

ITE Recommended Practice:

Design Guidelines to Accommodate Pedestrians and Bicyclists at Interchanges



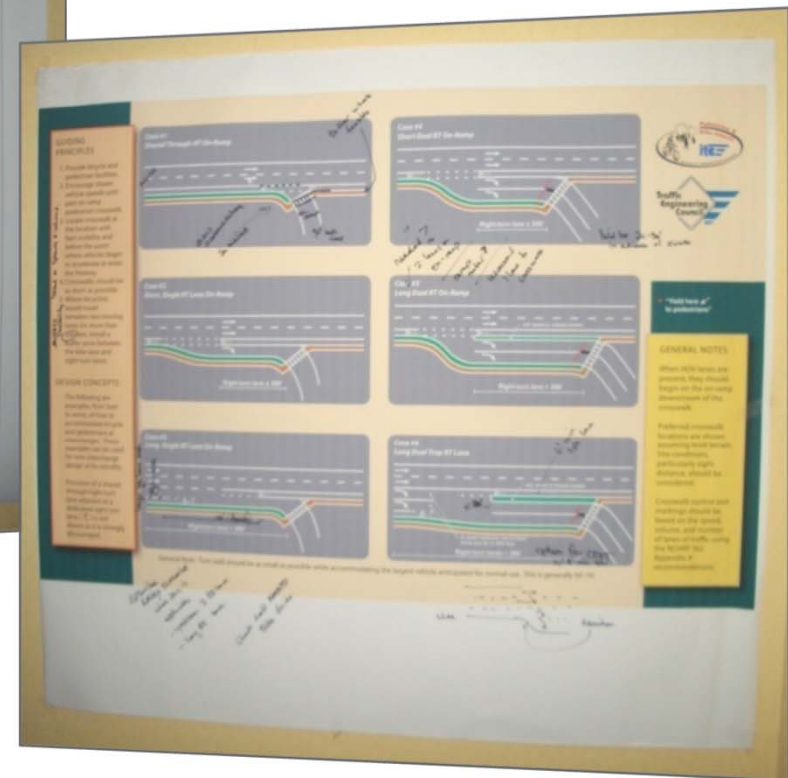
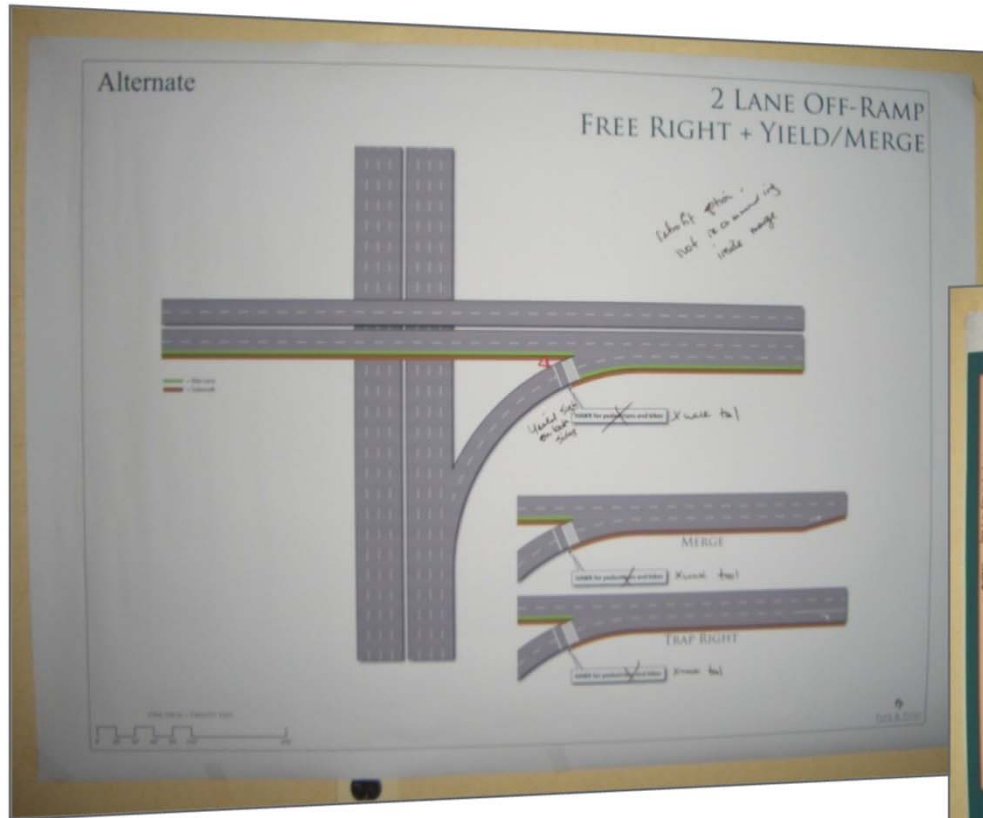
SAN DIEGO SECTION

Presented to the ITE San Diego Section
Eddie Barrios, P.E.
Nathan Schmidt, AICP

Outline

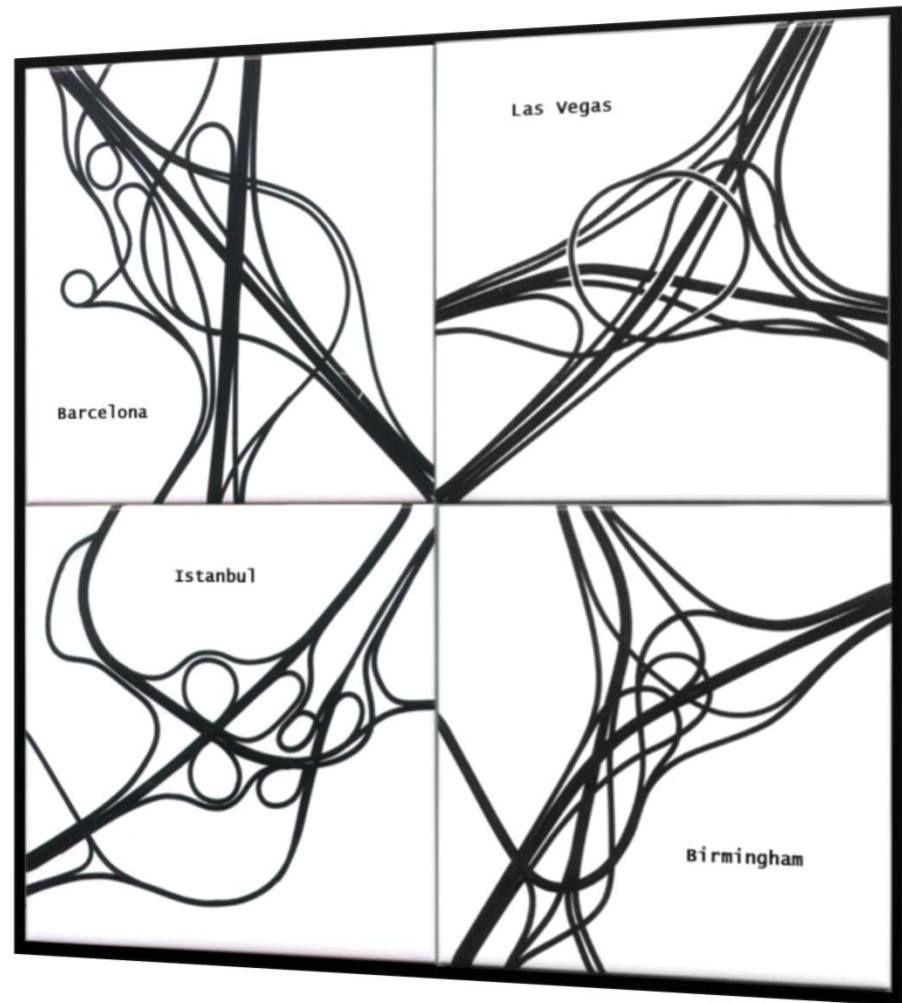
- Background
- Guiding Principles
- Crosswalk Treatments
- Interchange Cases
- Caltrans Best Practices & Local Projects Update

