲	△	△	$$$	UPB
VEHICLES	Adjust interchange ramp locations/ configurations	R	234	--	△	▽	▲	--	$$$	UPB
VEHICLES	Alternative intevrsection configurations	R	123456	▽	▽	▲	△	--	$$$$$	UPB

BUS STOP AND STATION AMENITIES

In addition to providing bus rapid transit service, bus stop and station amenities can increase transit ridership and provide a safer and more comfortable transit user experience. Different types of amenities that can improve ridership can include a unique or attractively design shelter, illumination, and climate or temperature control. General passenger amenities include seating, trash containers, bus arrival information, wayfinding, shade, and automated passenger information systems.

LOCATION KEY



MEETING GOALS

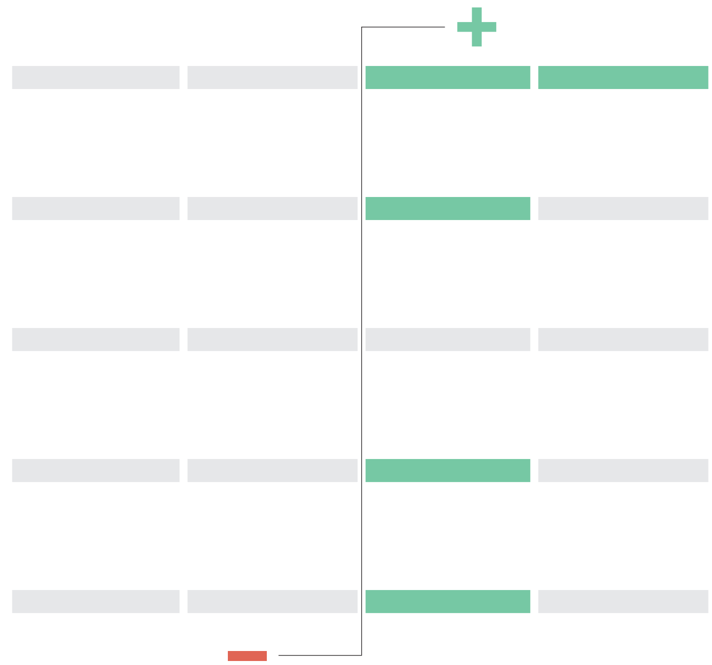
1 Improve travel time, reliability and convenience of transit.

2 Reduce impediments to walking and biking along and across corridor.

3 Maintain vehicular throughput and access to and from regional freeways network.

4 Provide a safe and accessible environment for all user groups.

5 Support local land use planning with improved mobility options.



DESIGN CONSIDERATIONS

/ Consistency with OCTA and Federal Transit Administration (FTA) bus stop and station design standards

/ Consistency with ADA design guidelines

/ Cost to implement amenities throughout the corridor

/ Potential right-of-way and physical constraints around a stop or station

/ Need for regular maintenance of some amenity types

/ May need to have electricity provided

TYPICAL APPLICATIONS

/ Locations with bus rapid transit or other improved local transit service

/ Areas with high transit ridership or the potential for significant demand that can benefit from stop or station amenities

/ Stop and station locations with perceived transit user discomfort

COST RANGE

$$$$$

COORDINATION NEEDED

U Utilities

P Adjacent Private Property Owners

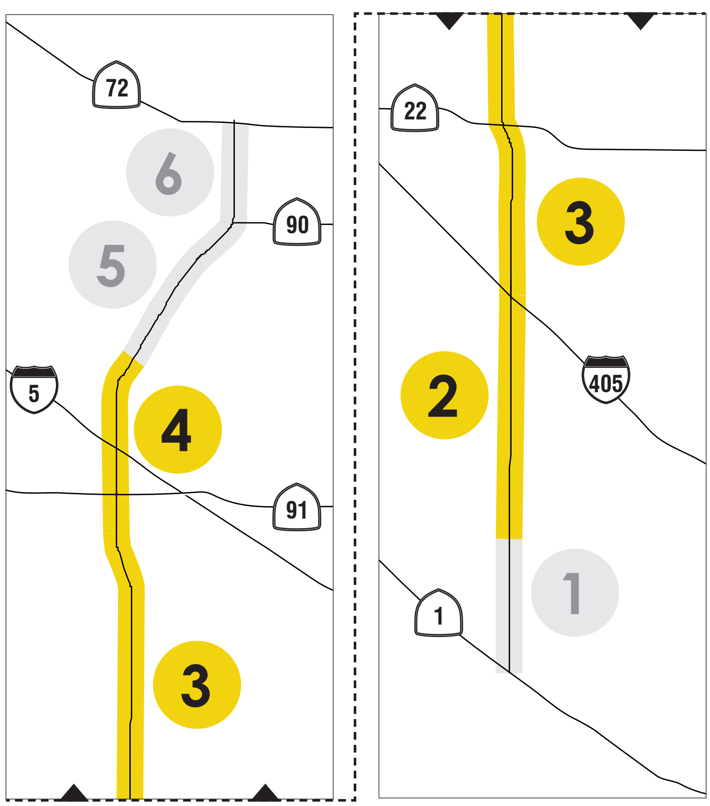
O OCTA Transit

B Adjacent Businesses

FIRST-LAST MILE IMPROVEMENTS AT MAJOR STOPS

The first and last mile of a transit user's trip is the portion of the trip to and from the transit stop or station that they must complete on their own. Strategies that can improve the first and last mile experience can include improvements that are oriented towards bicyclists, pedestrians, and rideshare/vanpool users. Improvements can increase ridership, provide a better active transportation network for those connecting to transit or not, can encourage carpooling, and help improve safety and local connectivity.

LOCATION KEY



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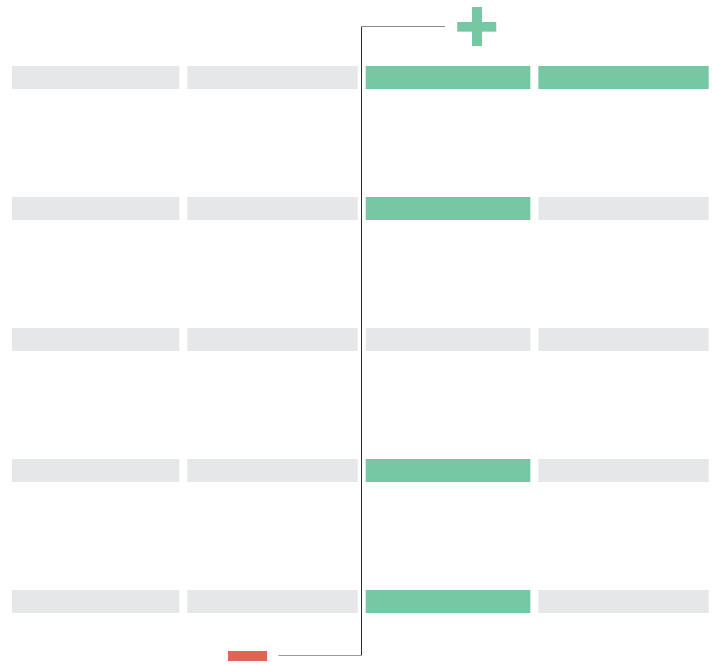


DESIGN CONSIDERATIONS

- Consistency with Caltrans, OCTA, and local jurisdiction active transportation plans
- Consistency with ADA design guidelines
- Cost to design, implement and maintain improvements
- Potential need to acquire right-of-way or physical constraints at stations and areas leading to stations that would undergo first-last mile treatments
- Coordination of designs and amenities across jurisdictional lines to maintain connectivity

TYPICAL APPLICATIONS

- Locations with major transit service and barriers to walking, biking, or taking rideshare to stops
- Areas with high transit ridership but low levels of walking or biking to stops and stations
- Stops near major destinations or nearby transfer locations

COST RANGE

$$$$$

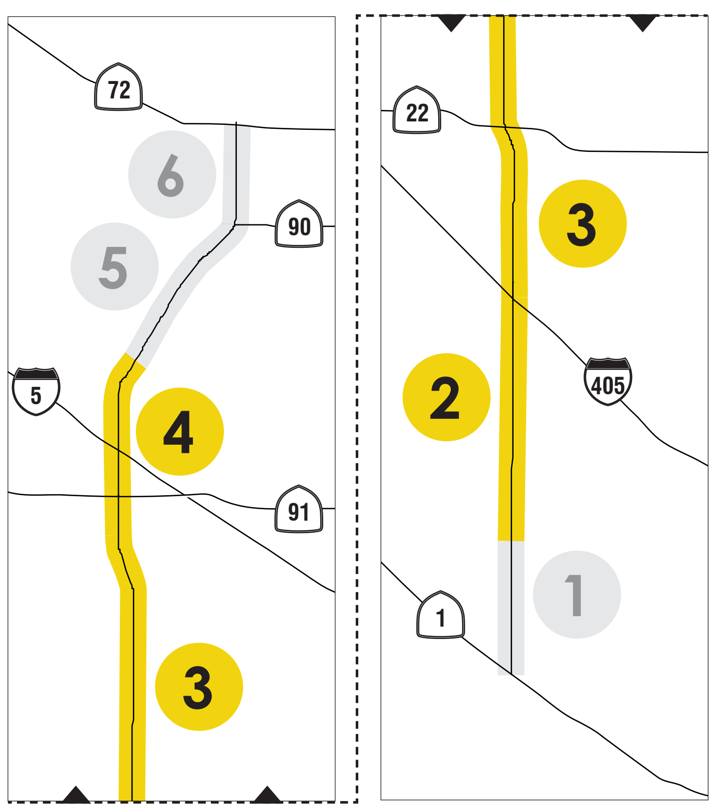
COORDINATION NEEDED

U	P	O	B
Utilities	Adjacent Private Property Owners	OCTA Transit	Adjacent Businesses

TRANSIT SIGNAL PRIORITY

Transit Signal Priority (TSP) systems give transit vehicles priority over other vehicles at signalized intersections. Typical TSP strategies extend traffic signal green time, or turn the traffic signal green earlier than scheduled, to provide priority passage through the intersection to transit vehicle. TSP systems can improve schedule reliability and on-time performance, reduce fuel usage, and can provide a smoother ride which increases ridership and transit vehicle and passenger throughput.

LOCATION KEY



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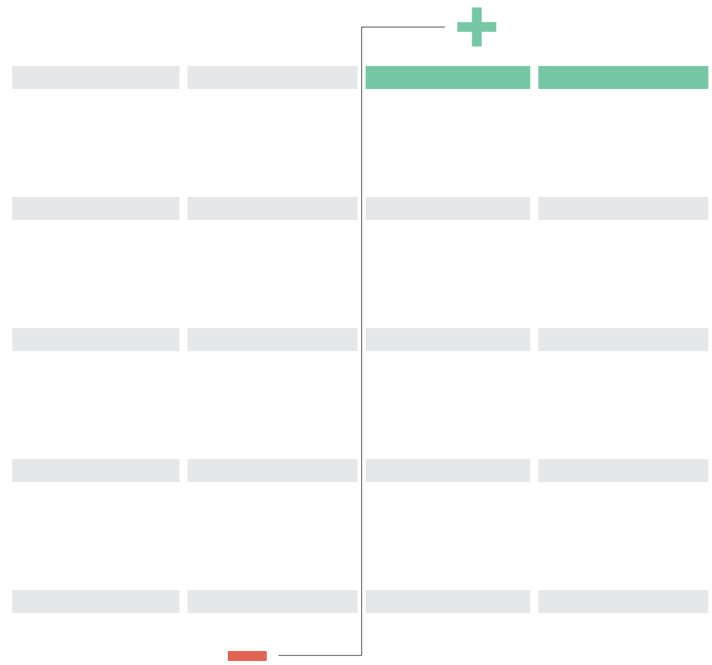


DESIGN CONSIDERATIONS

/ Coordination of implementation across jurisdictional lines

/ Travel time for other non-transit vehicles may increase due to preferential treatments for transit

/ Depending on the TSP type, there may be cost to the transit operators to purchase, install and maintain communication systems

TYPICAL APPLICATIONS

/ Along high transit ridership corridors with congestion

/ Where transit schedule is unreliable because of signal related delays

/ Where transit vehicles experience a high frequency of signal related stops

COST RANGE

$$$$$

COORDINATION NEEDED

U Utilities

P Adjacent Private Property Owners

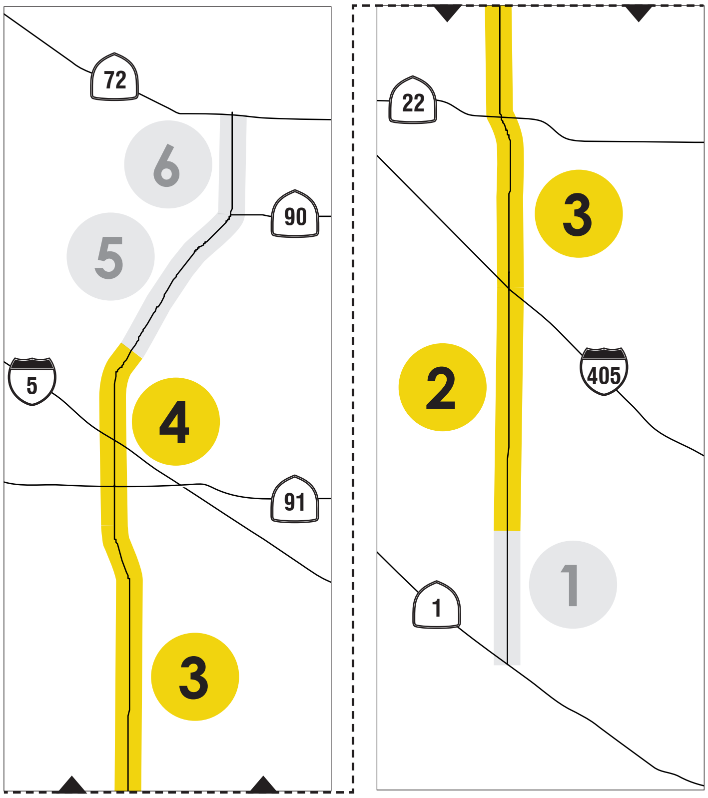
O OCTA Transit

B Adjacent Businesses

TRANSIT PREFERENTIAL TREATMENT

Successful transit must be reliable and efficient and removing sources of delay have proven to be more effective than increasing transit vehicle travel speeds. Reducing sources of transit delay shortens trip times and reduces the time and cost expenditures for each transit vehicle, allowing for shorter headways and more frequent service using the same number of vehicles. The design strategies include stop design factors, stop configurations, station and stop elements, transit lanes, and intersection and signal operations and design. Far-side in-lane stops provide the highest level of priority for transit operations.

LOCATION KEY



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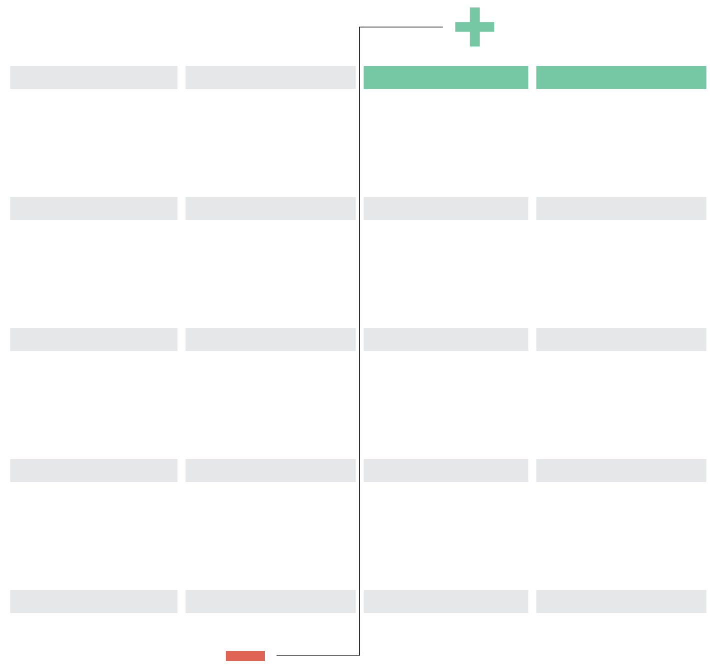


DESIGN CONSIDERATIONS

/ Consistency with Caltrans Highway Design Manual and Standard Plans and local guidelines

/ Effect on access and right-of-way of adjacent businesses

/ Cost to implement significant infrastructure improvements

/ Travel time for other non-transit vehicles may increase due to preferential treatments for transit

TYPICAL APPLICATIONS

/ Along high transit ridership corridors

/ Where transit schedule is unreliable due to roadway congestion

/ Where transit vehicles experience delays due to intersection operations

COST RANGE

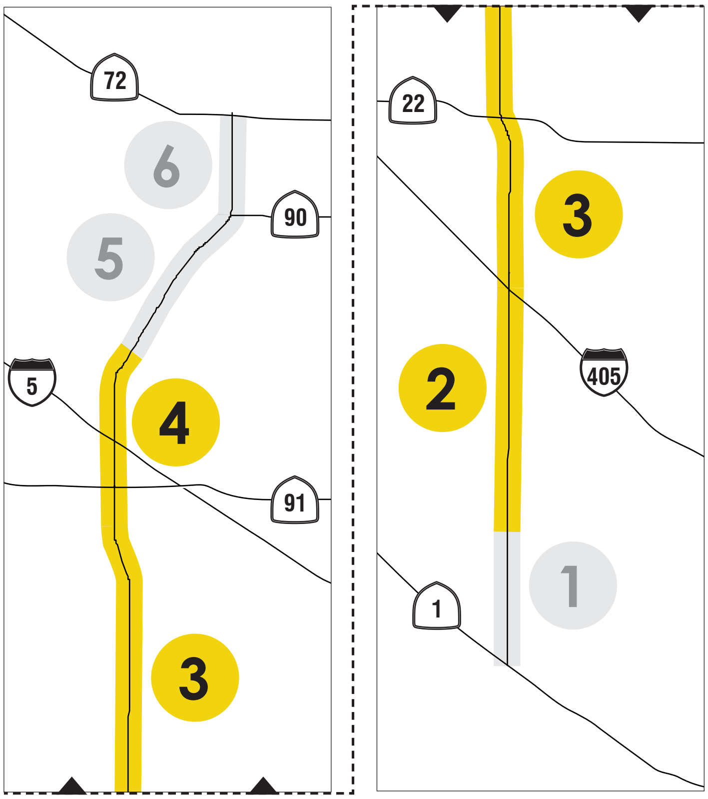
COORDINATION NEEDED

U	P	O	B
Utilities	Adjacent Private Property Owners	OCTA Transit	Adjacent Businesses

DEDICATED TRANSIT LANES (FOR BRT)

In addition to features of BRT service such as improved stations, vehicles, and service, an exclusive running way (dedicated transit lane) is effective in increasing ridership along a transit line. This is due to its improving on transit speed, reliability, identity/image, safety/security (of vehicles), and capacity. Dedicated transit lanes can be effective when combined with other BRT strategies such as off-board fare payment, all-door boarding, transit signal priority, queue jumps, and improved bus shelters.