Background

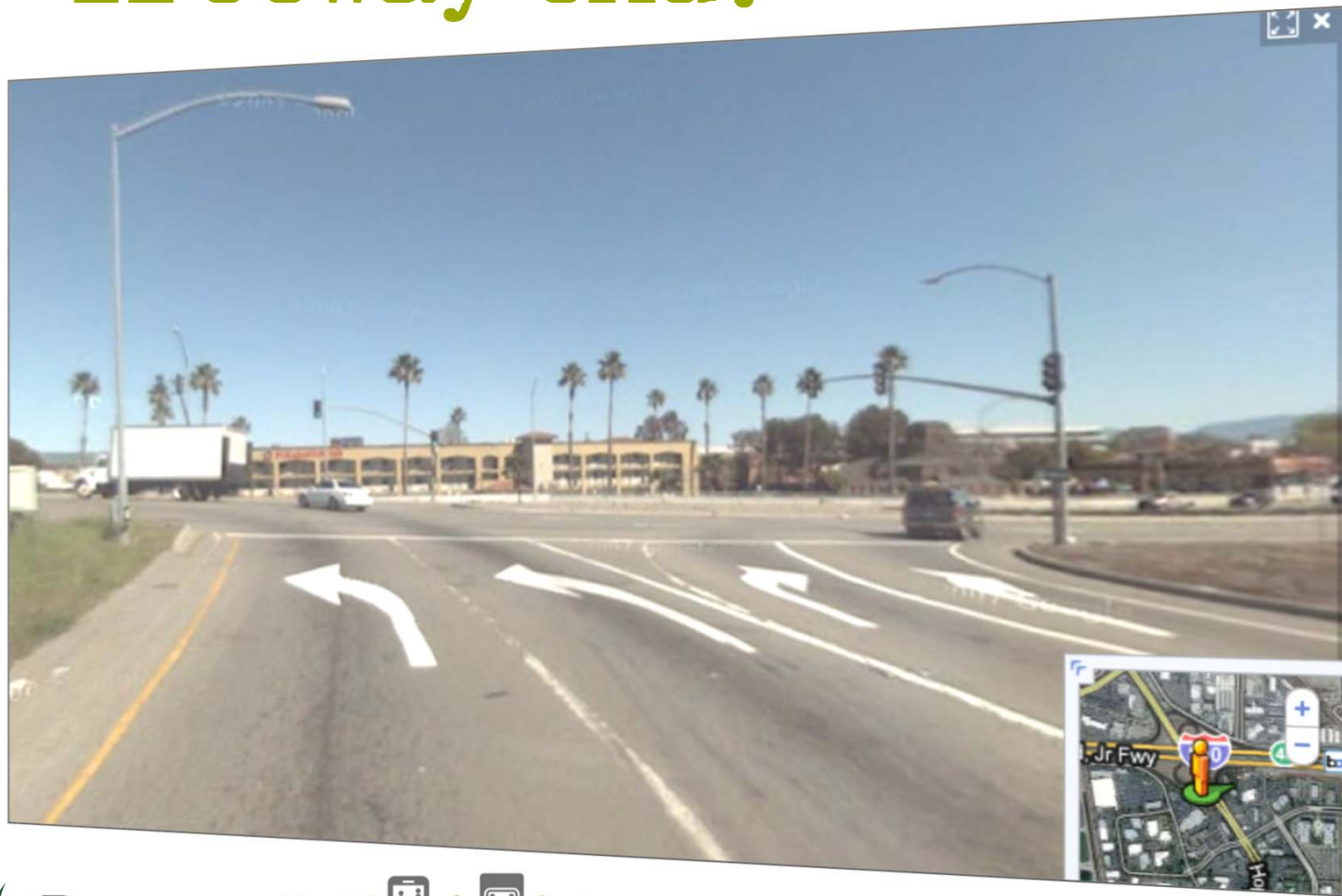


Problem Statement

- Enhance pedestrian and bicycle safety
- Connect pedestrian and bicycle facilities efficiently with surrounding land uses
- Provide a consistent “message”



Where does the freeway end?

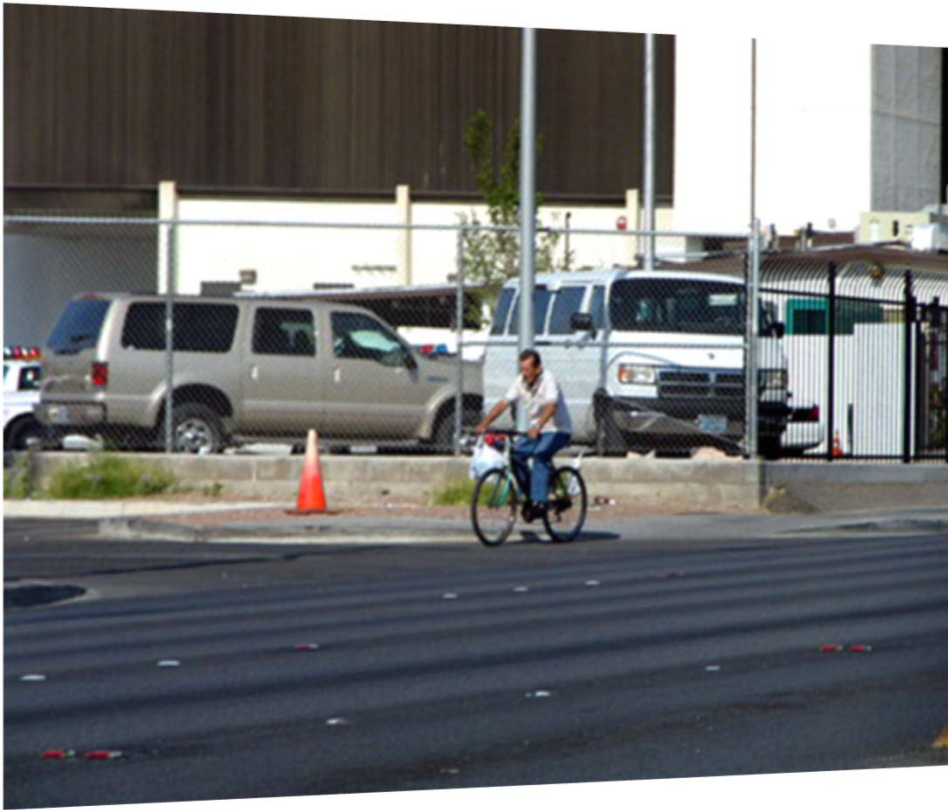


Guiding Principles



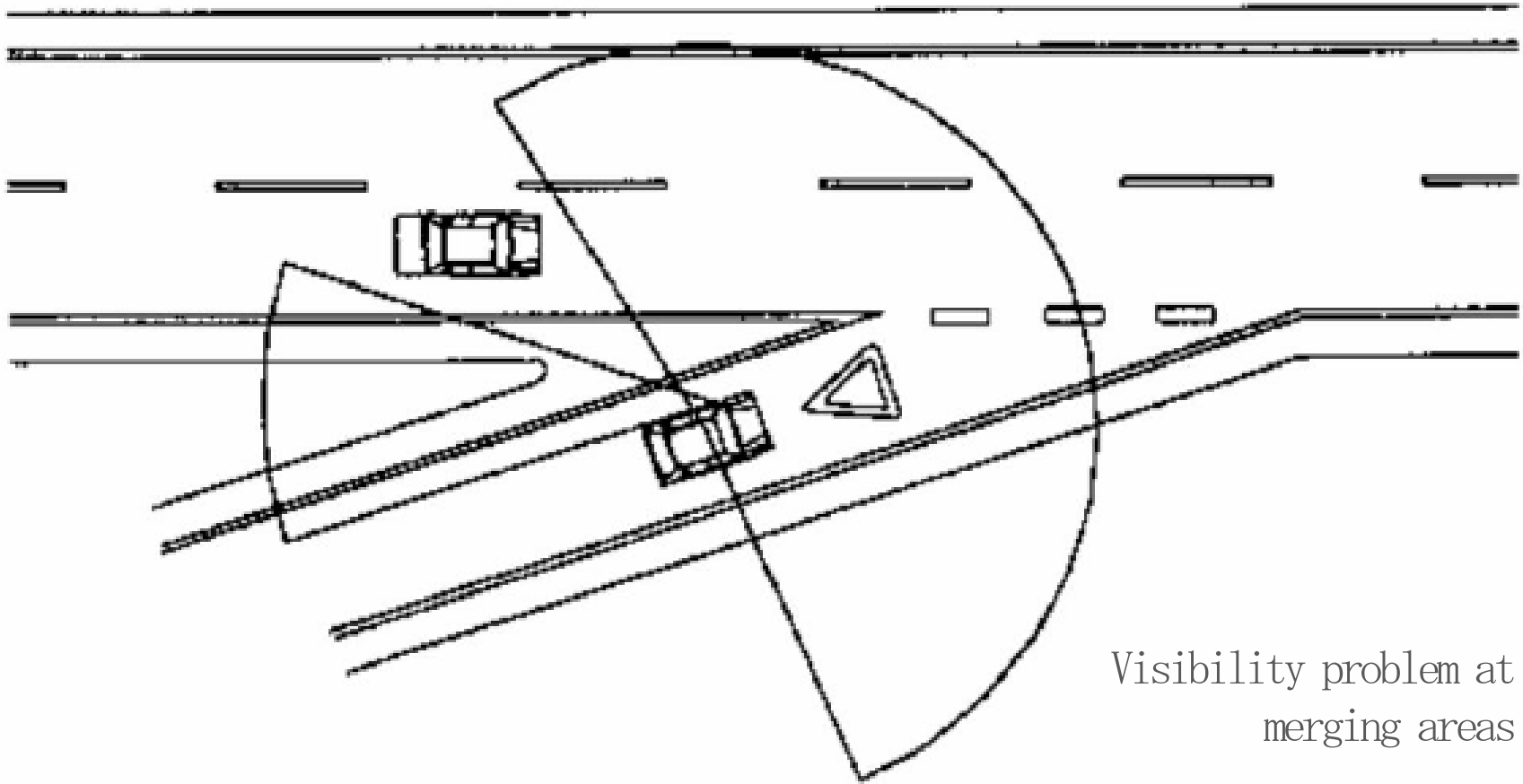
- Provide bicycles and pedestrian facilities
- Design ramp geometries to encourage slower vehicle speeds until past crosswalk
- Locate the crosswalk at the location with the best visibility and before the point where vehicles begin to accelerate
- Crosswalks should be as short as possible

Guiding Principles continued...