LOCATION KEY



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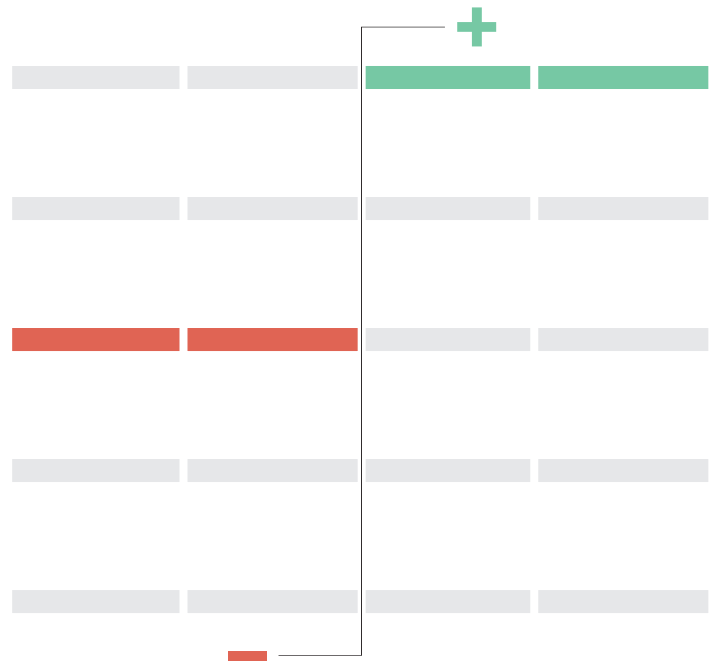


DESIGN CONSIDERATIONS

/ Consistency with Caltrans Highway Design Manual and Standard Plans and local guidelines

/ Potential need for additional right-of-way

/ Potential increase in delay and congestion for passenger vehicles with lane reduction

/ Modification of corridor signal timing and coordination to incorporate bus-only lanes

/ Coordination across jurisdictional lines

/ Driveway and access conflicts for businesses and other properties along the bus lane

TYPICAL APPLICATIONS

/ Along high transit ridership corridors with congestion

/ Corridors with bus rapid transit service

COST RANGE

COORDINATION NEEDED

U
Utilities

P
Adjacent Private Property Owners

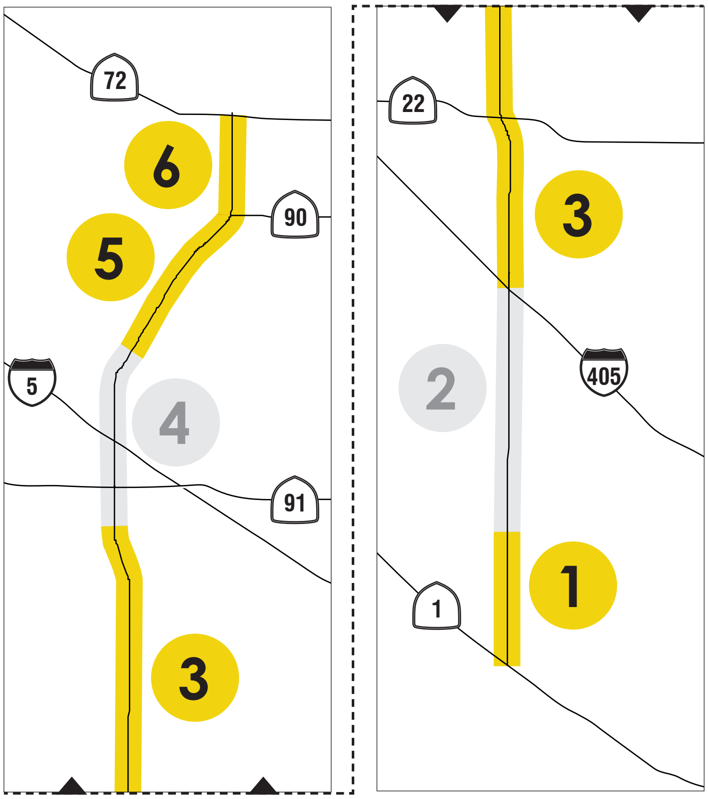
O
OCTA Transit

B
Adjacent Businesses

CLOSE GAPS IN SIDEWALK NETWORK

The presence of sidewalks is a basic element of pedestrian mobility. Gaps in the pedestrian network can result in pedestrians needing to walk in the street or crossing in unsafe locations to access sidewalk facilities. In general, completing a sidewalk network can increase active travel and reduce automobile travel as well reduce roadside collisions. Providing a completed network would also be consistent with regional and local policies and address ADA access concerns.

LOCATION KEY



MEETING GOALS

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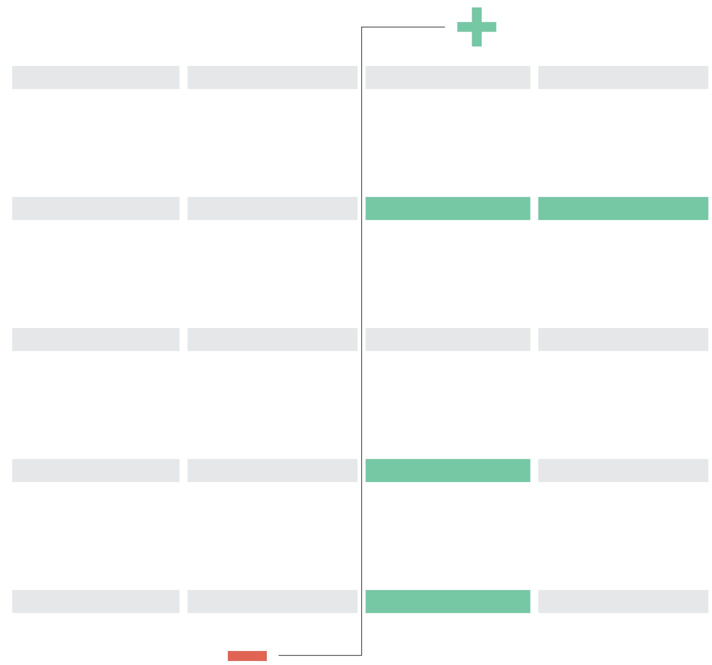


DESIGN CONSIDERATIONS

/ Consistency with ADA design guidelines

/ Consistency with Orange County Council of Governments Complete Streets Design Guidelines

/ Consistency with the pedestrian facility design standards per the Caltrans Highway Design Manual and Standard Plans

/ Consistency with the pedestrian facility design standards for the affected City or County

SPECIFIC APPLICATIONS

At the following locations:

/ Huntington Beach – east side south of Indianapolis Avenue

/ County of Orange – west side north of McFadden Avenue

/ Westminster – west side north of 21st Street

/ Anaheim/Buena Park – east side north of Stanton Avenue

/ Buena Park – west side south of La Palma Avenue

/ Buena Park – east side north of Argyle Drive

/ La Habra – west side south of Imperial Highway

COST RANGE

$$$$$

COORDINATION NEEDED

U Utilities

P Adjacent Private Property Owners

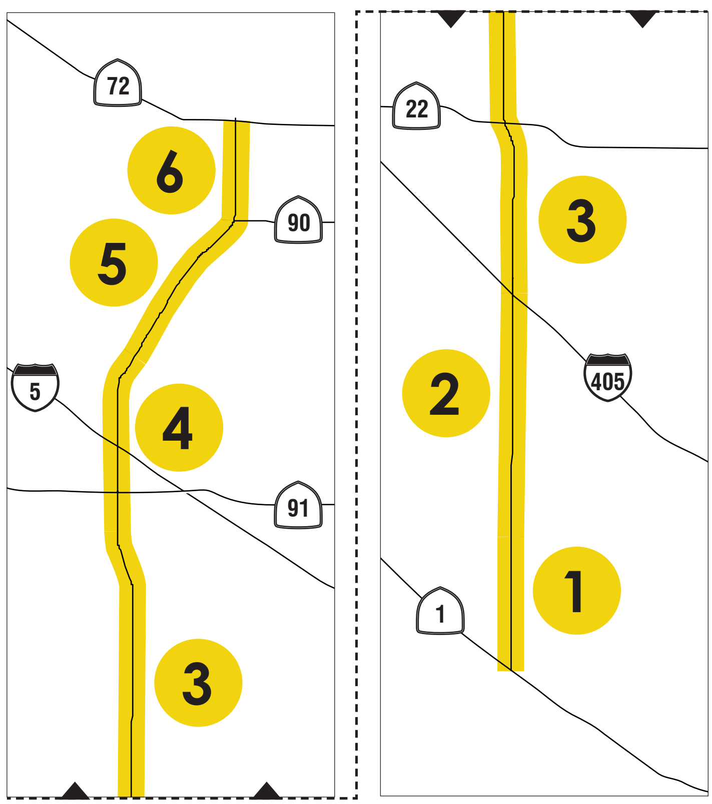
O OCTA Transit

B Adjacent Businesses

HIGH-VISIBILITY CROSSWALKS

A high-visibility crosswalk is much easier for an approaching motorist to see and improves yielding behavior by drivers and as a result improves pedestrian safety while crossing. High-visibility ladder and zebra marking are preferable to parallel or dashed markings.

LOCATION KEY



MEETING GOALS

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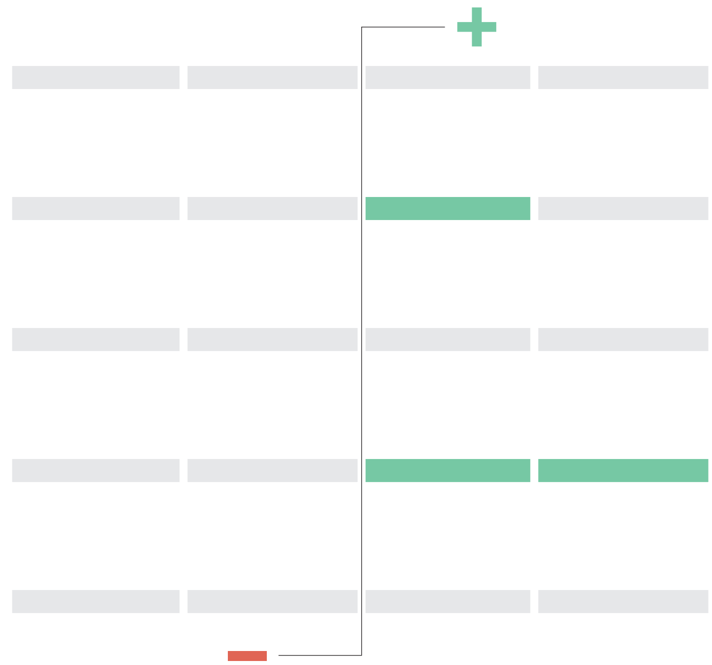


DESIGN CONSIDERATIONS

/ Consistency with the California MUTCD and local jurisdiction guidelines

/ Consistency with ADA guidelines

/ Cost of maintenance compared to standard crosswalks

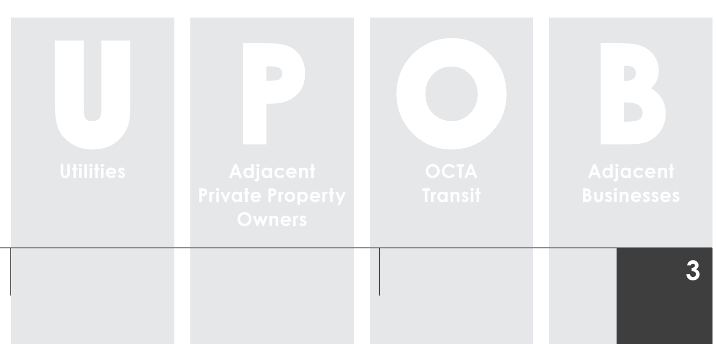
TYPICAL APPLICATIONS

/ At crosswalk locations with a minimum of 20 pedestrian crossings or more than 15 elderly or child pedestrians per peak hour at a particular location

COST RANGE

$$$$$

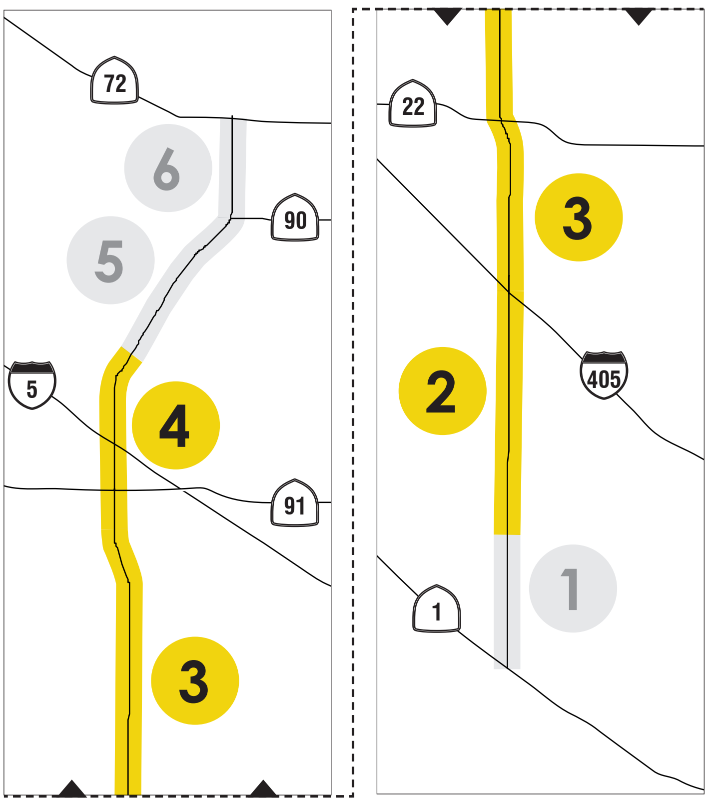
COORDINATION NEEDED



REALIGNED CROSSWALKS AT FREEWAY RAMPS

Multiple factors contribute to provide safe pedestrian crossings at freeway ramps including type of ramp, turning-angles, signalization, visibility, pedestrian crossing distance, and directness of route. Improving crosswalk location and alignment would improve motor vehicle awareness of pedestrians crossing which would reduce vehicle and pedestrian collisions and create a safer environment for pedestrians.

LOCATION KEY



MEETING GOALS

1 Improve travel time, reliability and convenience of transit.

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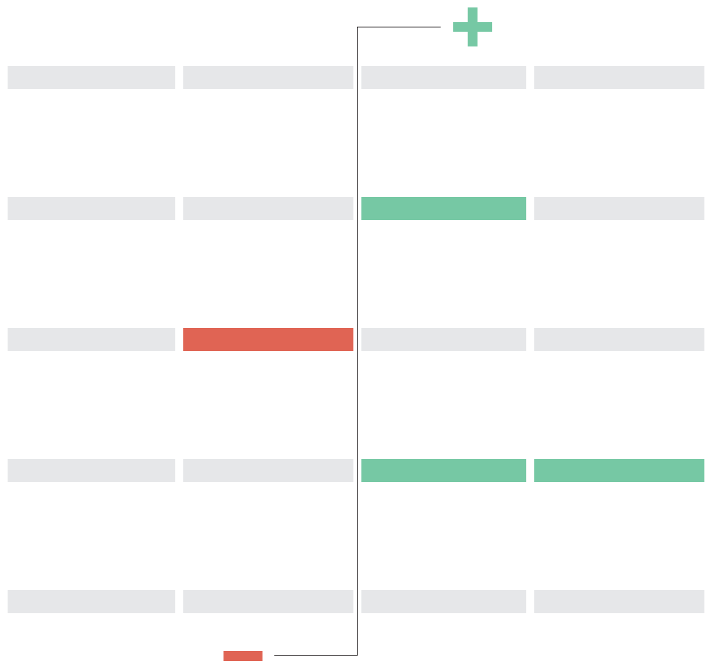


DESIGN CONSIDERATIONS

/ Consistency with the Caltrans Highway Design Manual and Standard Plans and local guidelines

/ Consistency with ADA guidelines

/ Cost to implement improvement strategies to crosswalks

/ Cost to reconfigure freeway ramps to be safer for pedestrians

/ Potential delays for vehicles entering and exiting the freeway

SPECIFIC APPLICATIONS

At locations where the ramp configurations can negatively affect pedestrian crossings and safety, at the following freeway interchanges

/ At the I-405 interchange

/ At the SR-22 interchange

/ At the SR-91 interchange

/ At the I-5 Interchange

COST RANGE

$$$$$

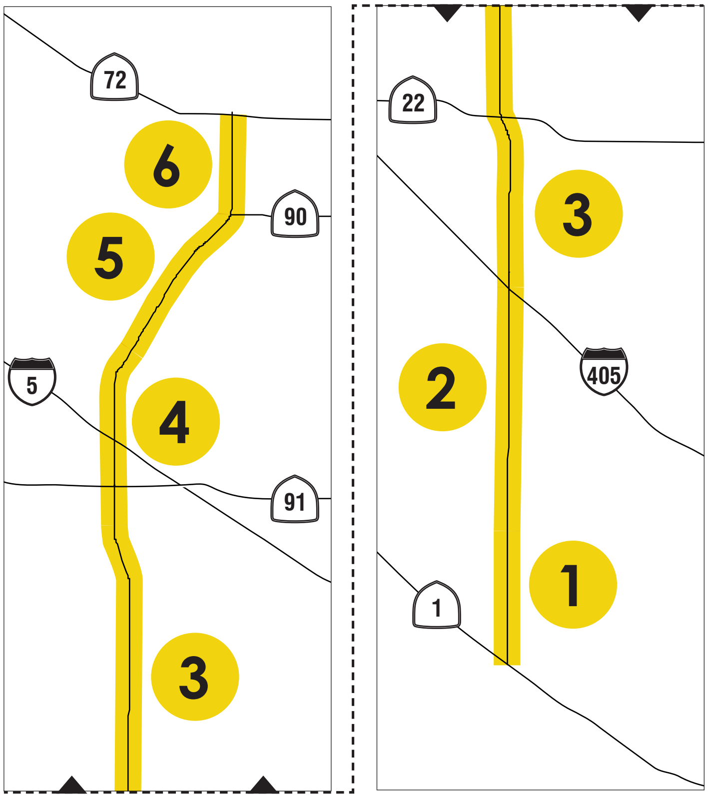
COORDINATION NEEDED

U	P	O	B
Utilities	Adjacent Private Property Owners	OCTA Transit	Adjacent Businesses

PEDESTRIAN COUNTDOWN SIGNAL HEADS

The pedestrian countdown signal device provides a numeric countdown display that indicates the number of seconds remaining for a pedestrian to complete his/her crossing of a street. Implementation of countdown signal heads has been shown to reduce pedestrian injury collisions and has positive reception from pedestrians over the conventional don't walk or raised hand pedestrian signal heads.