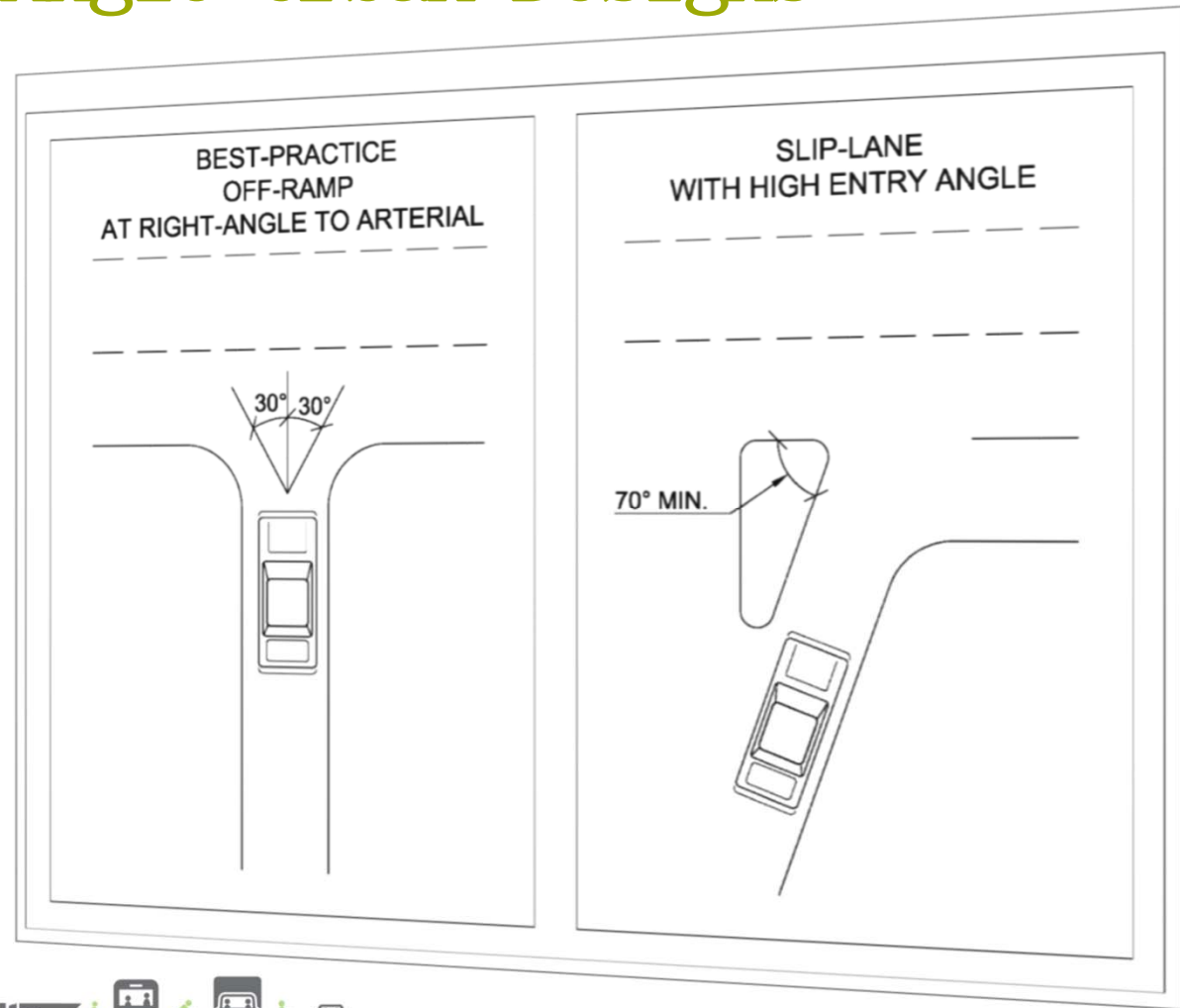
- Where bicyclists would travel between moving vehicles for more than 200 feet, install a buffer zone
- Where bicyclists merge across a vehicle lane allow flexibility to transition when/where safe
- Use the Crosswalk Tool to select appropriate crossing treatments

High Speeds, Poor Visibility



Visibility problem at
merging areas

Prefer Slow Speed Right Angle Urban Designs



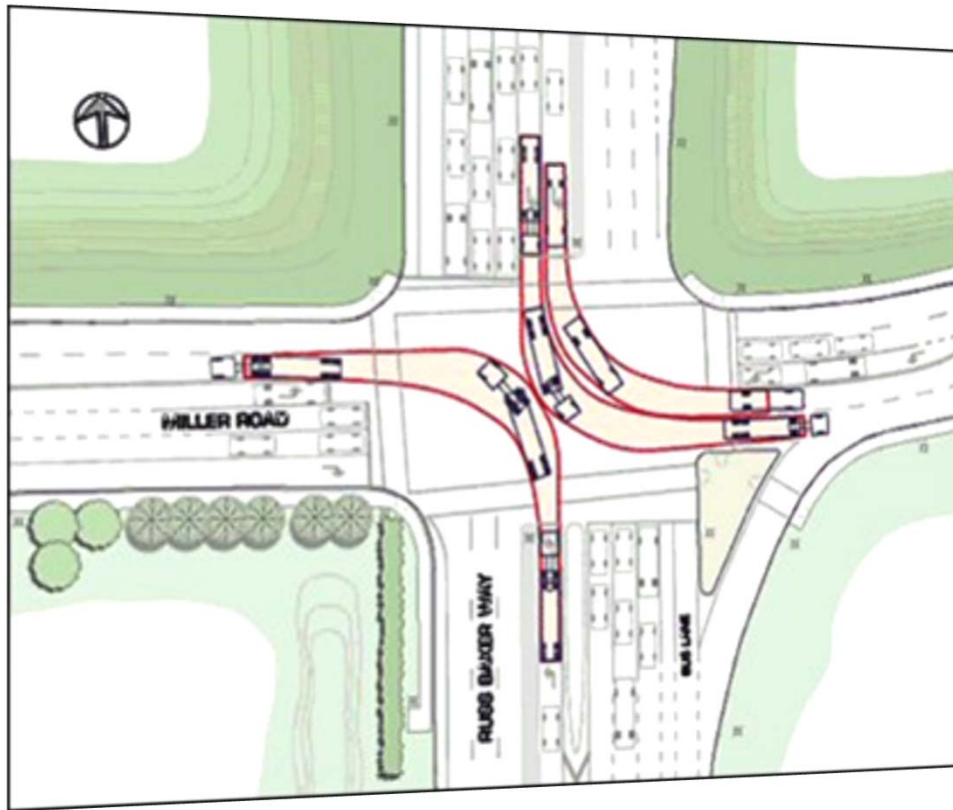
Positive example: reconfigured ramp terminus



Flat Angle = wide crossing & high-speed turns

Tight angle = short crossing & slow speed turns

Design Assumptions



- 6' Bike Lanes
- 6' Sidewalks
- 5' Landscape Buffers
- 12' Lane Widths
- 8' Right Shoulders
- AASHTO WB-62 Design Vehicle (69' Truck with Trailer)

Determining Crosswalk Treatments

XWalk+

Location
User

Date: 6-15-2015

Type

Uncontrolled Intersection

Input Parameters

Value

Intersection Characteristics

Yes

No

Speed Limit	35	Frequent at-grade transit?	<input checked="" type="radio"/>	<input type="radio"/>
Peak Hour Pedestrian Vol	78	Bicycle lanes?	<input checked="" type="radio"/>	<input type="radio"/>
Major Road Peak Hour Volume Total	450	Heavy bicycle traffic?	<input checked="" type="radio"/>	<input type="radio"/>
Major Road Peak Hour Vol Dir 1	150	Major/minor road intersection?	<input checked="" type="radio"/>	<input type="radio"/>
Major Road Peak Hour Vol Dir 2	300	Midblock/off-set intersection?	<input type="radio"/>	<input checked="" type="radio"/>
Avg Pedestrian Walking Speed	3	Heavy truck traffic?	<input type="radio"/>	<input checked="" type="radio"/>
15th Percentile Crossing Speed	3	Existing infrastructure limit treatments?	<input type="radio"/>	<input checked="" type="radio"/>
Ped start-up/end clearance time	3	On-street parking?	<input checked="" type="radio"/>	<input type="radio"/>
Pedestrian Crossing Distance	65	Downtown area?	<input type="radio"/>	<input checked="" type="radio"/>
1st Half Crossing Distance	30	Built-up area of an isolated community?	<input type="radio"/>	<input checked="" type="radio"/>
2nd Half Crossing Distance	35	Median refuge island?	<input type="radio"/>	<input checked="" type="radio"/>
Number of Lanes	4	Sufficient width for a median?	<input type="radio"/>	<input checked="" type="radio"/>
Actual Total Pedestrian Delay				
Expected Motorist Compliance	Moderate			

2 of 2 Recommendations

RRFB

Signalized or Unsignalized Crossing?	Unsignalized Crossing
Pedestrian LOS	F
Candidate Pedestrian Treatment Identified	RRFB
Candidate for Median Refuge Island?	NO
Candidate for Road Diet?	YES
Other Treatments for Consideration**	RRFB
Paired Treatments for Consideration**	Curb Extensions, Bus Bulb, Reduced Curb Radii, Staggered Pedestrian Refuge, High Visibility Crosswalk Markings, Advance Yield Lines, Advance signage

Interchange Cases

- On-Ramp Cases
- Off-Ramp Cases
- Single Point Urban Interchanges (SPUIs)

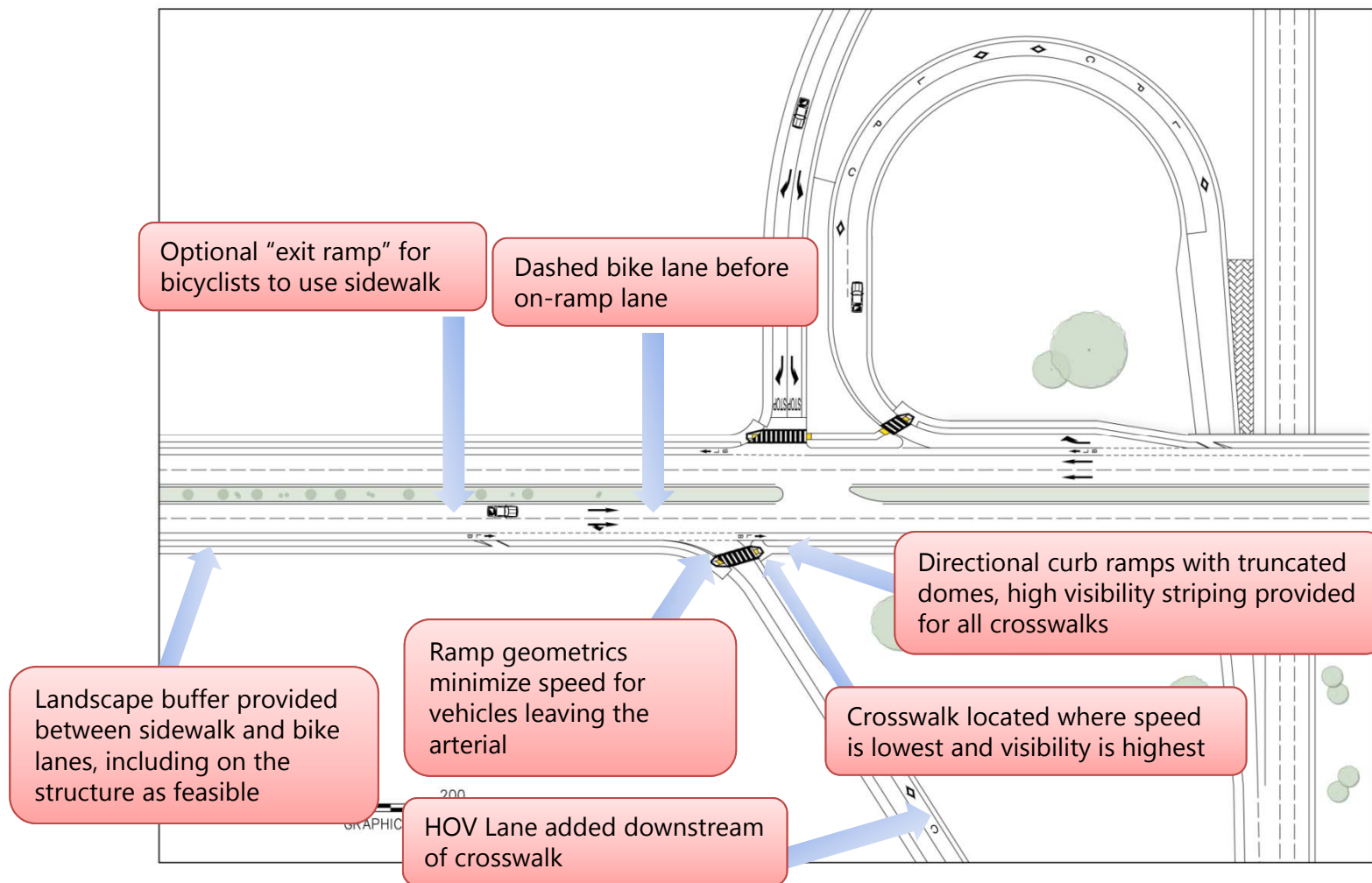
on-ramps

On-Ramps (4 Cases)