LOCATION KEY



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1 Improve travel time, reliability and convenience of transit.

2 Reduce impediments to walking and biking along and across corridor.

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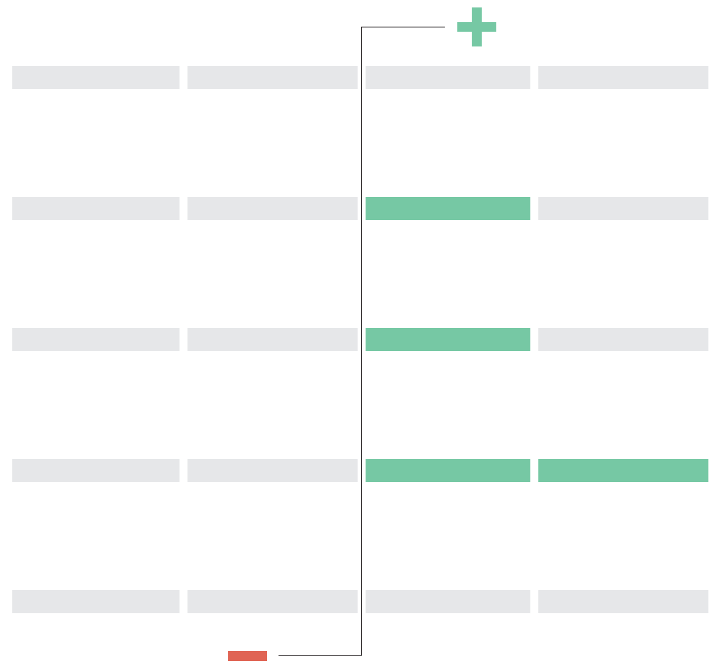


DESIGN CONSIDERATIONS

/ Consistency with the California MUTCD and local jurisdiction guidelines

/ Consistency with ADA guidelines

/ Cost of installing of replacing conventional signal heads with pedestrian countdown signal heads

TYPICAL APPLICATIONS

/ At all new or modified signalized crosswalks

COST RANGE

$$$$$

COORDINATION NEEDED

U Utilities

P Adjacent Private Property Owners

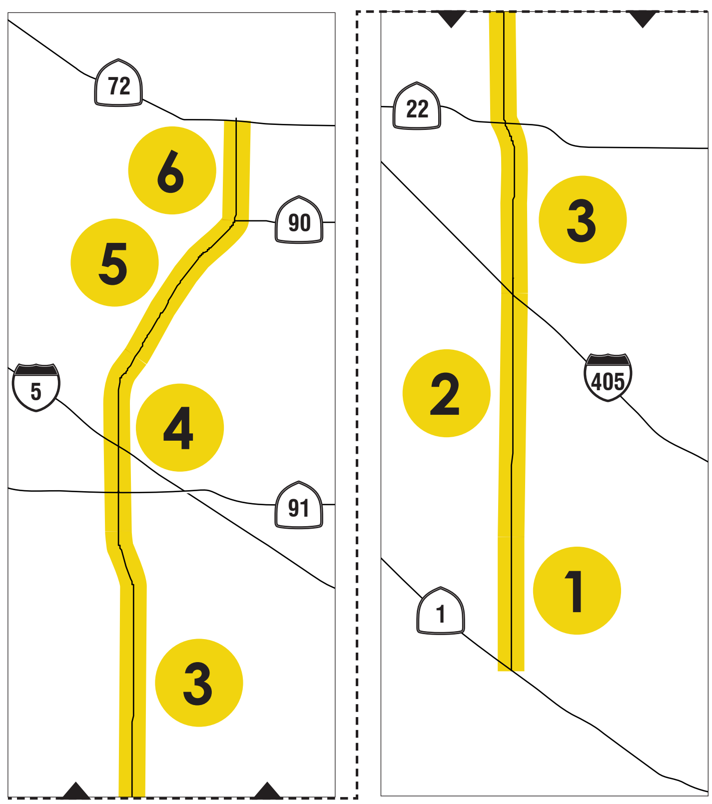
O OCTA Transit

B Adjacent Businesses

SIDEWALK AMENITIES

Sidewalk amenities can make for a safer pedestrian environment by separating users from fast moving traffic and providing features like adequate lighting, street furniture, and wayfinding signs. Case studies have demonstrated that sidewalk amenities can improve safety, increase walking and active trips, and contribute to a cleaner street environment through the provision of trash/recycling receptacles.

LOCATION KEY



MEETING GOALS

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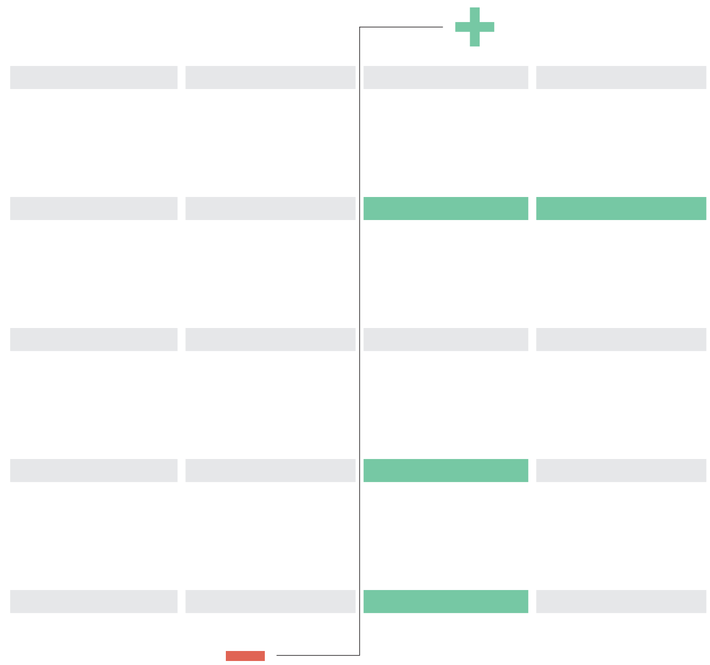


DESIGN CONSIDERATIONS

/ Consistency with NACTO recommended design measures

/ Sidewalk space constraints

/ Pedestrian-scale lighting in addition to overhead lighting for vehicles

/ Seating designed into existing structures or placed within the frontage zones

/ Adequate lighting beneath scaffolding and other construction sites

/ Using permeable metal shutters on storefronts at night, where security concerns exist, to protect and preserve amenities

TYPICAL APPLICATIONS

/ Where there are significant pedestrian volumes and minimal space constraints, threats to personal safety, lacking pedestrian sightlines, and access to local amenities

/ Where amenities would not compromise mobility and space for elderly pedestrians, mobility-impaired users, and adults with strollers

/ Where businesses and pedestrians would benefit from pedestrian-scale design, such as commercial corridors

/ Where high traffic speeds and volumes may make pedestrians feel unsafe and avoid walking

COST RANGE

$$$$$

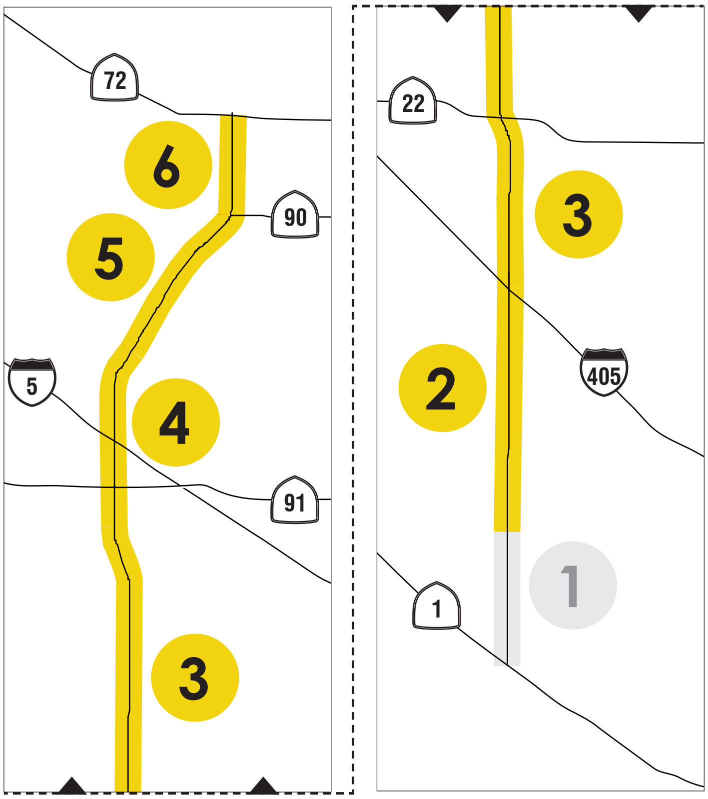
COORDINATION NEEDED

U	P	O	B
Utilities	Adjacent Private Property Owners	OCTA Transit	Adjacent Businesses

REMOVE SIDEWALK OBSTRUCTIONS

Sidewalks are how the majority of pedestrians access routes and should provide a continuous path that connects pedestrians to accessible elements, spaces, and facilities. Minimum sidewalk clear widths should be kept free of all obstructions including utilities, furniture, signs and others. Removing sidewalk obstructions improves pedestrian experience, addresses the needs for users with limited mobility or users who are most vulnerable and ensures compliance with ADA guidelines.

LOCATION KEY



MEETING GOALS

1 Improve travel time, reliability and convenience of transit.

2 Reduce impediments to walking and biking along and across corridor.

3 Maintain vehicular throughput and access to and from regional freeways network.

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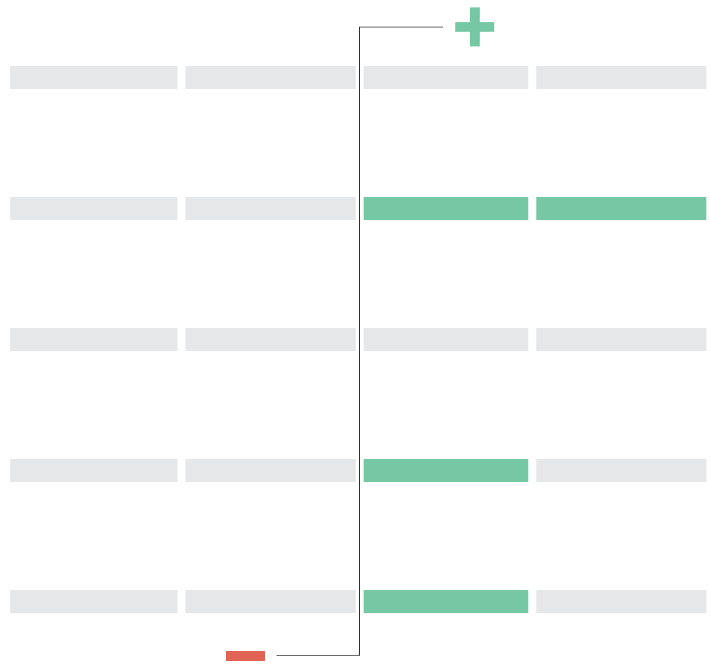


DESIGN CONSIDERATIONS

- / Consistency with the Caltrans Highway Design Manual and Standard Plans and local jurisdiction guidelines
- / Consistency with ADA guidelines
- / Continual maintenance of sidewalks
- / Cost to move or remove permanent obstructions obstacles i.e., utility boxes
- / Right-of-way availability to re-locate obstructions
- / Coordination across jurisdictional lines

TYPICAL APPLICATIONS

- / At locations where an obstruction interfere with the pedestrian clear path of travel

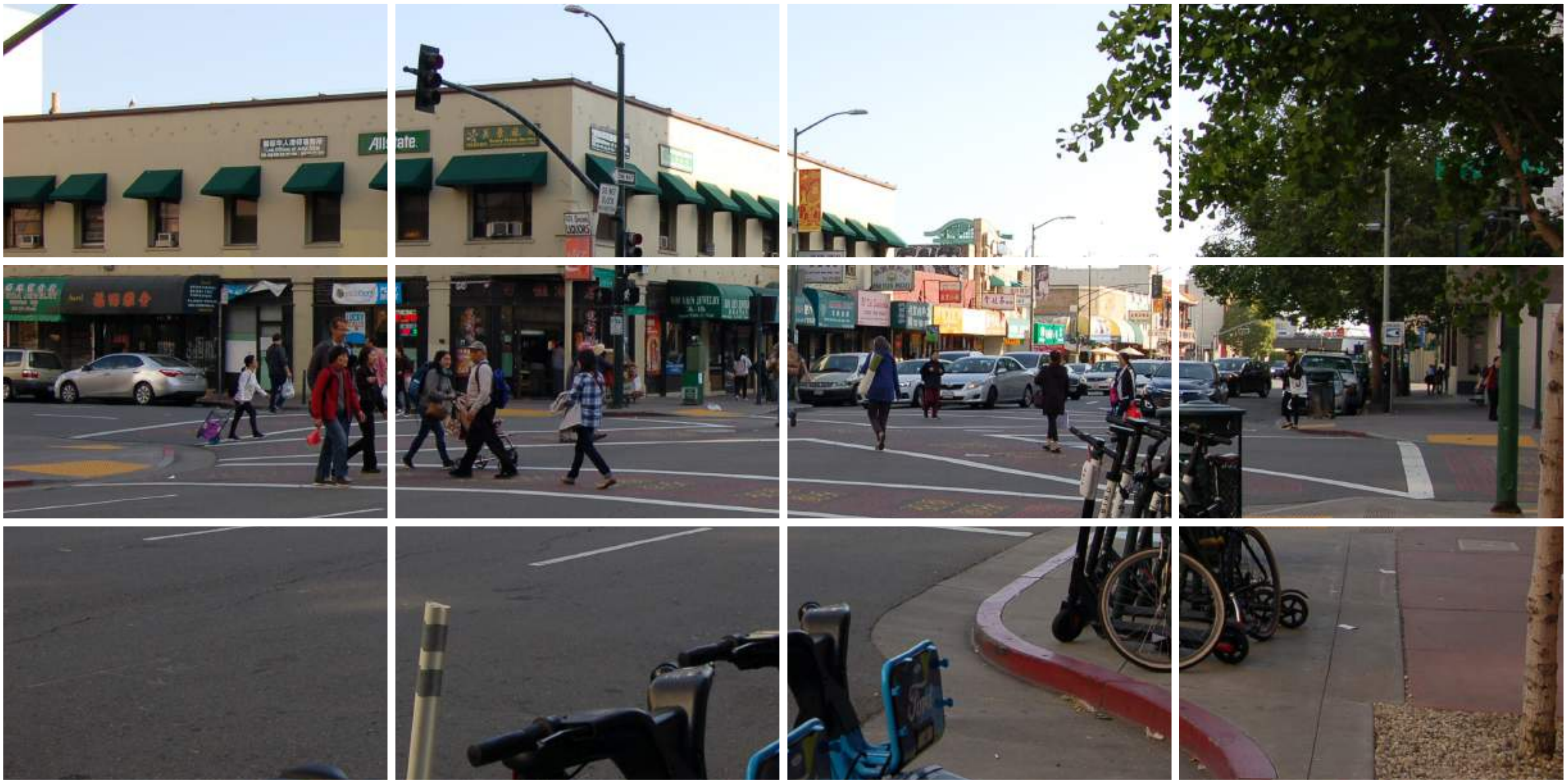
COST RANGE

$$$$$

COORDINATION NEEDED

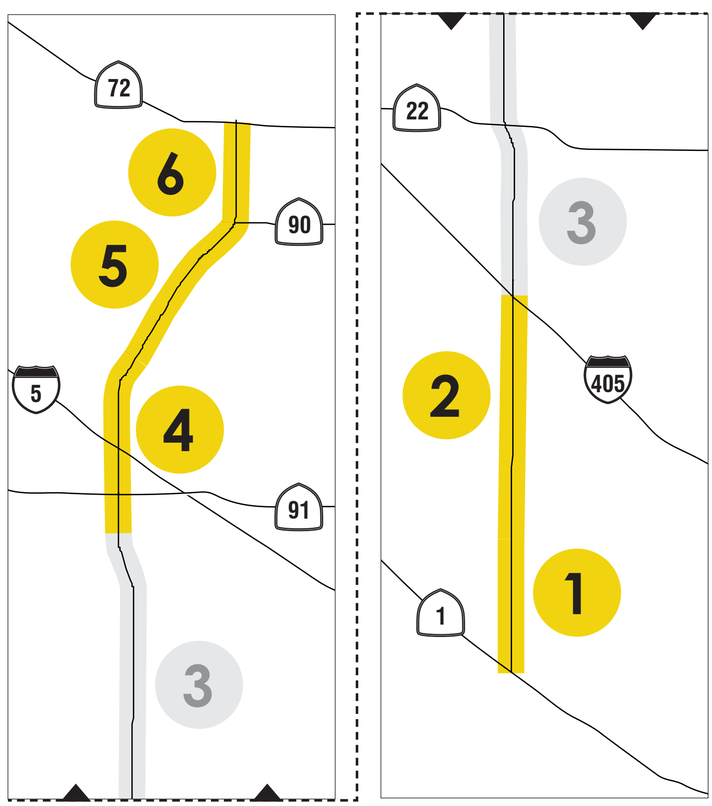
U	P	O	B
Utilities	Adjacent Private Property Owners	OCTA Transit	Adjacent Businesses

PEDESTRIAN SCRAMBLES



A pedestrian scramble crossing gives pedestrians an exclusive signal phase at an intersection during which all vehicle approaches are stopped. Crossing directions can include crossing diagonally which negates the need to cross twice to reach a destination. A pedestrian scramble phase reduces conflicts between motorist and pedestrians by isolating movements in separate signal cycles.

LOCATION KEY



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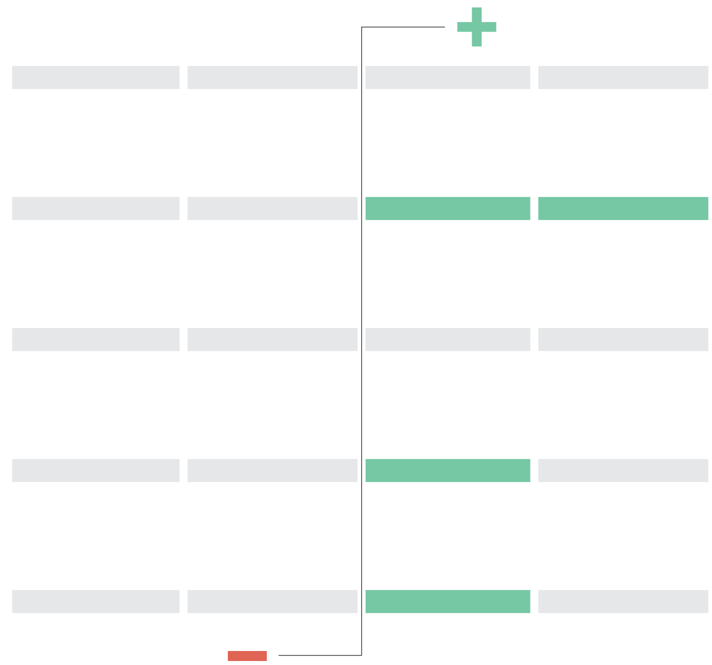


DESIGN CONSIDERATIONS

/ Consistency with ADA design guidelines

/ Consistency with the pedestrian facility design standards per the Caltrans Highway Design Manual and Standard Plans and local guidelines

/ Potential increase in pedestrian violations (pedestrians crossing on "do not walk symbol")

/ Trade-off in increased wait times for all intersection users

/ Potential confusion for visually impaired pedestrians who rely on traffic sounds to cross

/ Potential to affect the ability to synchronize timing at adjacent traffic signals

TYPICAL APPLICATIONS

/ Where high pedestrian volumes conflict with high volume vehicle turning movements

/ Where a high number of pedestrians cross the intersection twice

COST RANGE

$$$$$

COORDINATION NEEDED

U Utilities

P Adjacent Private Property Owners

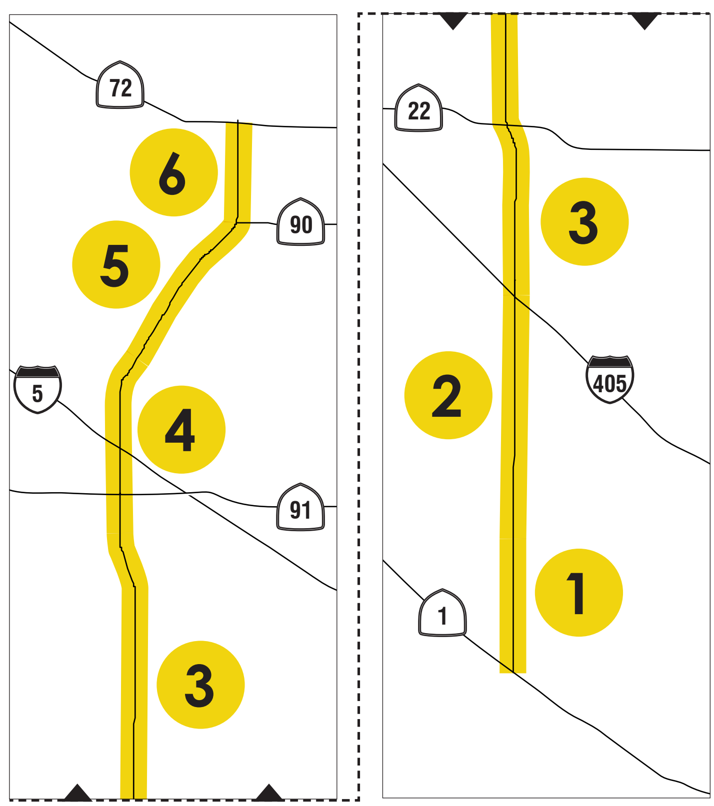
O OCTA Transit

B Adjacent Businesses

PEDESTRIAN REFUGE ISLANDS

A pedestrian refuge island splits the crossing journey into two steps which can make it more manageable and safer for those crossing. Pedestrian refuge islands are valuable at both signalized and unsignalized intersections and midblock crossings especially along high-volume and/ or high-speed corridors. Pedestrians can cross with less exposure to vehicles when able to concentrate on only one direction of the roadway and wait partially through their crossing on a refuge island. Crossing a shorter distance is also beneficial for those with reduced mobility.

LOCATION KEY



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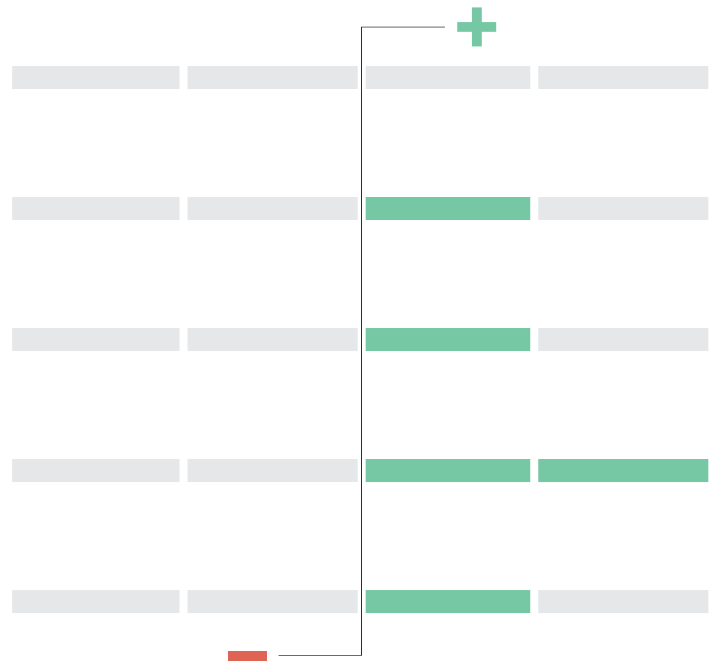


DESIGN CONSIDERATIONS

/ Consistency with Caltrans Highway Design Manual and Standard Plans and local guidelines

/ Consistency with NACTO's Urban Street Design Guide's critical design guidelines

/ Consideration of NACTO's Urban Street Design Guide's recommended design guidelines

/ Right-of-way requirements of at least 6 feet for a refuge island

/ Installation of pedestrian push button on the refuge island as needed

/ Cost to install and maintain

TYPICAL APPLICATIONS

/ Where roads have four or more lanes with speed limits are 35 mph or higher and/or high traffic volumes

/ Where pedestrians crossing high-capacity signalized intersections would benefit from a refuge island

/ Where pedestrians with reduced mobility are frequently crossing wide and busy roads

COST RANGE

$$$$$

COORDINATION NEEDED

U Utilities

P Adjacent Private Property Owners

O OCTA Transit

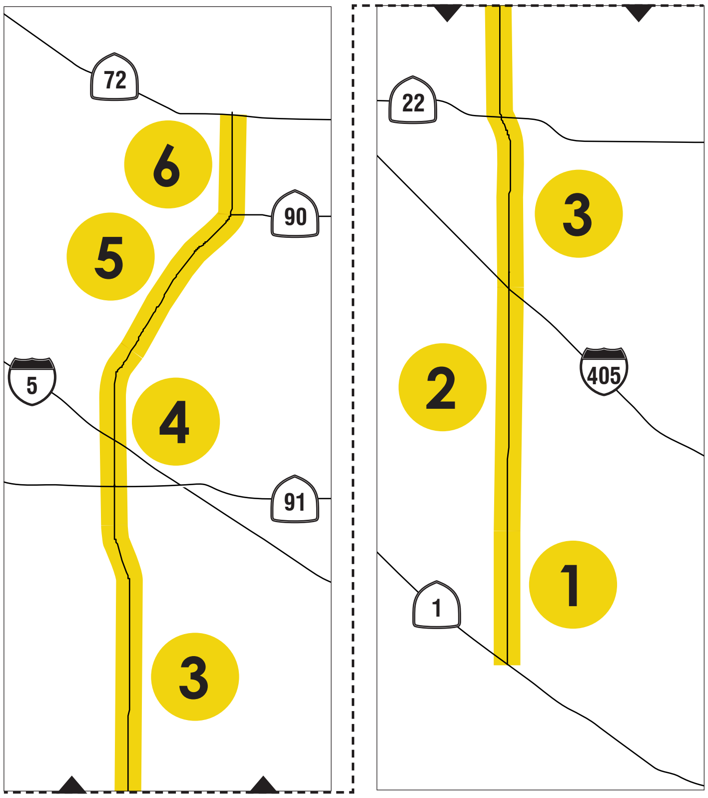
B Adjacent Businesses

CORNER OR SIDEWALK BULBS


Source: NACTO Urban Street Design Guide

Curb extensions extend the line of the curb into the roadway, reducing the width of the street, and typically are used at pedestrian crossing locations. Curb or sidewalk bulbs can increase the visibility of pedestrians, reduce crossing distances, and slow vehicle turning speeds. Curb extensions have been shown to improve safety and reduce the number of pedestrian-involved collisions.

LOCATION KEY



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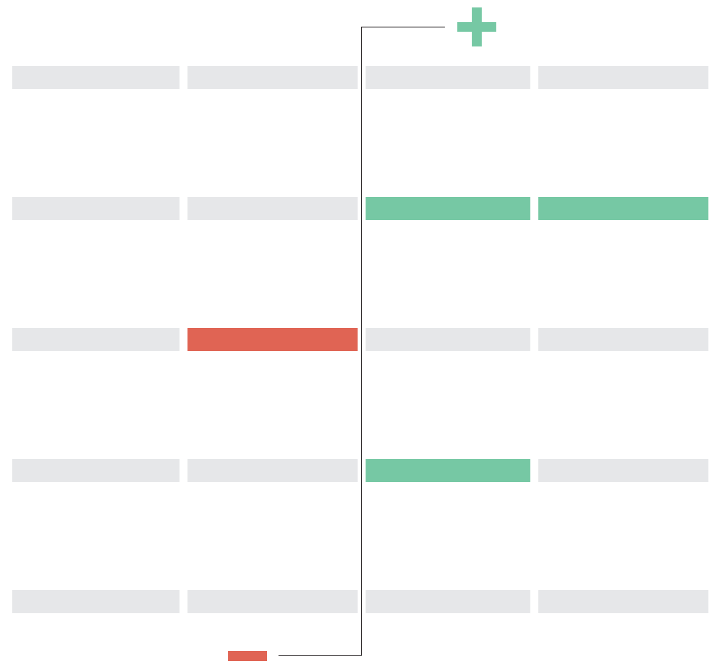


DESIGN CONSIDERATIONS

- Consistency with Caltrans Highway Design Manual and Standard Plans and local guidelines
- Consistency with the NACTO Global Street Design Guide
- Right-of-way requirements for adding corner or sidewalk bulbs
- May affect drainage and utility access

TYPICAL APPLICATIONS

- Where on-street parking and high pedestrian crossing demand exists
- Where pedestrians could benefit from slower vehicle turning speeds and increased visibility
- At mid-block crossing locations to reduce pedestrian crossings times and improve visibility

COST RANGE

$$$$$

COORDINATION NEEDED

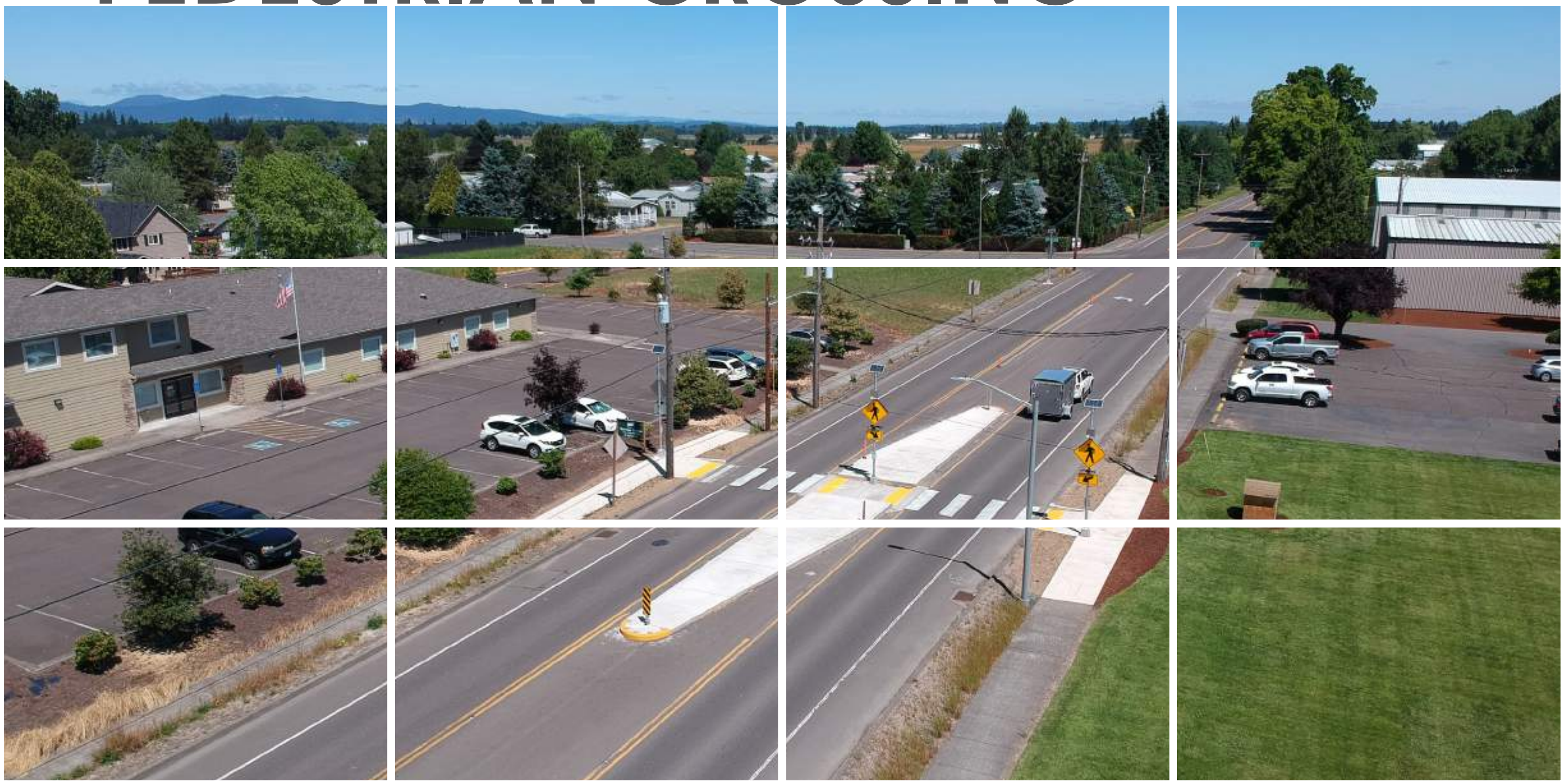
U Utilities

P Adjacent Private Property Owners

O OCTA Transit

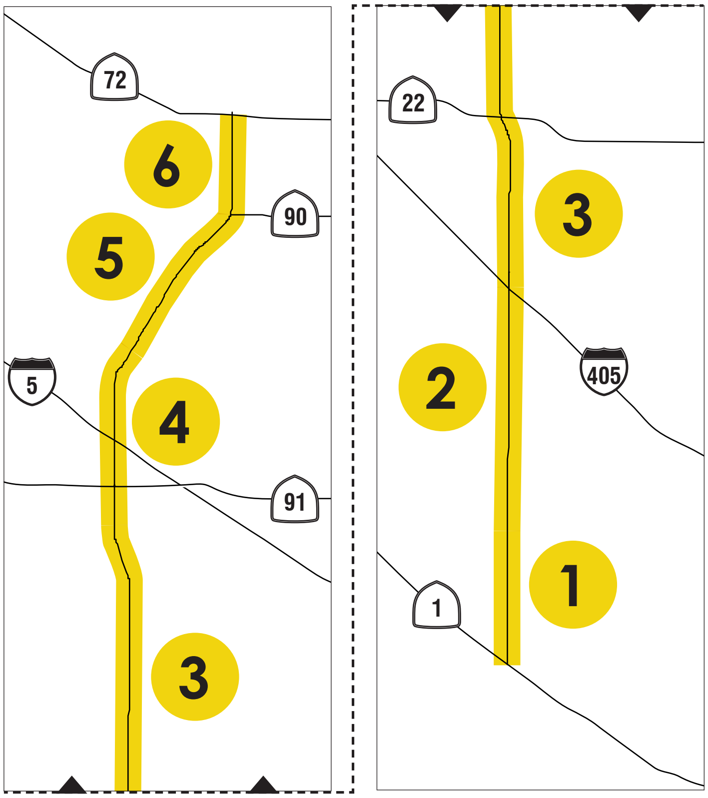
B Adjacent Businesses

MID-BLOCK SIGNALIZED PEDESTRIAN CROSSING



Along busy streets with multitude of destinations along each side and long block lengths, pedestrians may seek to cross mid-block than walk the additional distance to the nearest signalized intersection. To improve pedestrian safety, the installation of signalized mid-block crossings could be beneficial to pedestrian safety and improve convenience. Mid-block locations are often controlled by pedestrian hybrid beacons, or are tied into new traffic signals. Signalized mid-block crossings are most valuable on multi-lane arterial streets with high traffic volumes and speeds with distances between signals from before 0.25 to 0.5 miles.