- Shared through/right-turn lane
- Short single right-turn lane
- Long single right-turn lane
- Long dual right-turn lanes

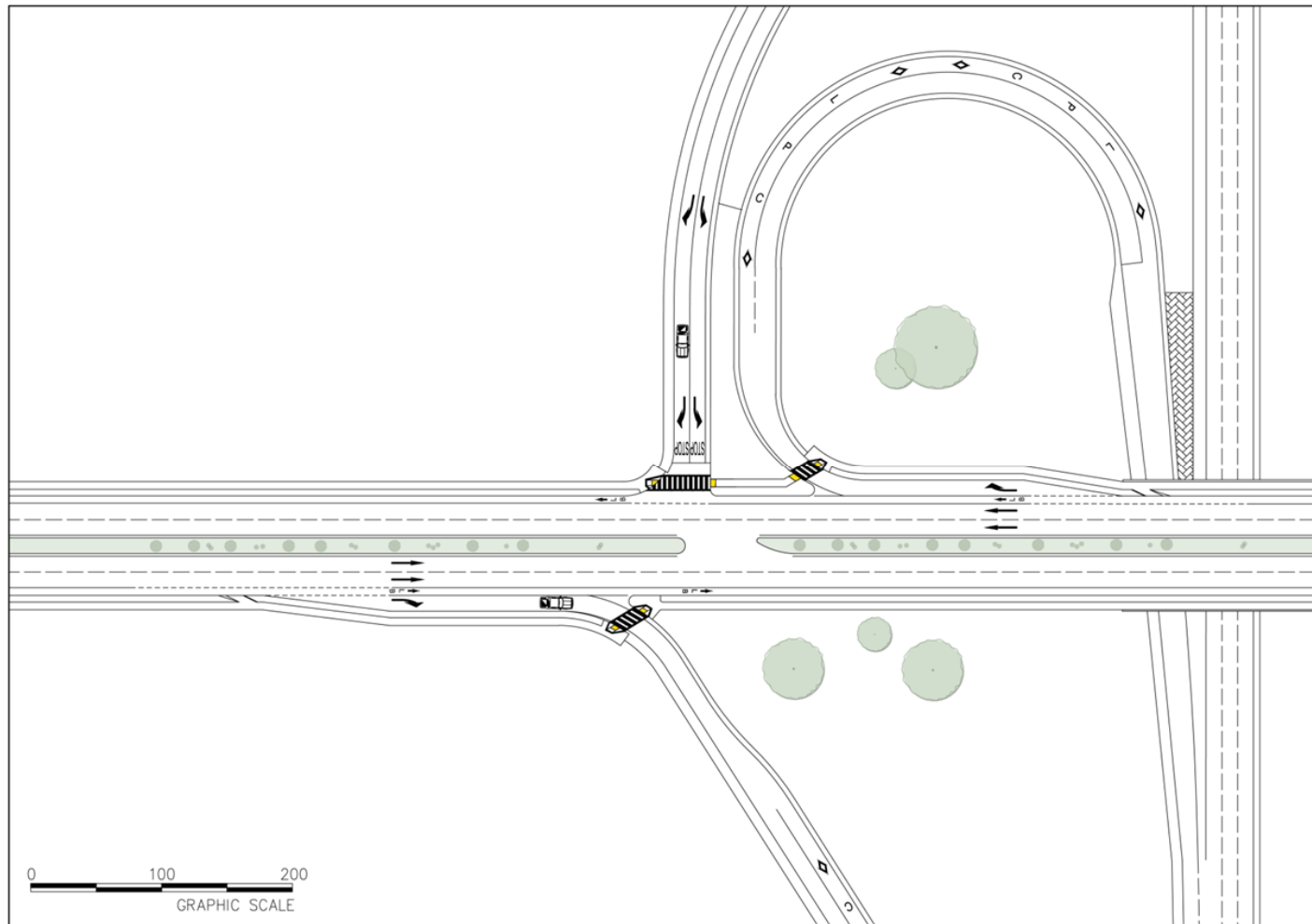
on-ramps

1. On-Ramp Entered from Shared Through Right Lane



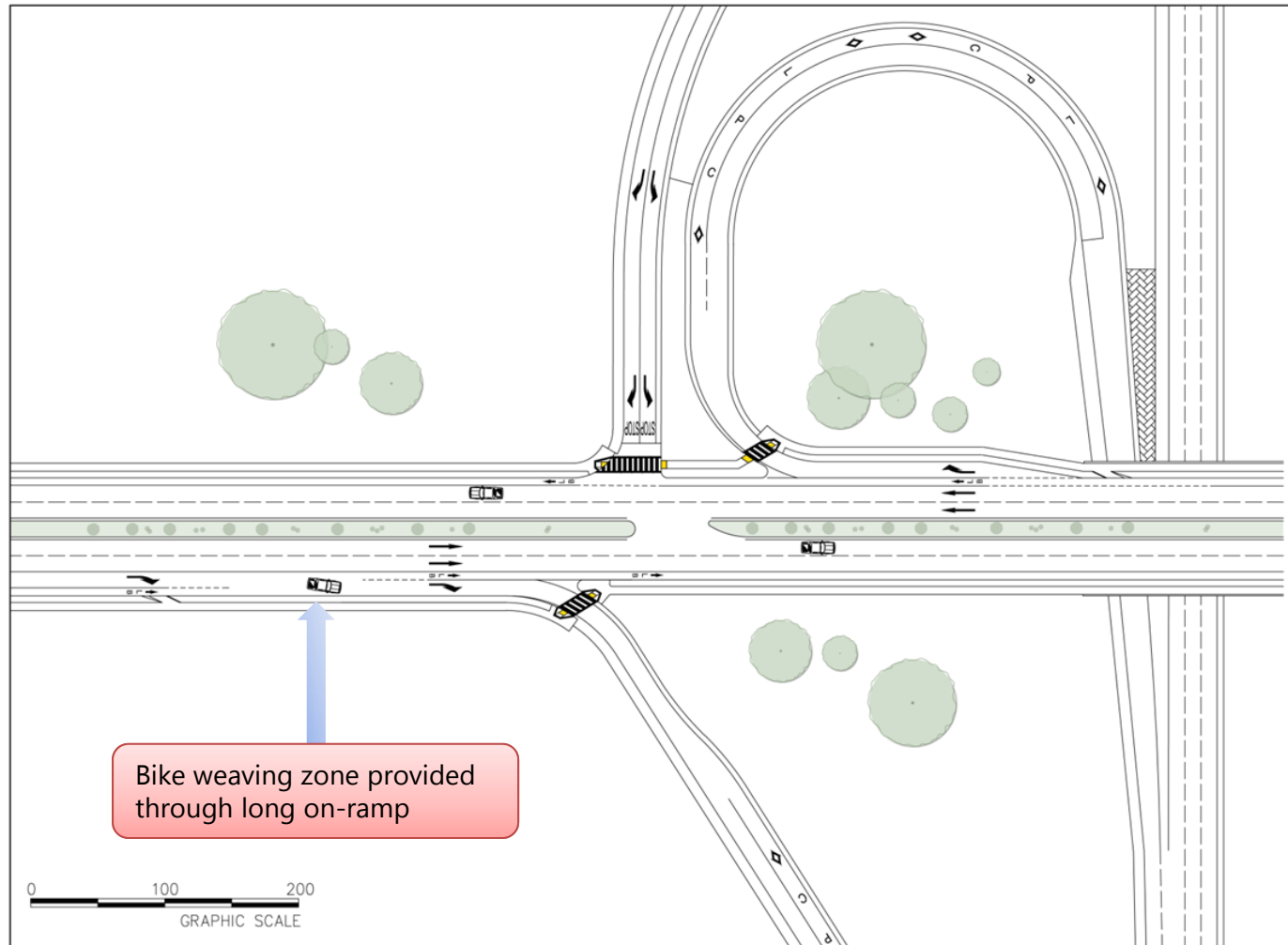
on-ramps

2. On-Ramp Entered from Short, Single Right Lane



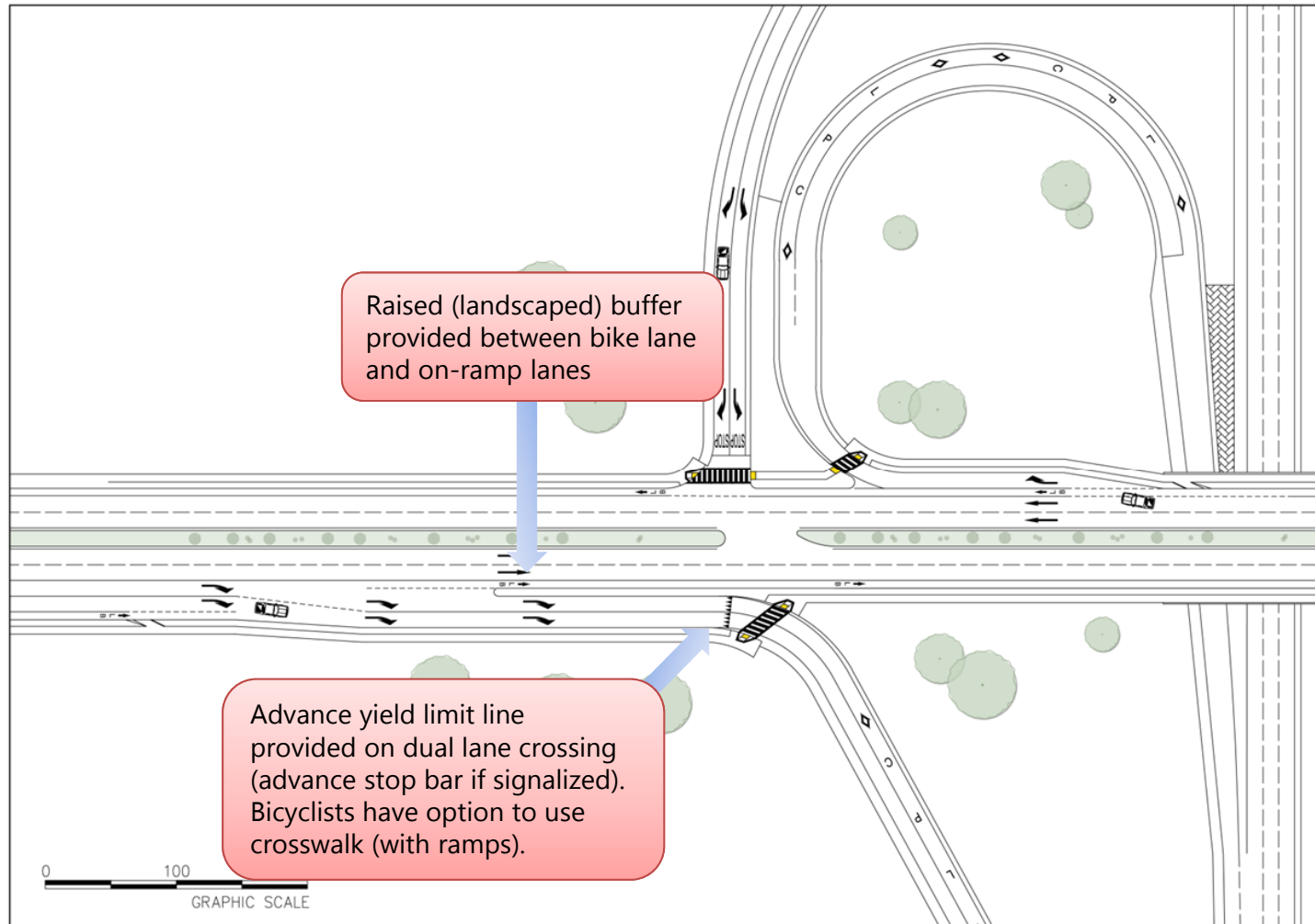
on-ramps

3. On-Ramp Entered from Long, Single Right Lane



on-ramps

4. On-Ramp Entered from Long, Dual Right Lane



off – ramps

Off-Ramps

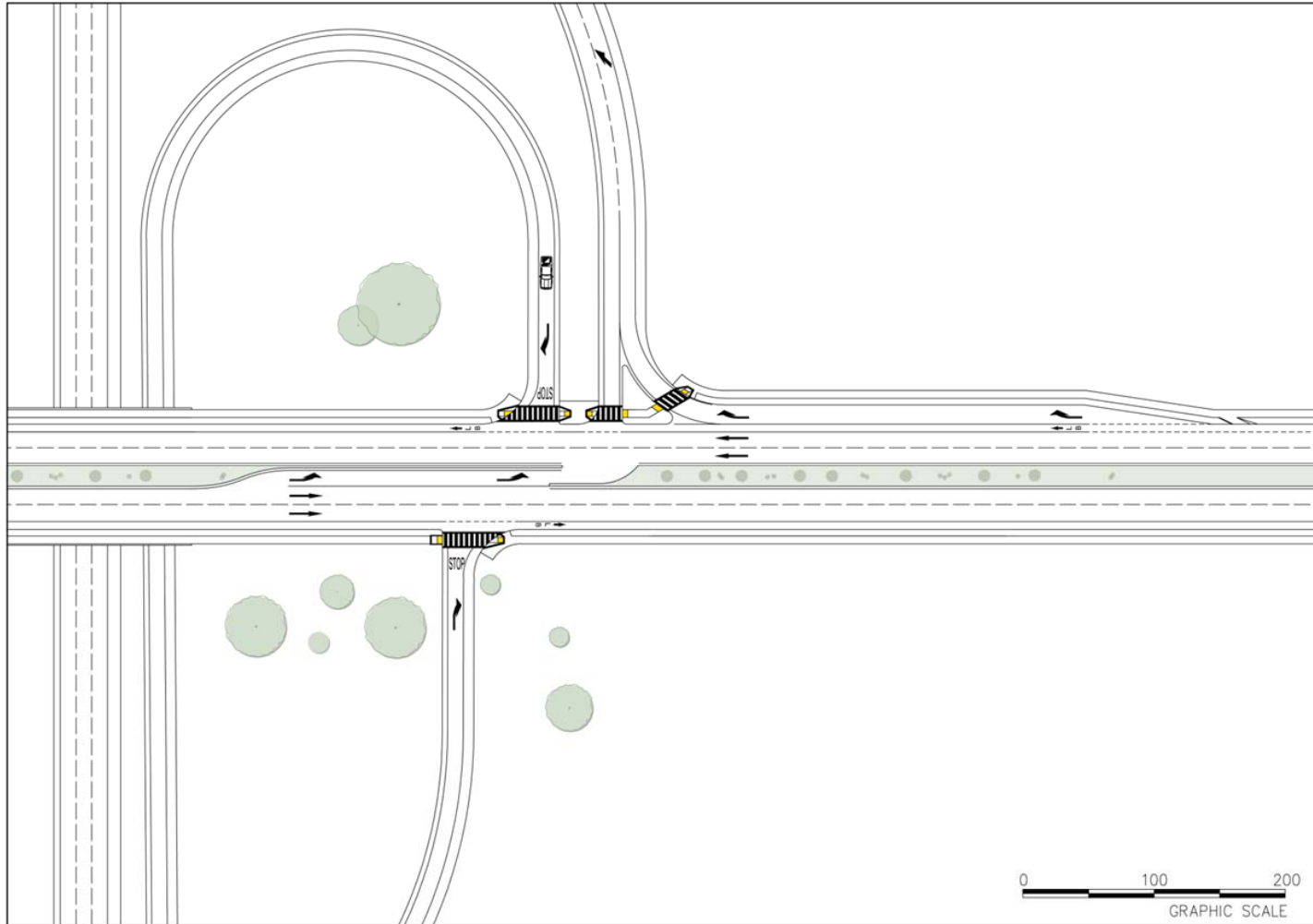


FEHR & PEERS



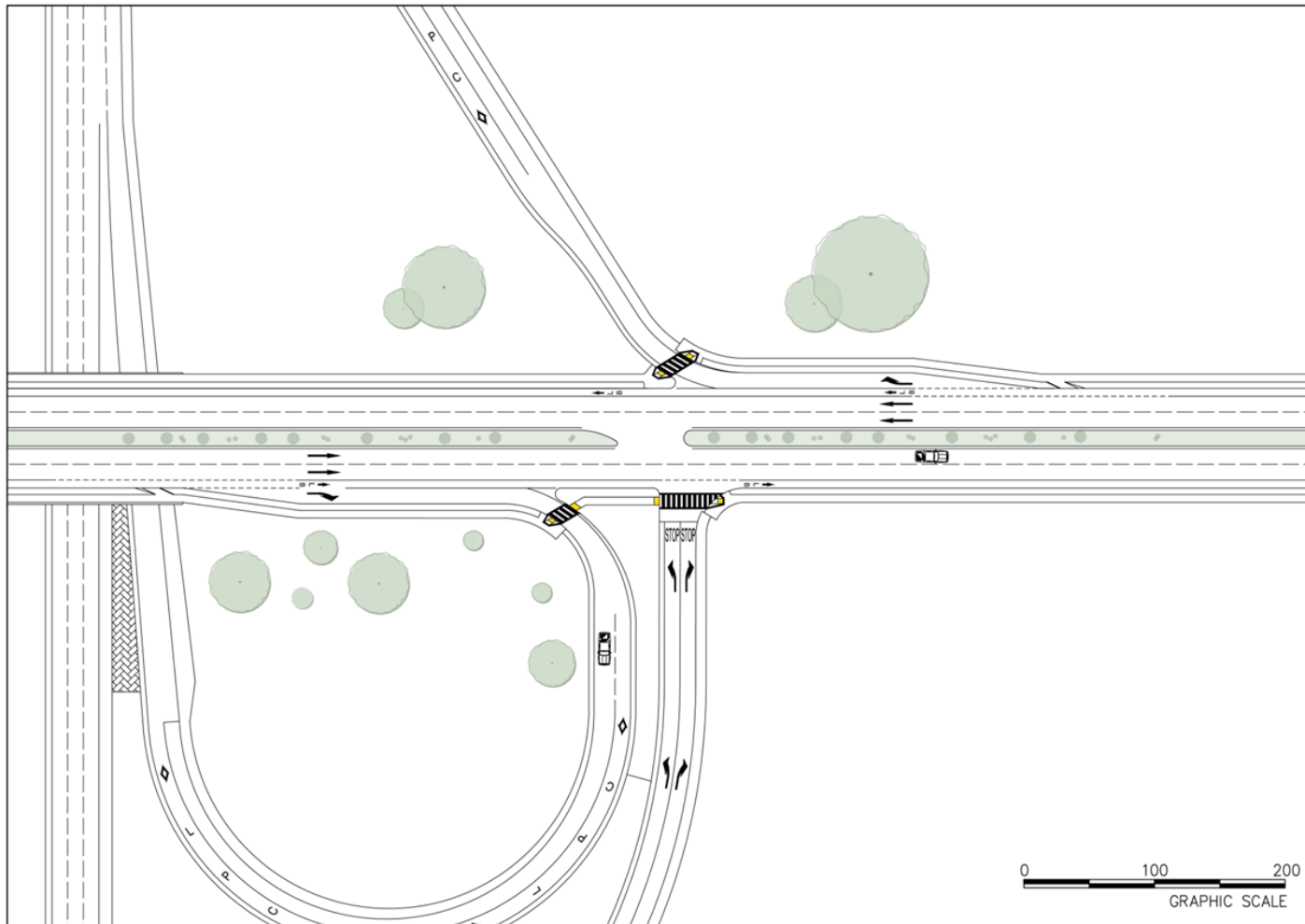
off - ramps

1a. Arterial Entered from Stop/Merge Off-Ramp (Split Ramps)