LOCATION KEY



MEETING GOALS

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2. Reduce impediments to walking and biking along and across corridor.
3. Maintain vehicular throughput and access to and from regional freeways network.
4. Provide a safe and accessible environment for all user groups.
5. Support local land use planning with improved mobility options.

DESIGN CONSIDERATIONS

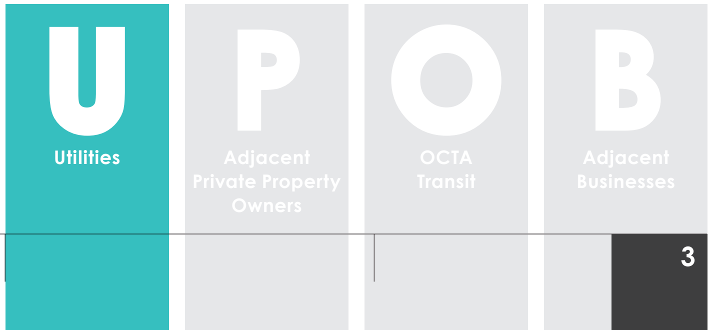
- Consistency with the California MUTCD
- Consistency with ADA guidelines
- Consistency with Caltrans Highway Design Manual and Standard Plans and local guidelines
- Ensuring vehicles stop for flashing lights
- Cost of installing signalization if connections required to adjacent signals
- Designing a highly visible crosswalk to ensure pedestrian safety

TYPICAL APPLICATIONS

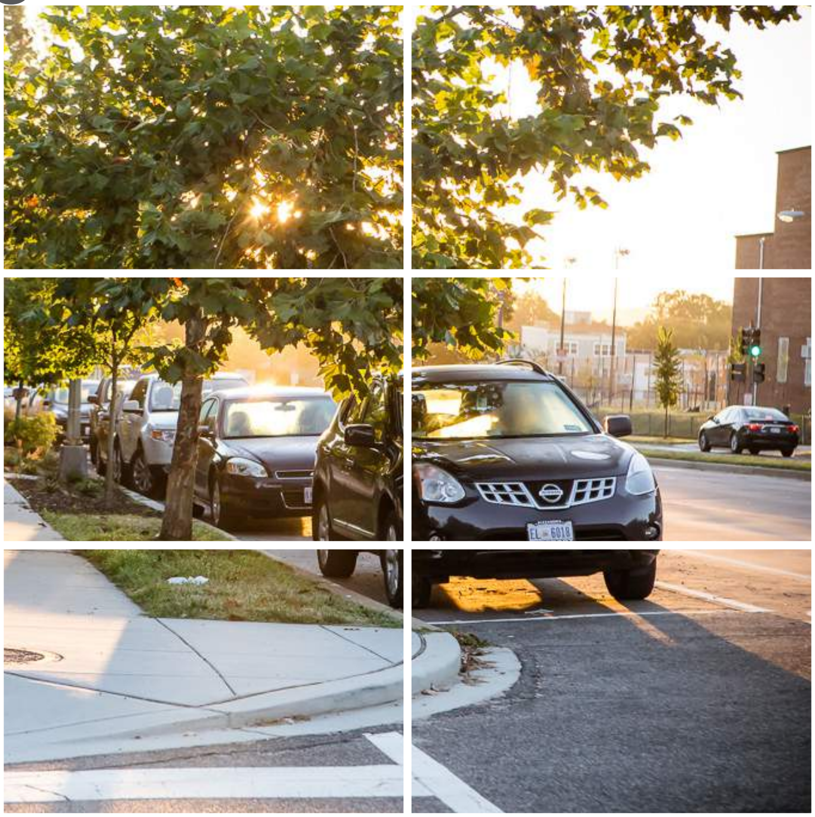
- Where midblock crossings are warranted by either pedestrian volume, distance between signalized crossings, or land use / destinations
- Where the traffic volume on a major street leads to excessive delay for pedestrians
- Where instances of jaywalking are frequently observed
- Where collisions with vehicles and pedestrian crossing incidents occur

COST RANGE

COORDINATION NEEDED

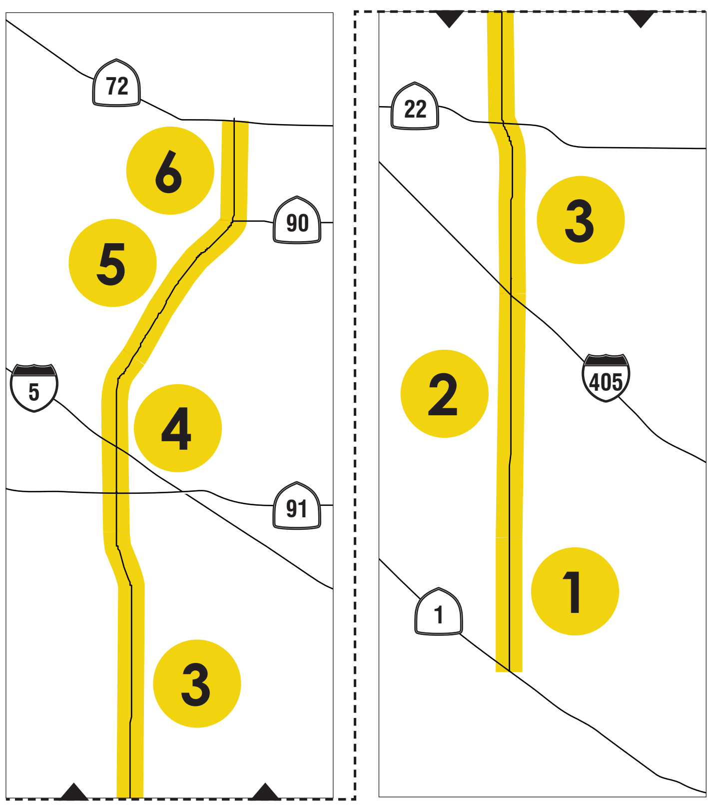


ON-STREET PARKING OR LOADING ZONES



The addition of on-street parking can be used to improve the street pedestrian environment. Parking lanes narrow the travel right-of-way, which can slow down traffic as well as reducing crossing distances for pedestrians. On-street parking can also act as a buffer between traffic and pedestrians on the sidewalk. Parking can also be good for businesses and improve neighborhood connectivity and allow space for commercial deliveries.

LOCATION KEY



MEETING GOALS

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DESIGN CONSIDERATIONS

/ Consistency with Caltrans Highway Design Manual and Standard Plans and local guidelines

/ Consistency of parking system design across jurisdictional lines

/ Consideration of payment systems for paid parking options

/ Effect of travel lane reduction on vehicle throughput and congestion

/ Additional design features required to mitigate visual barrier between pedestrians and oncoming traffic during crossing

/ Cost to implement and maintain parking along the corridor including parking payment systems and additional safety design features

TYPICAL APPLICATIONS

/ Throughout the Project Corridor especially in locations with storefronts and residential adjacent to the Project Roadway

COST RANGE

COORDINATION NEEDED

U
Utilities

P
Adjacent Private Property Owners

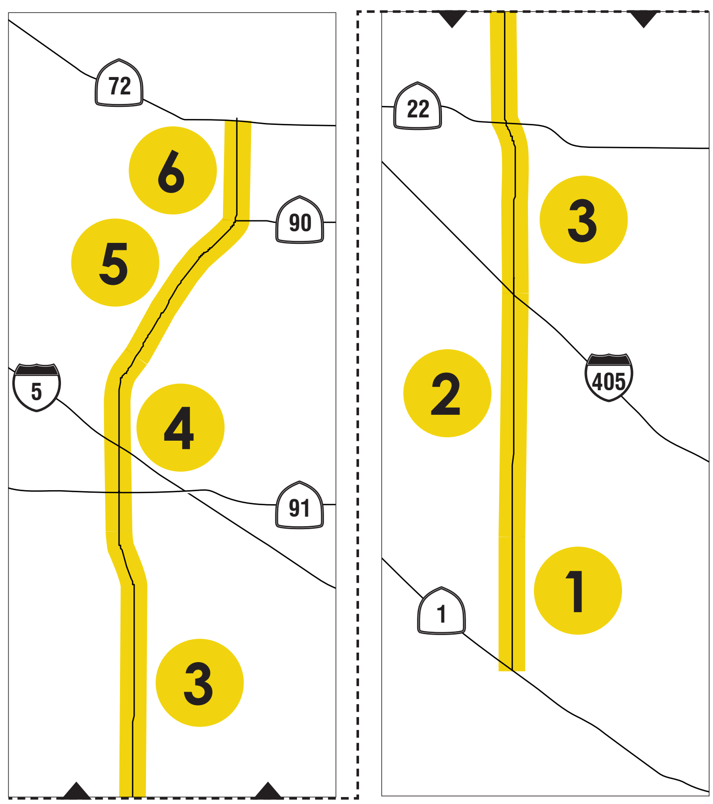
O
OCTA Transit

B
Adjacent Businesses

BIKE ON SIDEWALK TREATMENTS

Allowing bicyclists to ride on the sidewalk can improve safety and security for cyclists and reduce the potential for conflict between bikes and motorists in the vehicle right-of-way. Bike on sidewalk allowance would also provide bikeway continuity along high speed or heavily traveled roadways with inadequate space for bicyclists. Due to the increased potential for pedestrian-bicyclist collisions on the sidewalk, a form of indication or signage would be necessary to distinguish where people cycling travel and where people walking travel and to warn vehicles to look both ways for bikes.

LOCATION KEY



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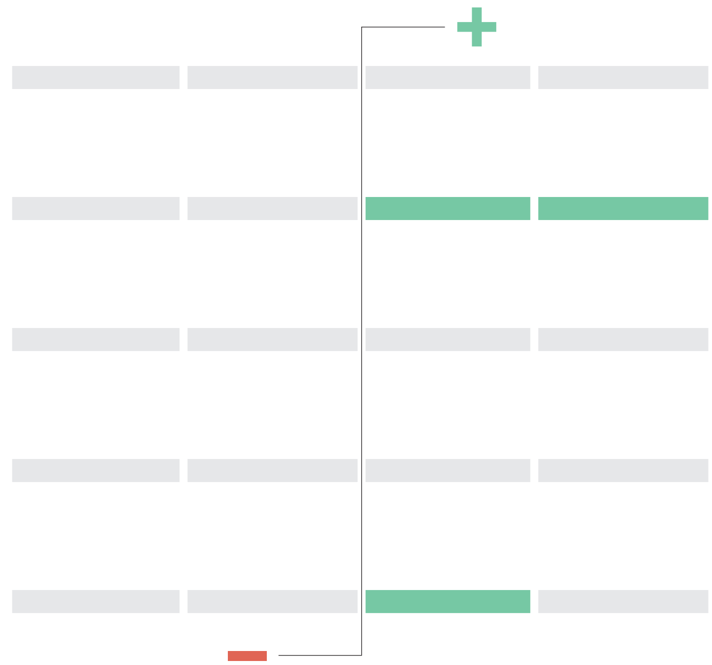


DESIGN CONSIDERATIONS

/ Consistency with Caltrans Highway Design Manual and Standard Plans and local guidelines

/ Consistency with ADA guidelines

/ Current laws in Orange County do not allow bicyclists on sidewalks

/ Potential increase in pedestrian and bicyclist collisions

/ Distinguishing pedestrian and bicyclist paths of travel

/ Right-of-way constraints

/ Maintenance of sidewalk facilities for bicyclists

/ Design to minimize the potential for vehicle and bicyclist collisions at driveways

TYPICAL APPLICATIONS

/ Where bike lanes are not available or cannot be provided

/ Where cyclists are not currently safe or comfortable riding in vehicle travel lanes

/ Where current or planned sidewalk widths would allow safe pedestrian/bicycle travel

/ To provide connections between east-west bicycle routes and major destinations

COST RANGE

$$$$$

COORDINATION NEEDED

U Utilities

P Adjacent Private Property Owners

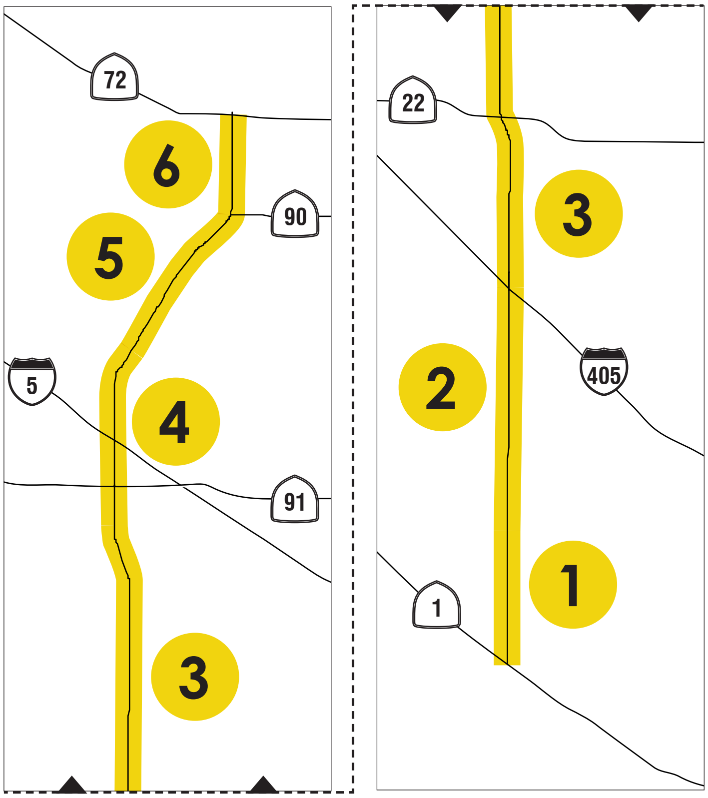
O OCTA Transit

B Adjacent Businesses

CLOSE GAPS IN BICYCLE NETWORK

Connected and consistent networks for bicycles are important for enabling a comfortable and direct trip for those traveling by bike and can encourage higher levels of bicycling. Well delineated and designed facilities for bicyclists can reduce conflict with pedestrians and motor vehicles. To accomplish good bicycle connectivity where the bike facility cannot be accommodated on the primary arterial, steps can be taken on parallel lower-traffic streets to provide a safer and continuous bicycle route. These bike facilities may be lower cost than implementing separated bike lanes along the primary arterial.

LOCATION KEY



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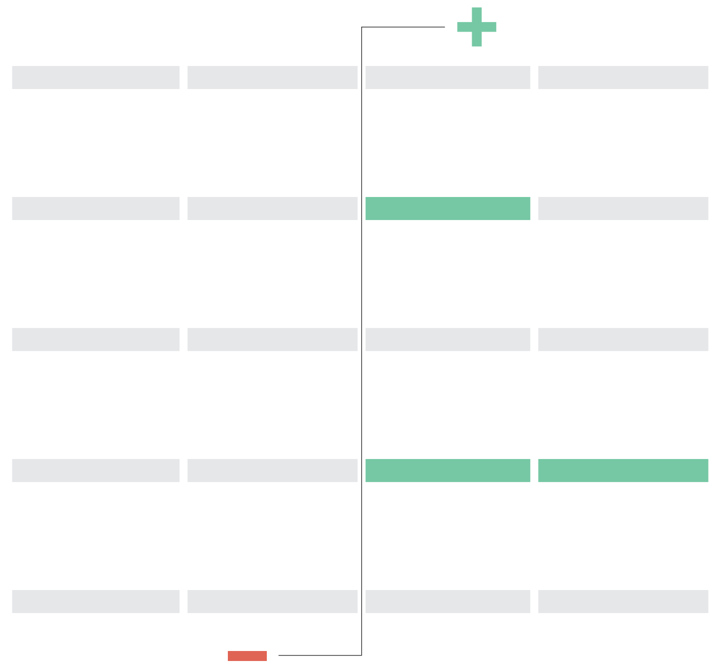


DESIGN CONSIDERATIONS

- Consistency with the California MUTCD and local jurisdiction guidelines
- Consistency with ADA guidelines
- Consistency with Caltrans, OCTA, and local bike plans and guidelines
- Selection of bikeways facility type within the context of the number or bicyclists and the street environment
- Wayfinding along route that runs along different streets
- Creating bicycle connection from parallel routes back over to Beach Boulevard for connections to destinations
- Coordination and continuation of routes across jurisdictional lines

TYPICAL APPLICATIONS

Primarily, on the following streets for parallel routes east and west of Beach Boulevard:

West Parallel Corridor

- Western Avenue
- Beach Boulevard between Pacific Avenue and La Habra Boulevard
- La Habra Boulevard
- Dexford Drive/Rigsby Street

East Parallel Corridor

- Newland Street
- Dale Street
- Stanton Avenue
- Beach Boulevard between Franklin Street and Lambert Road
- Lambert Road
- Idaho Street

COST RANGE

$$$$$

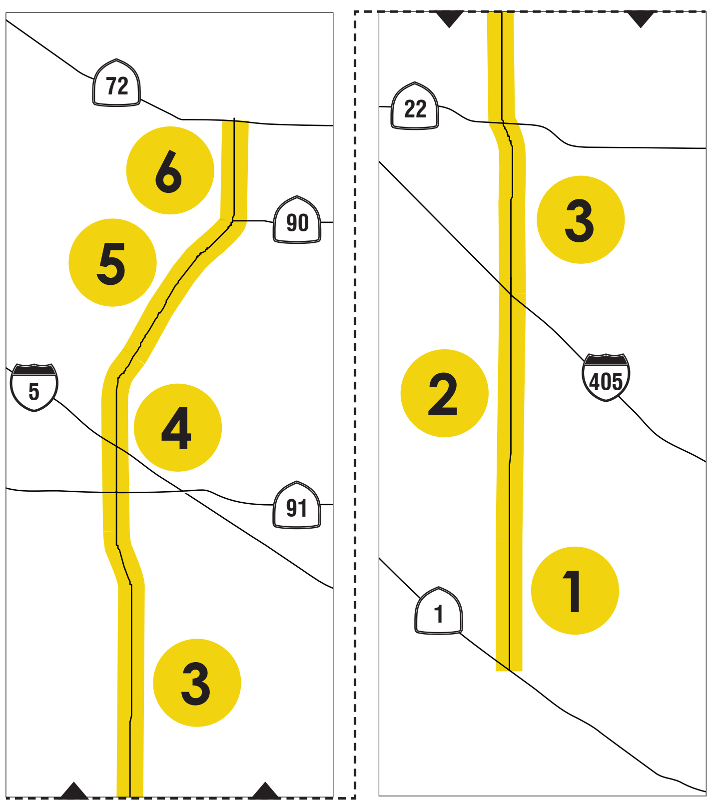
COORDINATION NEEDED

U	P	O	B
Utilities	Adjacent Private Property Owners	OCTA Transit	Adjacent Businesses

BIKE PREFERENTIAL TREATMENTS

Bicyclist-oriented improvements focus on implementing or improving bikeways along roads whereas bicyclist preferential treatments can help improve bicyclist comfort and safety and encourage bicycling for all ages and abilities. These treatments allow bicyclists to navigate stressful intersections and roadway segments. Treatments can reduce conflict points between bicyclists and other modes and improve bicyclist safety at intersections. A secondary affect of bike preferential treatments is an increase in bicycle ridership and utilization of bike facilities along roads such as bike lanes.