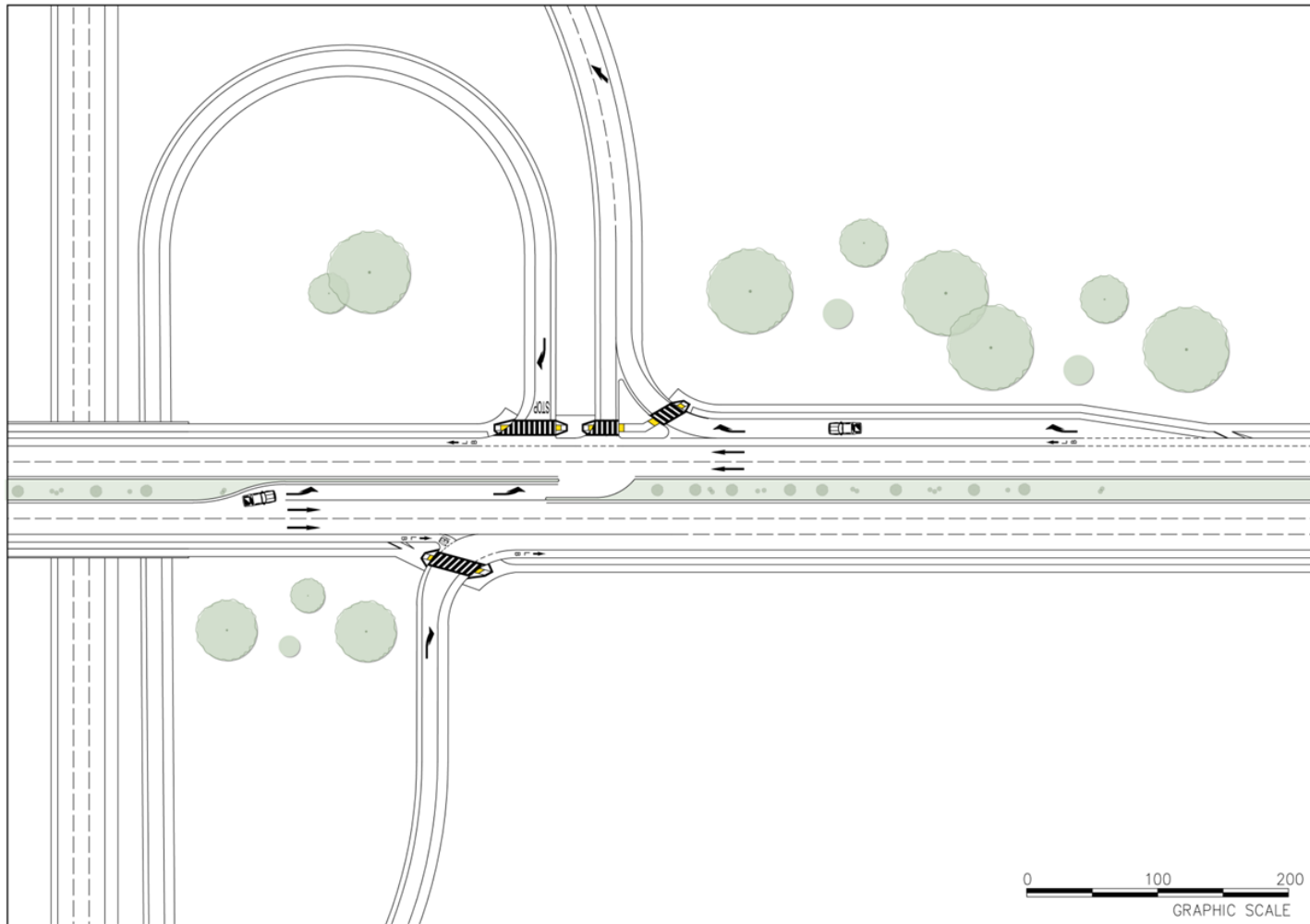
off- ramps

1b. Arterial Entered from Stop/Merge Off-Ramp (Combined Ramps)



off – ramps

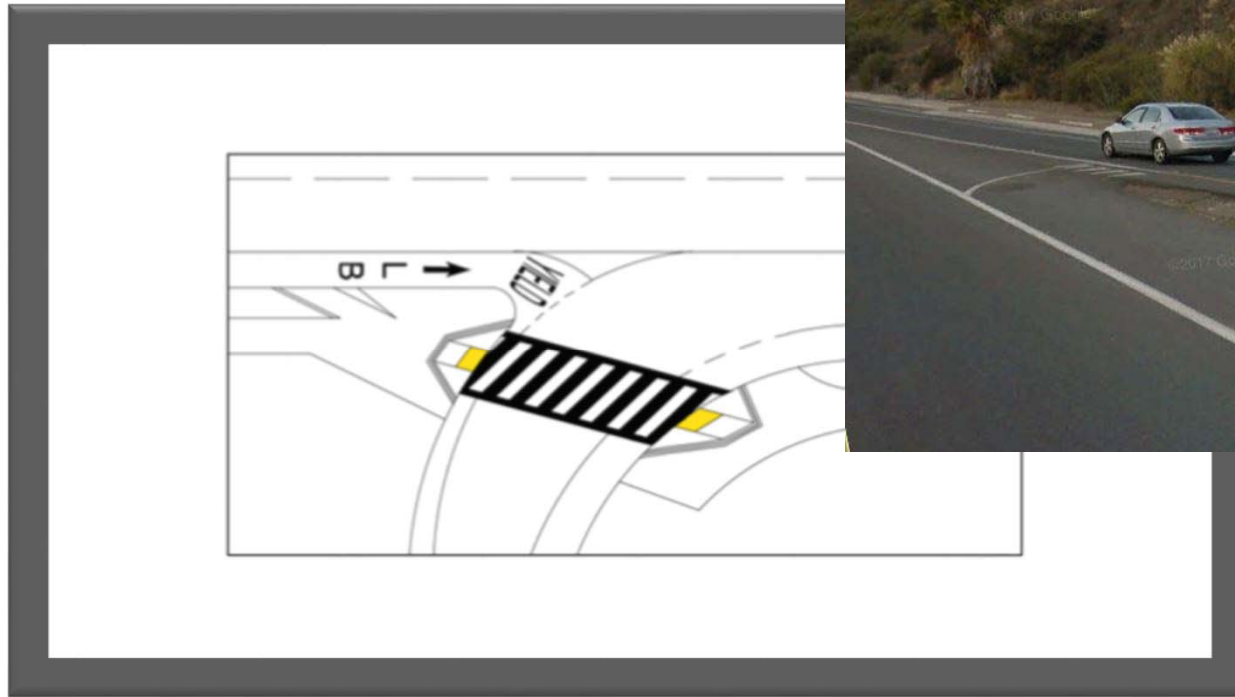
2. Arterial Entered from Free Off-Ramp



off – ramps

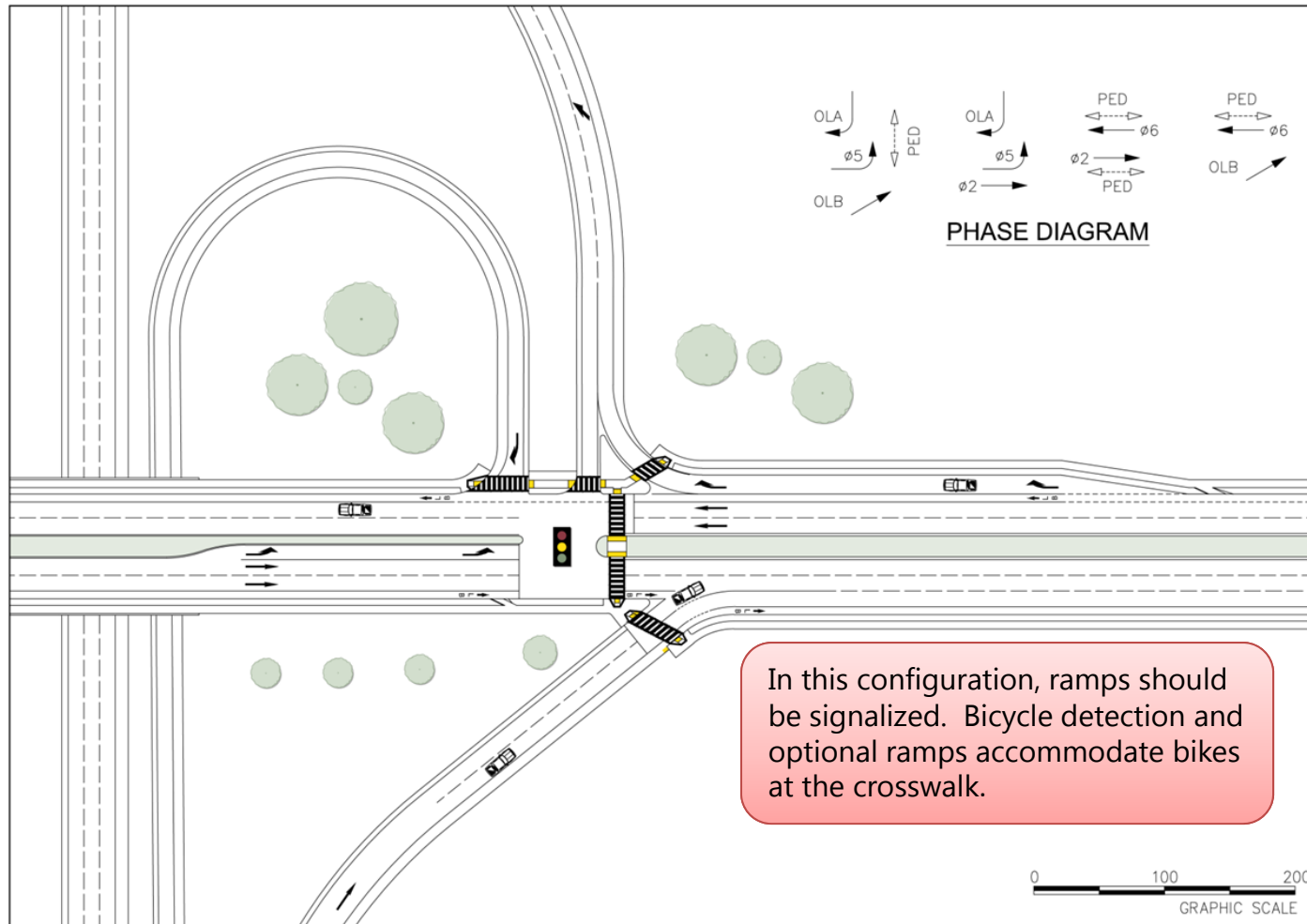
Bike Lane Crossing

detail



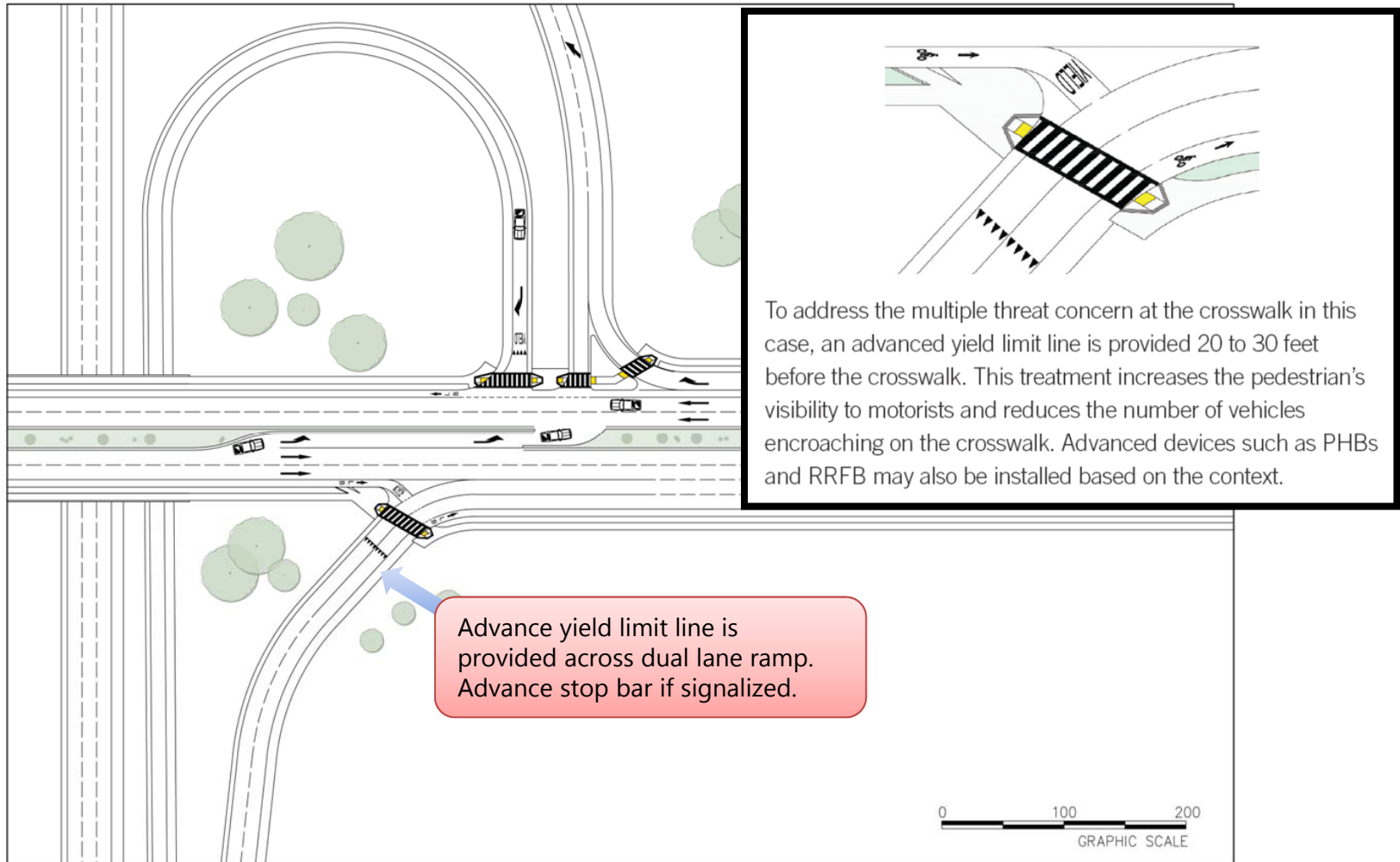
off – ramps

3. Arterial Entered from Two Lane Off-Ramp, Signalized Right Turns

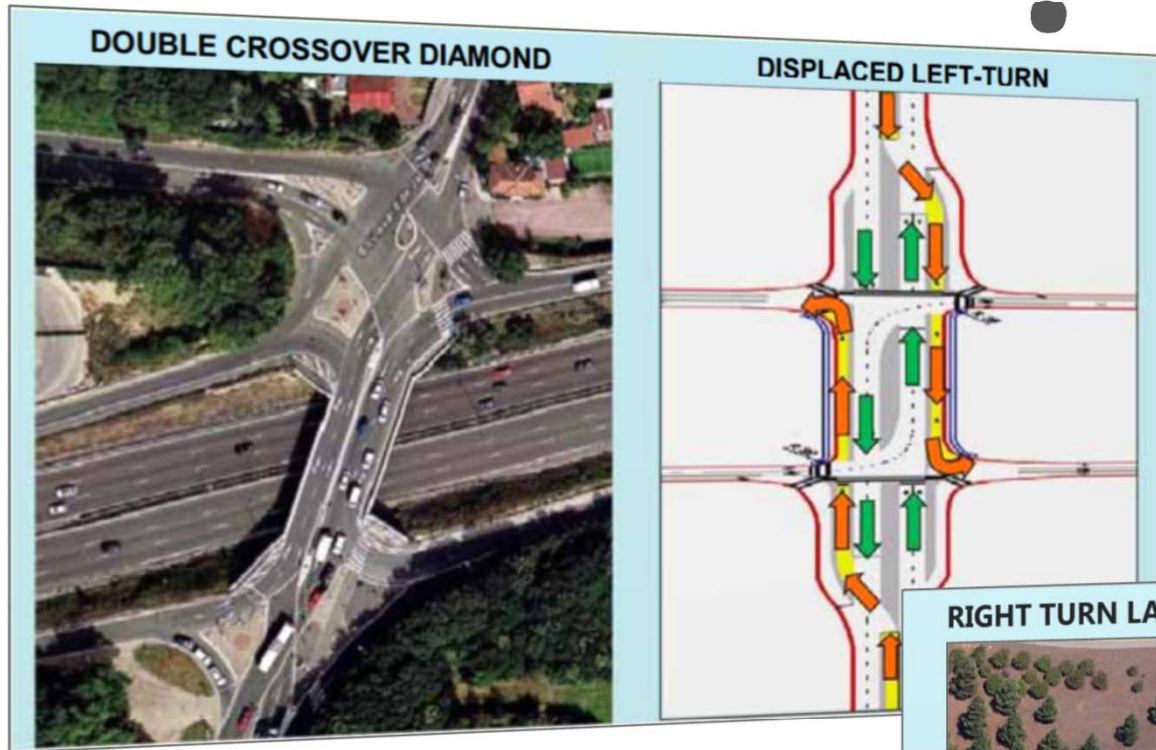


off – ramps

4. Arterial Entered from Two Lane Off-Ramp, Two Free Right Turns



What's Missing



Single Point Urban Interchanges (SPUIs)