LOCATION KEY



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DESIGN CONSIDERATIONS

/ Consistency with California MUTCD, Caltrans Highway Design Manual and Standard Plans and local guidelines

/ Consistency with NACTO guidance

/ Consistency with Caltrans, OCTA, and local active transportation plans

/ Potential need for right-of-way

/ Updates to and maintenance of signal timing to incorporate protected bike signal and/or leading bike intervals

/ Potential increase in vehicular delay

TYPICAL APPLICATIONS

/ Where bicyclist-involved collisions are frequently observed

/ Where bicyclist does not feel safe and comfortable to navigate through intersections

/ Where the utilization of bike facilities along roads is low

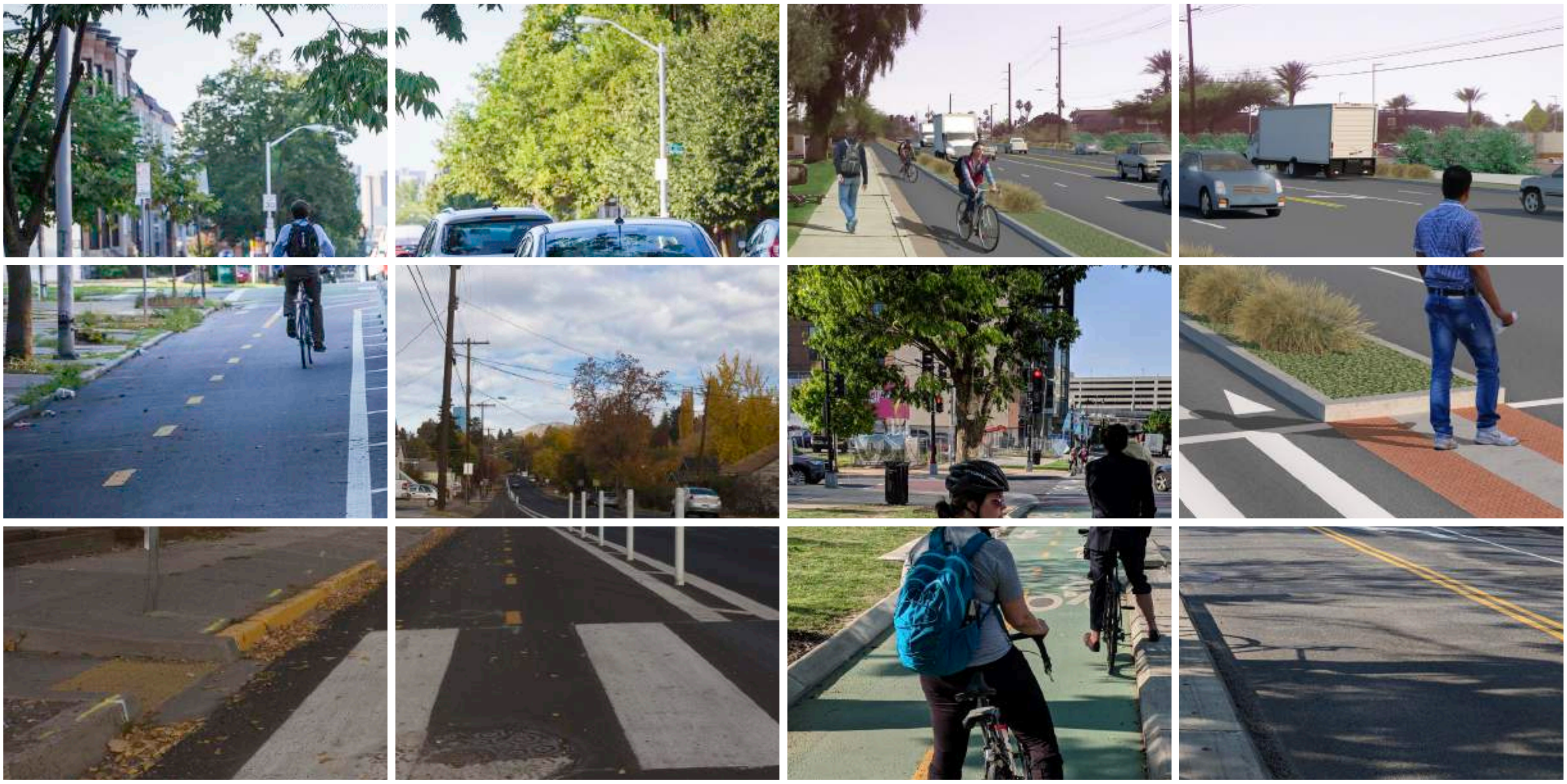
COST RANGE

$$$$$

COORDINATION NEEDED

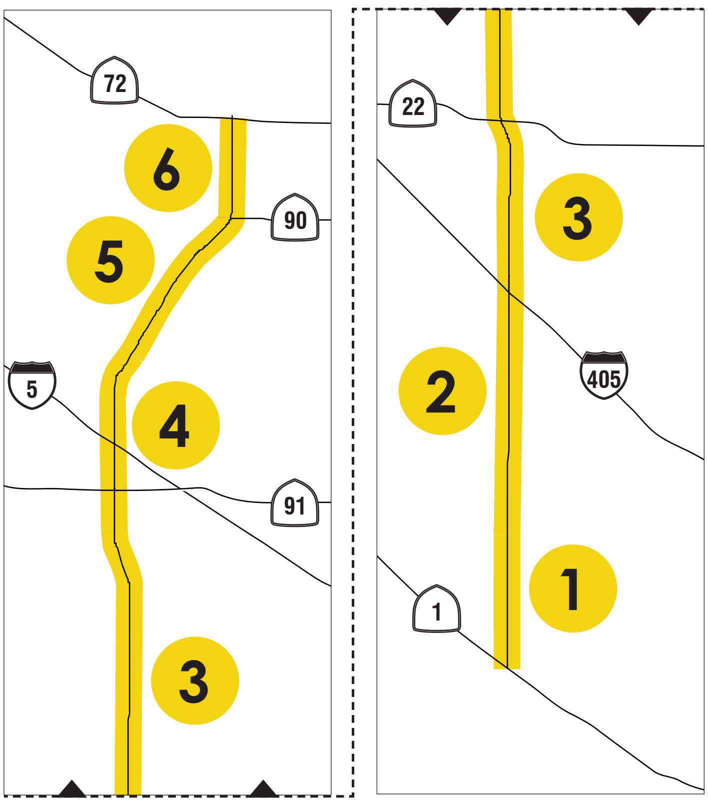
U	P	O	B
Utilities	Adjacent Private Property Owners	OCTA Transit	Adjacent Businesses

PROTECTED BIKE LANES



Protected bike lanes are facilities exclusively for bicyclists that are within or directly adjacent to the roadway but have an element of physical separation from vehicle traffic. By separating bicyclists from traffic, bikeways become low-stress and safer for bicyclists. They have the potential to improve traffic safety for all street users and can increase the volumes of those bicycling. Protected bike lanes can also improve access to community destinations and transit.

LOCATION KEY



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DESIGN CONSIDERATIONS

/ Consistency with the Caltrans, OCTA, and local jurisdiction plans active transportation

/ Educating and building community support for separated bike lanes

/ Designing for bicycle safety at intersections

/ Cost to implement and maintain

/ Coordination and continuation of facility across jurisdictional lines

/ Additional right-of-way may be required

TYPICAL APPLICATIONS

/ Where right-of-way is available

/ At locations with a high demand for bicycle activity

/ Where there are high corridor speeds that warrant separated facilities

COST RANGE

COORDINATION NEEDED

U Utilities

P Adjacent Private Property Owners

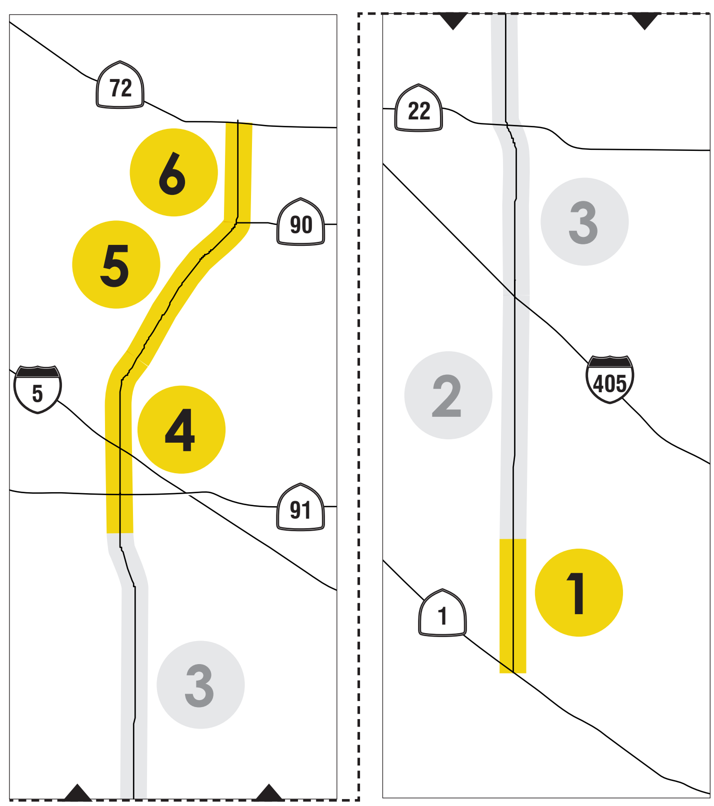
O OCTA Transit

B Adjacent Businesses

ON-STREET PARKING OR LOADING ZONES REMOVAL

On-street parking zones (for short-term parking, handicapped parking, passenger loading, or deliveries) can provide an amenity for users and a buffer for pedestrians along adjacent sidewalks. However, their presence can negatively affect local traffic operations at high-turnover locations, due to the friction caused by vehicles entering and exiting parking spaces. In addition, high-demand spaces can result in increases in traffic volumes due to vehicles circling while looking for available parking spaces. The elimination of on-street parking can therefore improve circulation conditions and vehicular throughput. In addition, the presence of on-street parking can affect visibility issues for crossing pedestrians, delay transit operations, and result in increase conflicts with adjacent bicycle facilities.

LOCATION KEY



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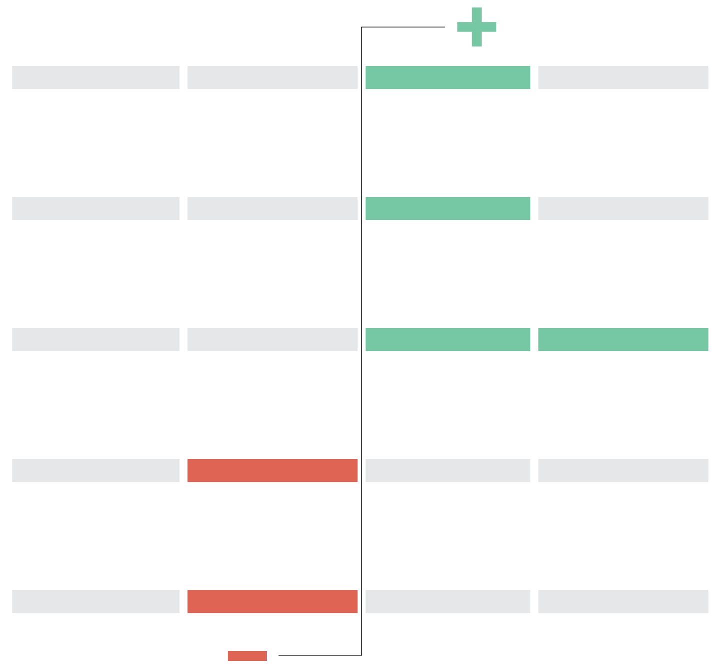


DESIGN CONSIDERATIONS

/ Consistency with the Caltrans Highway Design Manual and Standard Plans and local jurisdiction guidelines

/ Eliminates parking spaces for convenient parking by business patrons

/ Usually opposed by adjacent business owners

/ Removal of buffer between travel lanes and pedestrians

/ Loss of city revenue with metered parking removal

/ Can result in double-parking or parking/stopping in illegal spaces.

SPECIFIC APPLICATIONS

/ Where parking maneuvers cause significant delay and congestion

/ Where parking maneuvers create safety concerns for pedestrian, bicyclists, and through traveling vehicles

/ Current on-street parking or loading zones are at the following locations

  / Generally from SR 1 to Ellis Avenue

  / Generally from Hillsborough Drive to SR 72

COST RANGE

COORDINATION NEEDED

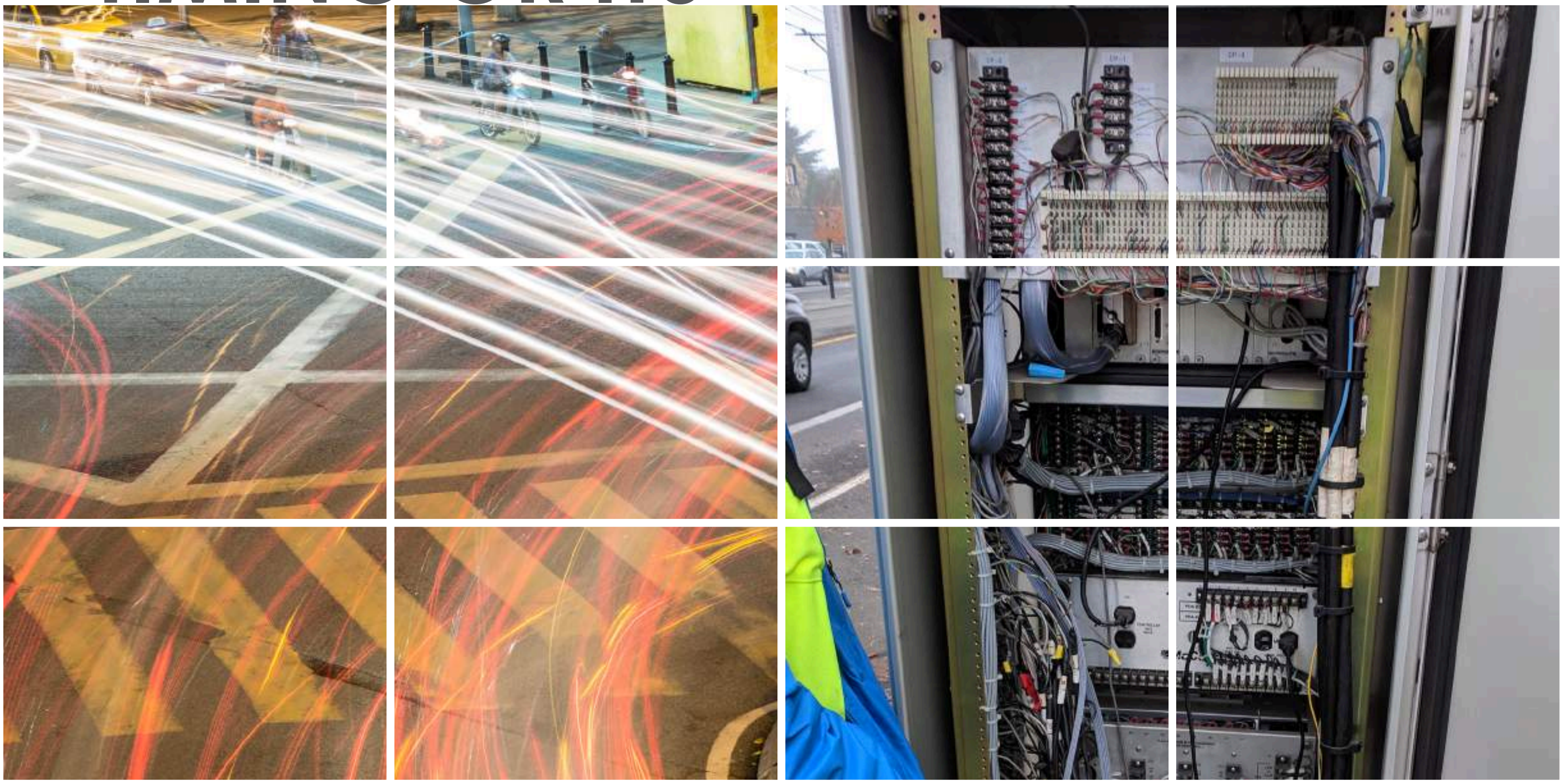
U Utilities

P Adjacent Private Property Owners

O OCTA Transit

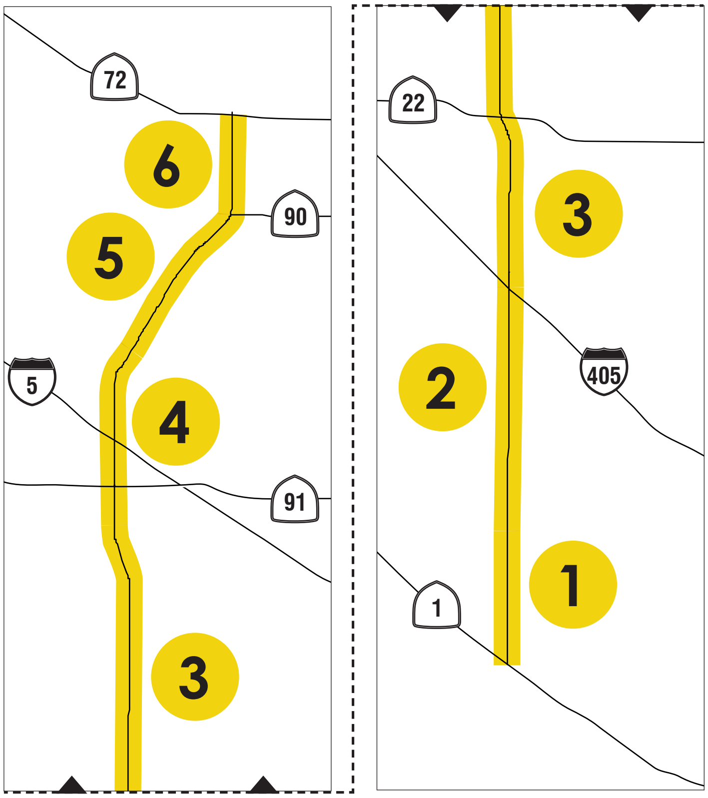
B Adjacent Businesses

ADVANCED TRAFFIC SIGNAL TIMING OR ITS



Implementation of advanced traffic signal timing and intelligent transportation systems can reduce stops, vehicle delays, travel time, fuel consumption, and emissions. In addition to the operational benefits, signal coordination can also reduce vehicle conflicts, particularly rear-end collisions, as vehicles tend to move more in platoons from intersection to intersection. Implementation would require an interconnected system and integration into a traffic management center.

LOCATION KEY



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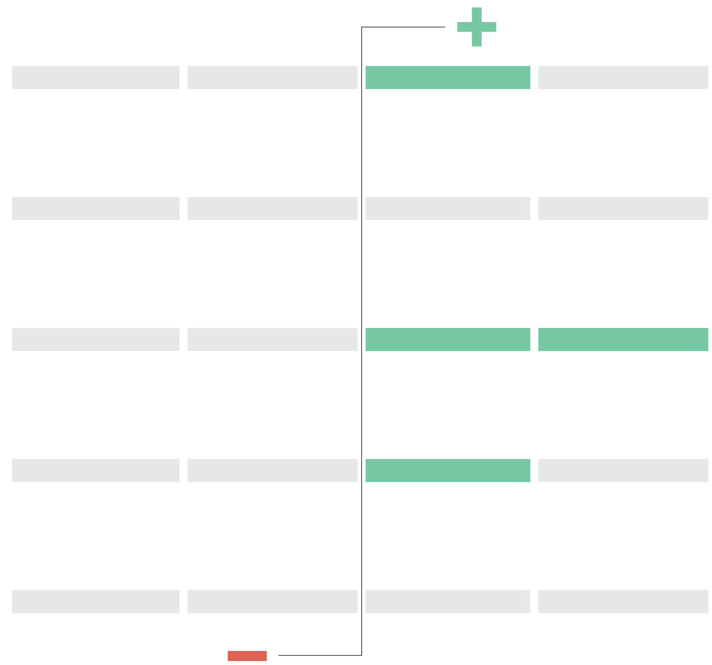


DESIGN CONSIDERATIONS

/ Consistency with Caltrans, OCTA, and local signal timing guidance and operational goals

/ Most effective if implemented along long segments of roadway

/ Required periodical signal timing plan updates

/ Potential for longer pedestrian and side-street delays due to longer cycle lengths

/ Cost to install and maintain new traffic signals and operate traffic control centers

TYPICAL APPLICATIONS

At the following locations:

/ Where traffic delay and congestion occurs

/ Where distances between intersections are less than 0.5 miles

COST RANGE

$$$$$

COORDINATION NEEDED

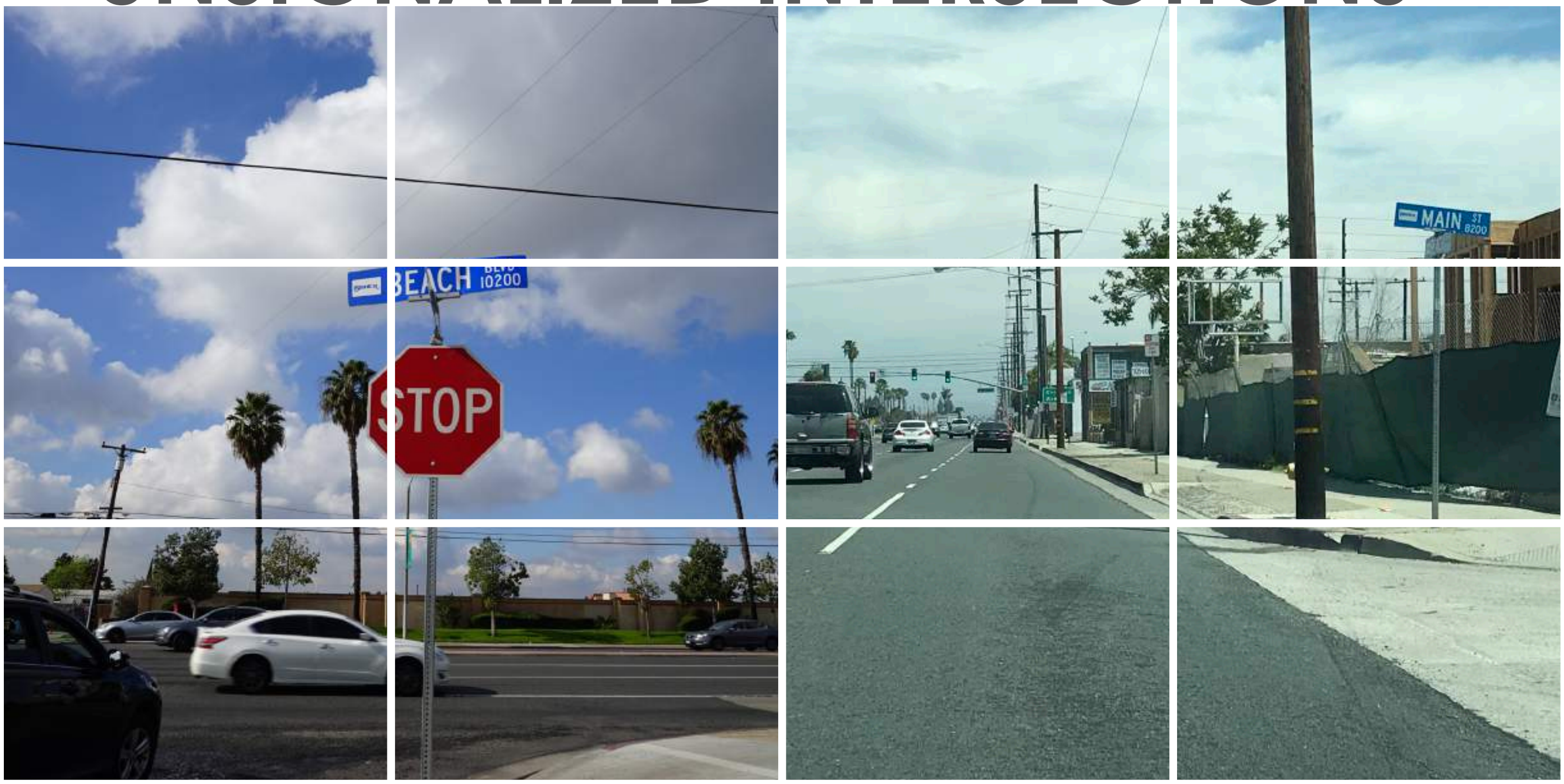
U Utilities

P Adjacent Private Property Owners

O OCTA Transit

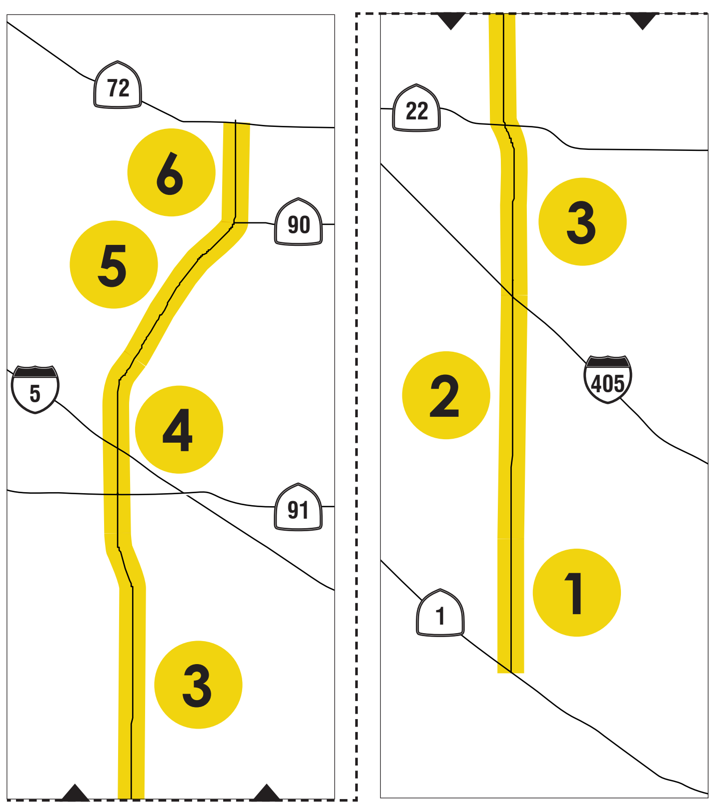
B Adjacent Businesses

CONSOLIDATE MID-BLOCK UNSIGNALIZED INTERSECTIONS



Consolidation of mid-block unsignalized intersections can reduce vehicle conflict points which can reduce localized congestion and increase speeds and travel times. In addition, the elimination of intersections can reduce collision rates for turning vehicles. At the consolidated locations, new traffic signals can be provided which would increase safety and allow for the provision of additional crosswalk locations.

LOCATION KEY



MEETING GOALS

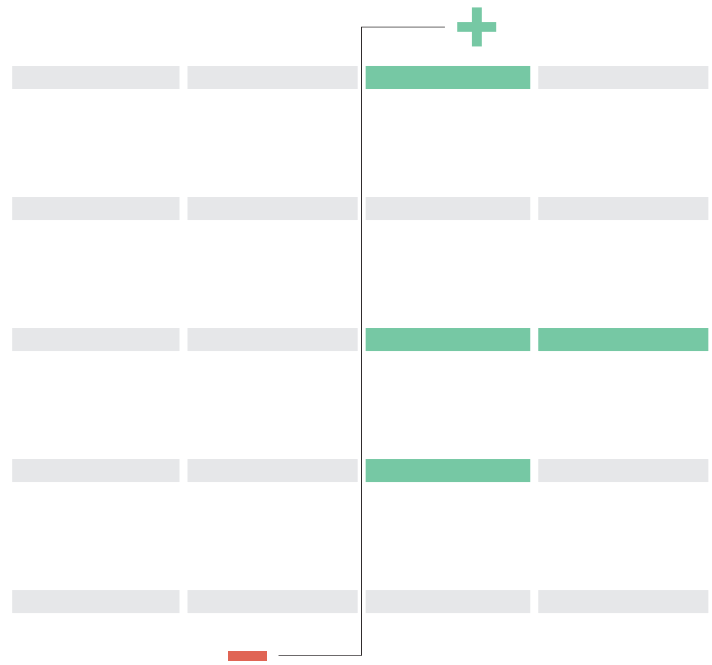
1 Improve travel time, reliability and convenience of transit.

2 Reduce impediments to walking and biking along and across corridor.

3 Maintain vehicular throughput and access to and from regional freeways network.

4 Provide a safe and accessible environment for all user groups.

5 Support local land use planning with improved mobility options.



DESIGN CONSIDERATIONS

/ Consistency with Caltrans Highway Design Manual and Standard Plans and local guidelines

/ Increase in u-turn movements at upstream/ downstream intersections

/ Increase in delay at upstream or downstream intersections

/ Maintain access to all land parcels

/ Signalization needed at consolidated intersections, including pedestrian crossings

TYPICAL APPLICATIONS

/ Where unsignalized intersections are close to signalized intersections

/ Where corridors speed is 45 mph or greater and whose primary purpose is mobility

/ Where collisions are frequently observed at non-signalized intersections or driveways

/ Where left turns increase delays and decrease accessibility of driveways

COST RANGE

$$$$$

COORDINATION NEEDED

U Utilities

P Adjacent Private Property Owners

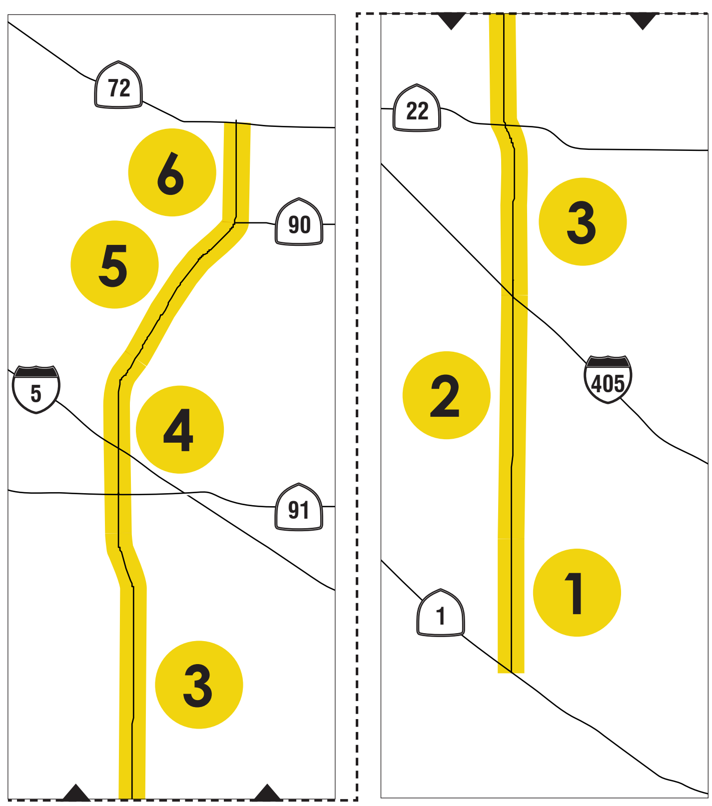
O OCTA Transit

B Adjacent Businesses

ACCESS MANAGEMENT

Access management is the proactive management of vehicular access to land parcels adjacent to roadways. Access management encompasses a set of techniques to control access to highways, major arterials, and other roadways. Access management can reduce congestion and improve overall traffic flow and travel time as well as increase roadway capacity. It can reduce vehicle and pedestrian conflict points thereby reducing the number of collisions. Typically, this involved consolidating access points to reduce the number of driveways and curb-cuts.

LOCATION KEY



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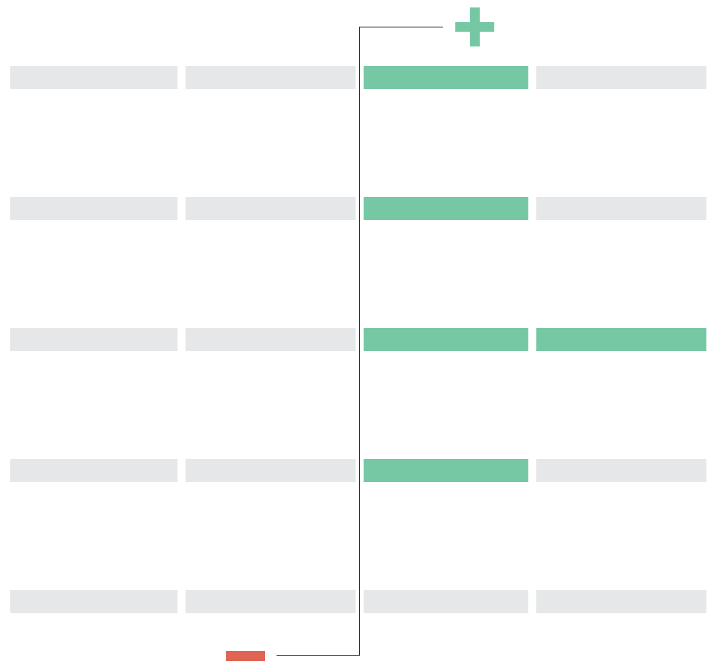


DESIGN CONSIDERATIONS

- Consistent approach to development project review between Caltrans and local jurisdictions
- Manage driveway access based on the feasible access between two signalized intersection
- Maintain access to all land parcels
- May not be acceptable to property owners

TYPICAL APPLICATIONS

- Where access points are close to signalized intersections
- Where driveways are closely spaced
- Where shared access can be provided

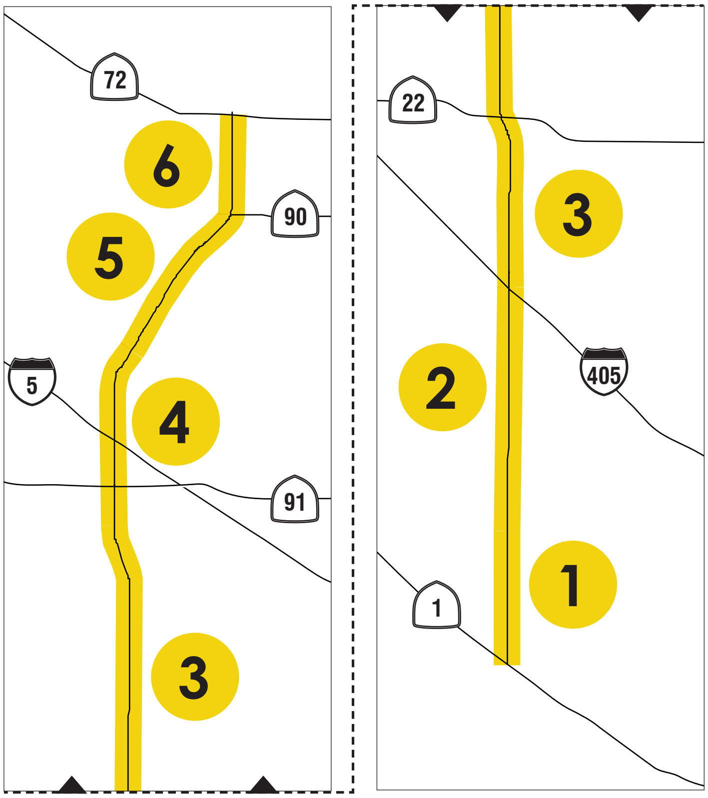
COST RANGE

COORDINATION NEEDED

ACTIVE TRAFFIC MANAGEMENT

Active traffic management (ATM) is the ability to dynamically manage recurrent and non-recurrent congestion based on prevailing and predicted traffic conditions. ATM tools help maximize the effectiveness and efficiency of the corridor and enhance trip reliability. ATM approaches focus on influencing travel behavior with respect to lane choices and operations. Various ATM strategies can be deployed concurrently to meet system-wide needs of congestion management, traveler information, and safety. ATM can increase corridor travel speeds and trip reliability increasing throughput and can also reduce the number of collisions due to slowed or stopped traffic.

LOCATION KEY



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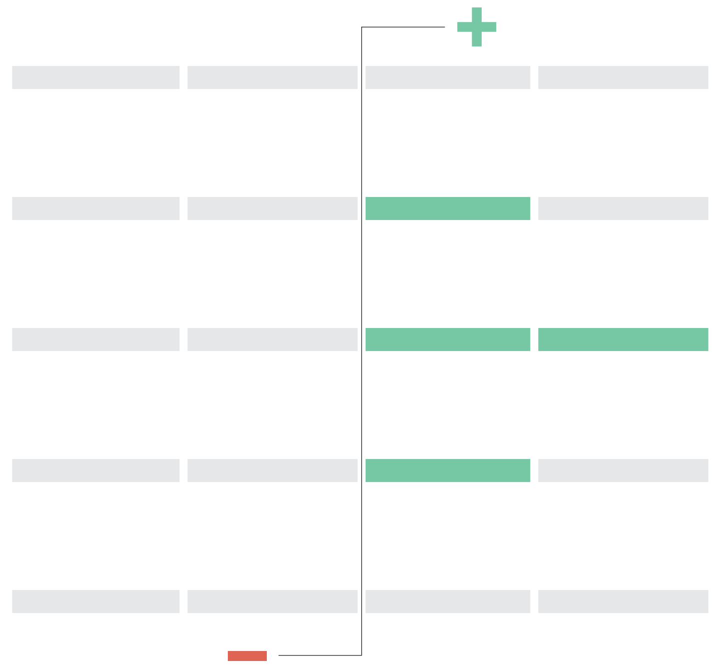


DESIGN CONSIDERATIONS

/ Consistency with the FHWA ATM implementation and operations guide

/ Consistency with Caltrans, OCTA, and local guidelines

/ Cost to implement active traffic management strategies

/ May result in additional traffic on parallel routes due to detours or temporary rerouting of vehicles

TYPICAL APPLICATIONS

During periods with high congestion caused by:

/ Freeway on- and off-ramps

/ Near ramps

/ Due to construction

/ Due to an accident

/ Due to events

COST RANGE

$$$$$

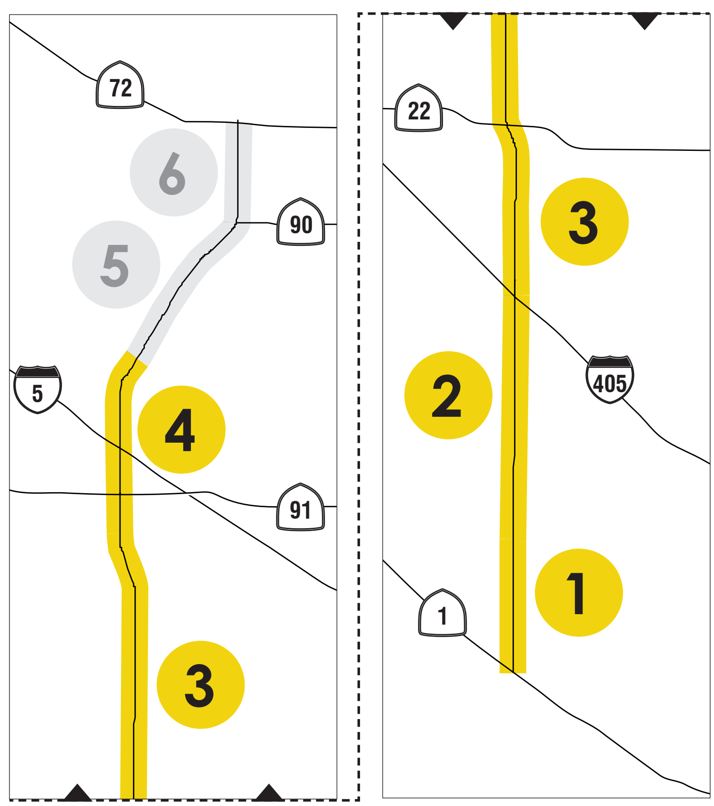
COORDINATION NEEDED

U	P	O	B
Utilities	Adjacent Private Property Owners	OCTA Transit	Adjacent Businesses

PEDESTRIAN BRIDGES

Pedestrian bridges are typically provided in areas of high pedestrian volumes crossing streets with high vehicular volumes. By separating the crossing pedestrians, pedestrian/vehicular conflicts can be eliminated which can improve conditions for roadway and transit operations (by eliminating pedestrian signal phases). Adequate areas at the end of the bridges are needed to accommodate bridge access, via stairs, ramps and/or elevators.

LOCATION KEY



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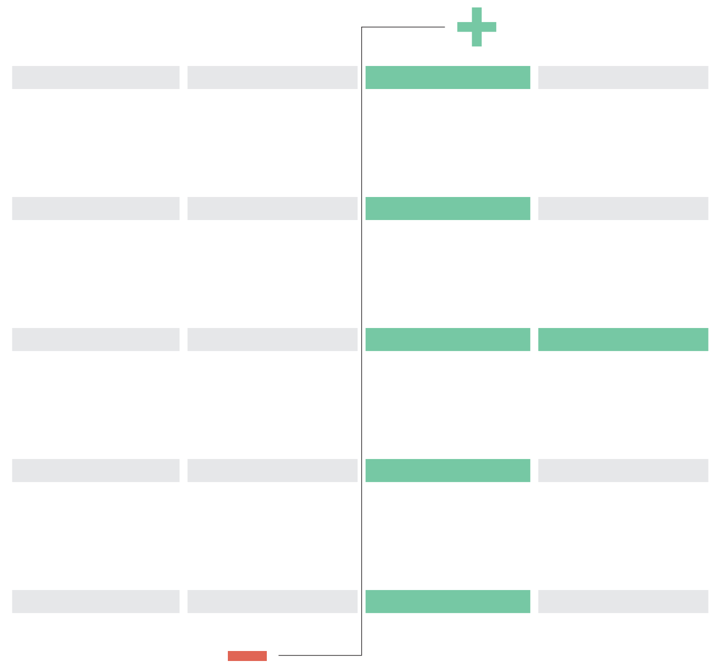


DESIGN CONSIDERATIONS

/ Consistency with Caltrans Highway Design Manual and Standard Plans and local guidelines

/ Consistency with ADA requirement guidelines

/ Designed to provide convenient access and reduced number of steps or ramps to ensure usage

/ Required additional space for constructing a landing point and approach ramp

/ May pose a personal security risk if not well-lit or has inadequate surveillance

/ Cost to construct and maintain

/ Designed to meet vertical clearance requirements

APPLICATIONS

/ Where pedestrian demand land uses are severed by a high-speed road network

/ Where continuity for bicycle and pedestrian routes can be enabled by bridges

/ Where an at-grade crossing is not feasible

COST RANGE

$$$$$

COORDINATION NEEDED

U Utilities

P Adjacent Private Property Owners

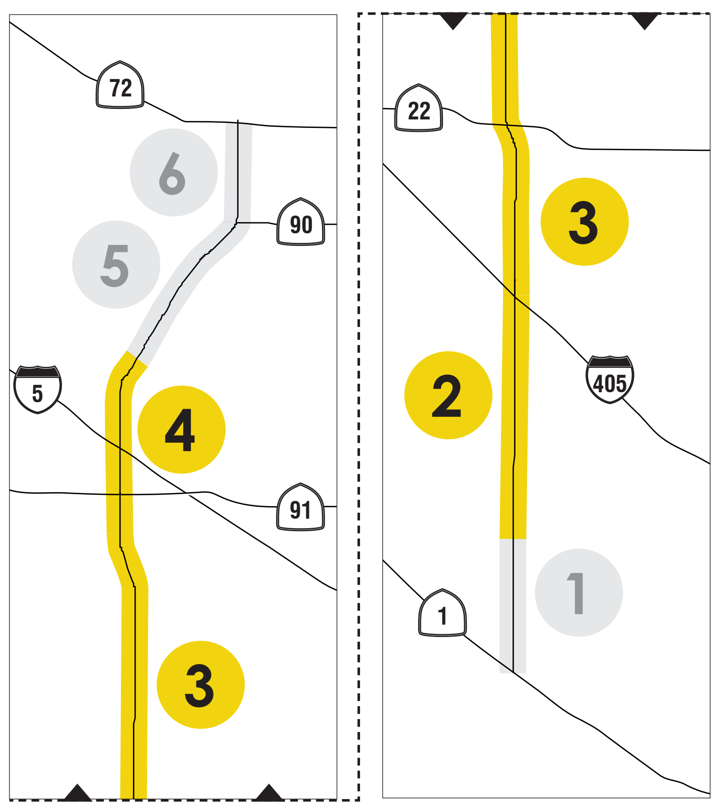
O OCTA Transit

B Adjacent Businesses

ADJUST INTERCHANGE RAMP LOCATIONS AND/OR CONFIGURATIONS

At interchange locations, there can be significant localized congestion due to the volume of vehicles entering and exiting the freeway. Typically, these locations encounter high volumes of turning movements, which result in the need for multiple signal phases, long turn pockets, and addition turn lanes. In addition, these facilities can have multiple conflict points with crossing bicyclists and pedestrians. Modifications to the intersection design can improve conditions by consolidating ramp locations and streamlining movements, and may affect the design and configuration of the entire interchange.

LOCATION KEY



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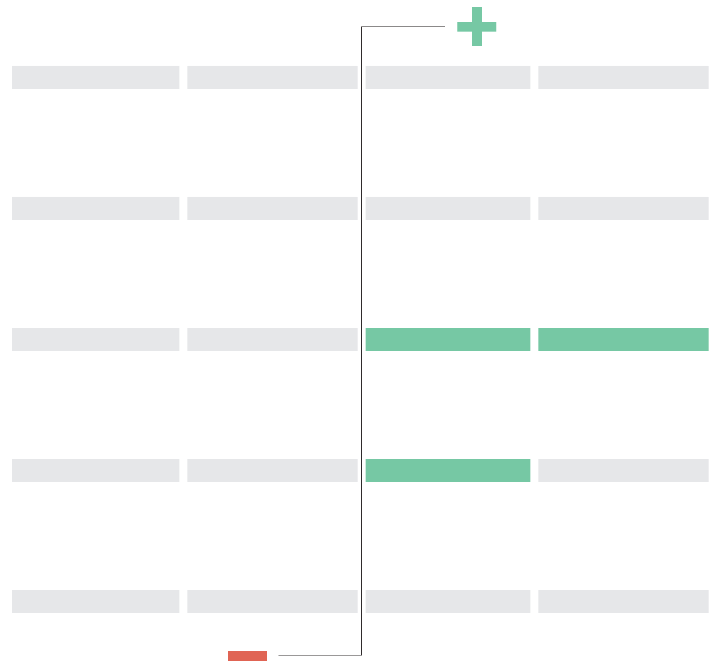


DESIGN CONSIDERATIONS

- Consistency with FHWA design guidelines
- Consistency with the Caltrans Highway Design Manual and Standard Plans
- Consistency with OCTA and local arterial design standards
- Cost of reconfiguring interchanges
- Potential additional right-of-way requirements
- Some configurations require more complicated signalization that would need to be design, installed and maintained.
- Driver unfamiliarity with newer or non-traditional interchange designs

SPECIFIC APPLICATIONS

At the following locations:

- At the I-405 interchange
- At the SR-22 interchange
- At the SR-91 interchange
- At the I-5 Interchange

COST RANGE

$$$$$

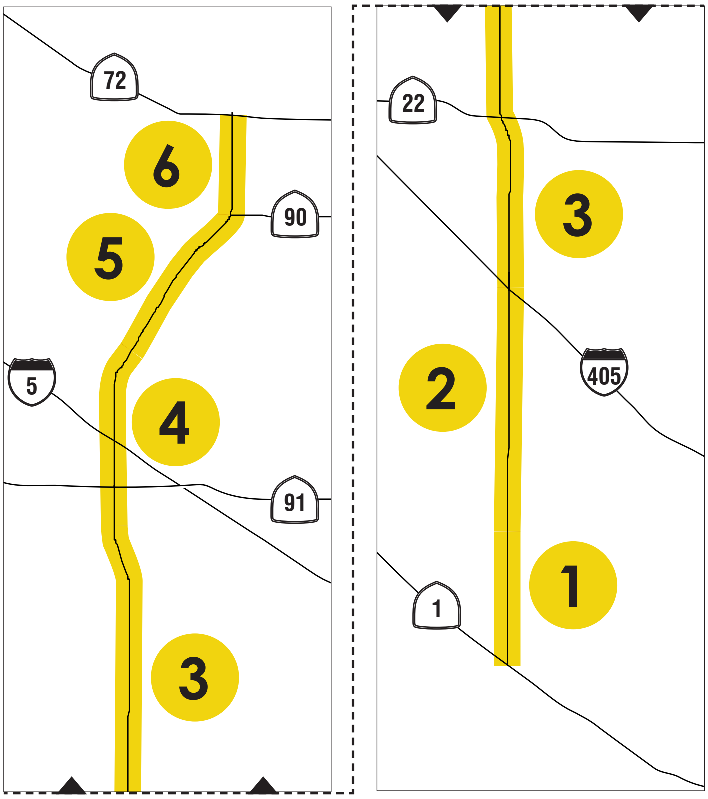
COORDINATION NEEDED

U	P	O	B
Utilities	Adjacent Private Property Owners	OCTA Transit	Adjacent Businesses

ALTERNATIVE INTERSECTION CONFIGURATIONS

The number of lanes along a corridor and its functional classification affect its overall capacity and flow; it is also affected by the spacing and type of intersections. While improving capacity at intersections has traditionally involved lane additions, alternative intersection types offer the potential to reduce delay (and improve safety) at a lower cost and with fewer impacts. Roundabouts and displaced left-turn intersections are two alternative intersection configurations that can offer improved operations and traffic flow along urban arterials setting.

LOCATION KEY



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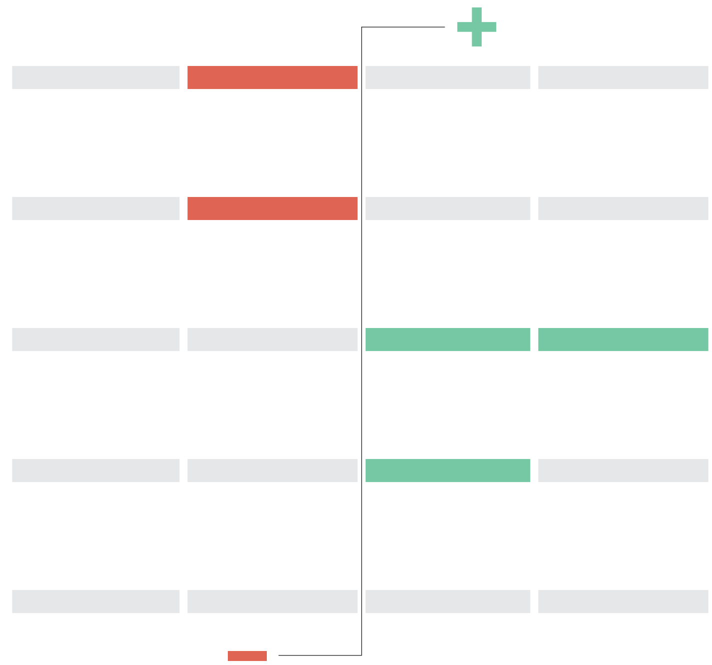

DESIGN CONSIDERATIONS

/ Consistency with the Caltrans Highway Design Manual

/ Consistency with the arterial design standards for OCTA and the affected Cities

/ Potentially higher right-of-way requirements at the intersection compared to conventional intersections

/ Cost of reconfiguring the intersection as well as the arterial approaches

/ Driver unfamiliarity with intersections that deviate from conventional designs

/ Design to maintain access to adjacent properties

/ Can be implemented at one intersection or designed to operate as a system

TYPICAL APPLICATIONS

/ Typical applications are in the three lane segments with lower volume cross-streets

/ With a two lane roundabout, the intersection approaches would need to be narrowed therefore the 3-lane segments would be best to accommodate the roundabout as the third lane could be dropped or trapped into a right only lane

/ The displaced left-turn can accommodate heavy left turning volumes and would require roadway widening or could be accommodated with narrowing of the existing roadway segment

/ With the displace left-turn, the 4-lane segments would best accommodate lane reduction and reconfiguration

COST RANGE

$$$$$

COORDINATION NEEDED

U — Utilities

P — Adjacent Private Property Owners

O — OCTA Transit

B — Adjacent Businesses