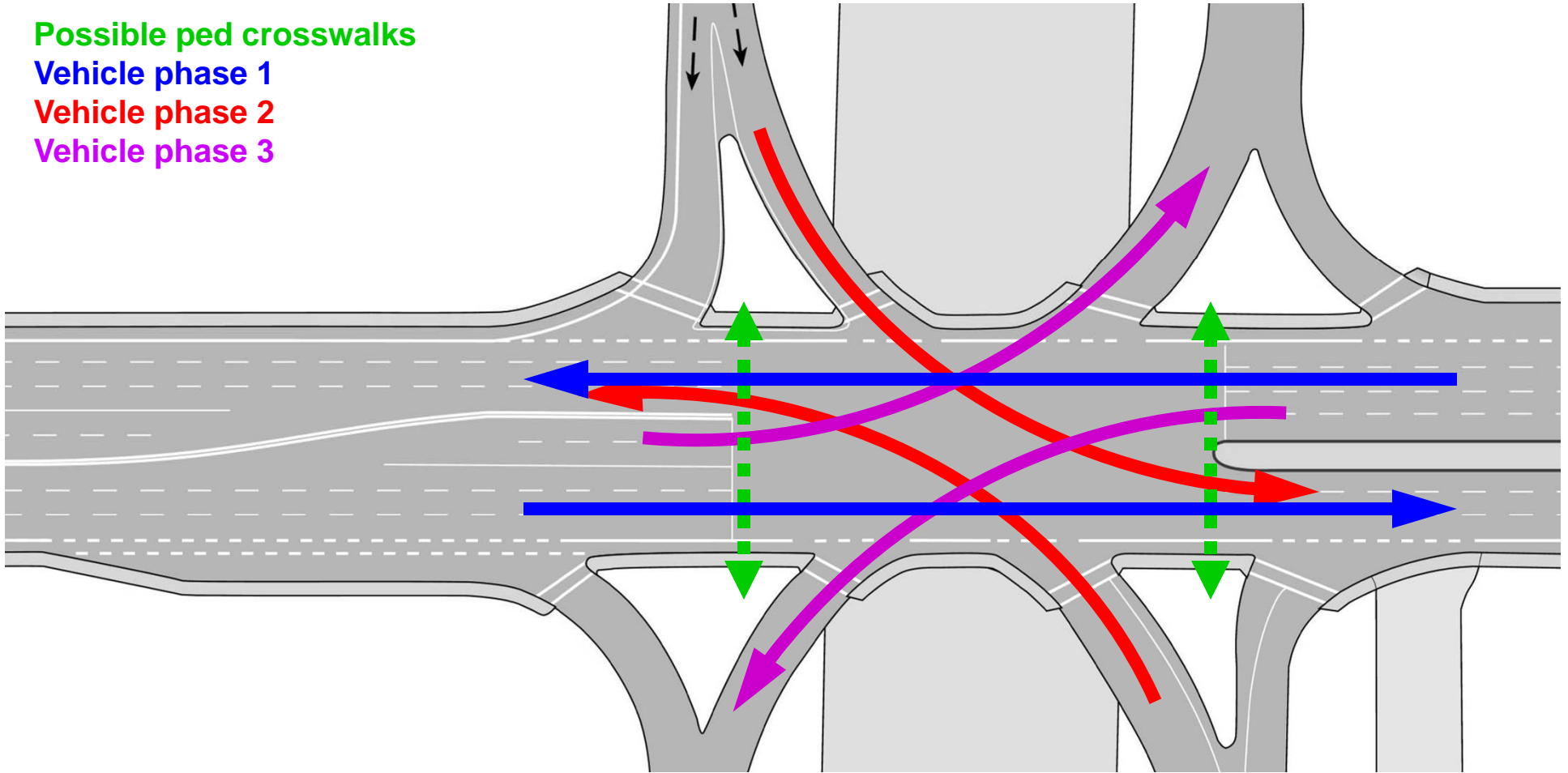


Possible ped crosswalks

Vehicle phase 1

Vehicle phase 2

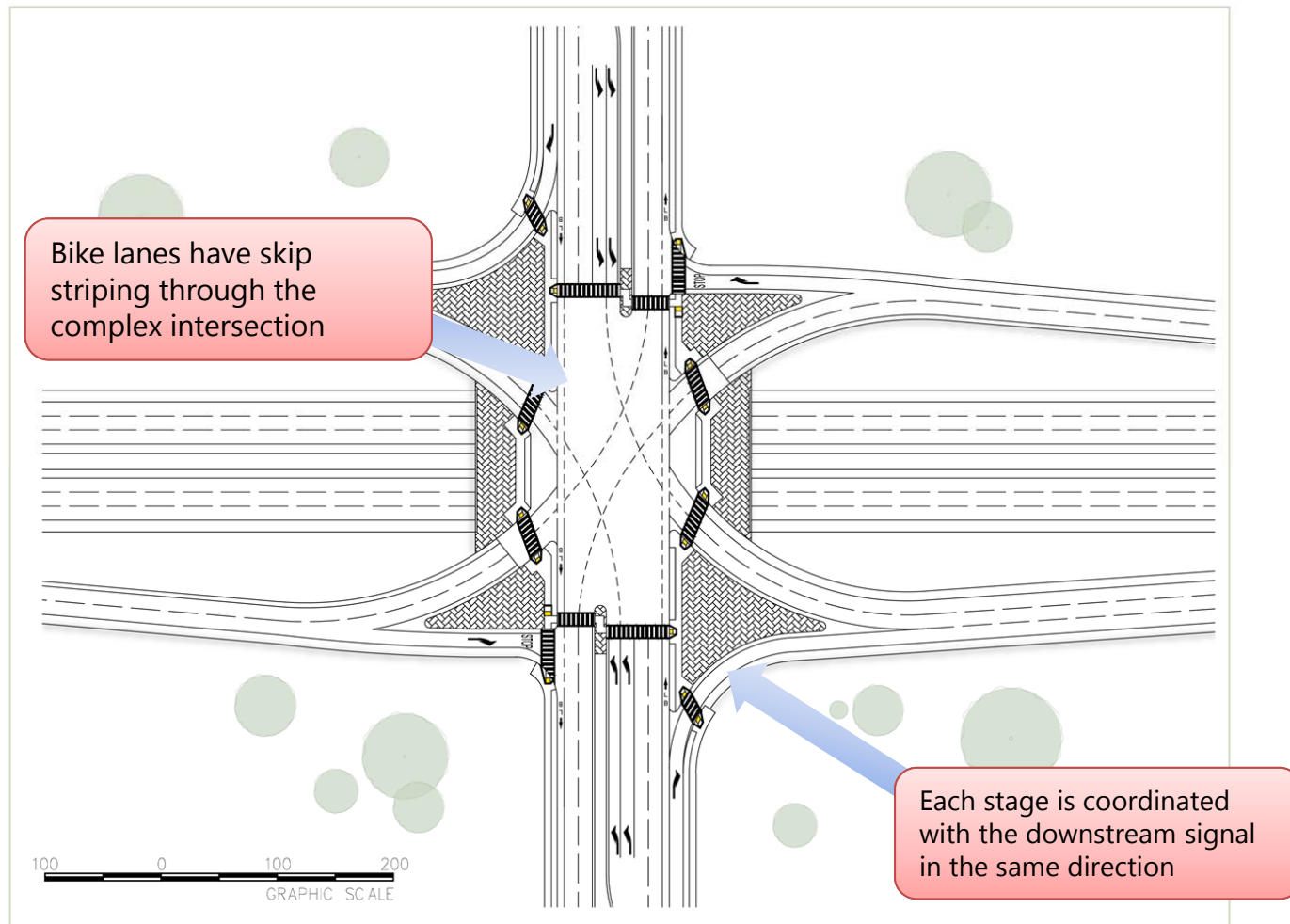
Vehicle phase 3



With most SPUIs there is never a phase when pedestrians can cross the urban arterial without conflict

Solution: Two-step crossing (one step during vehicle phase 2 and the other during vehicle phase 3)

SPUI 1. Two Stage Crossing

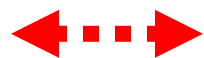
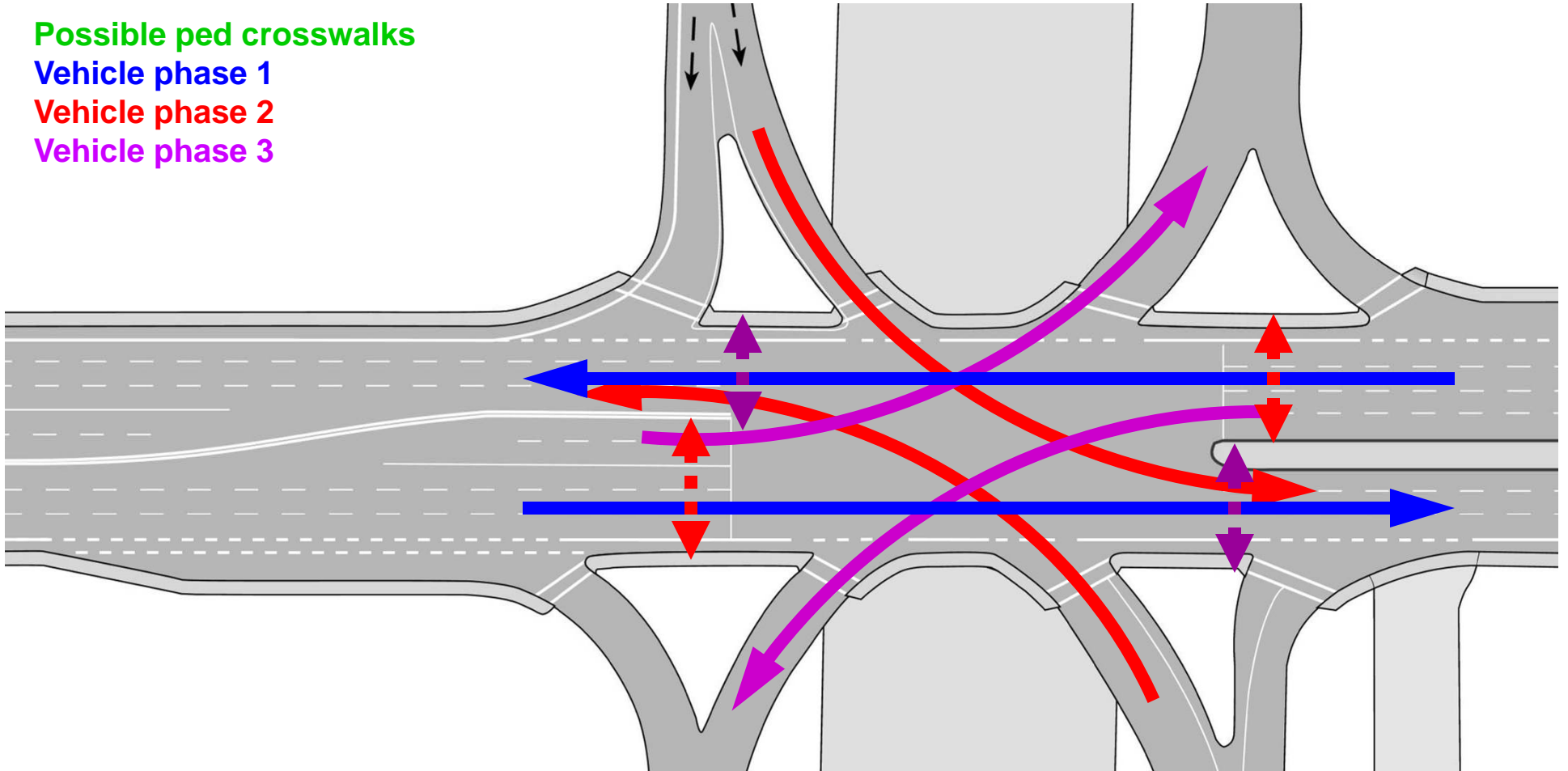


Possible ped crosswalks

Vehicle phase 1

Vehicle phase 2

Vehicle phase 3

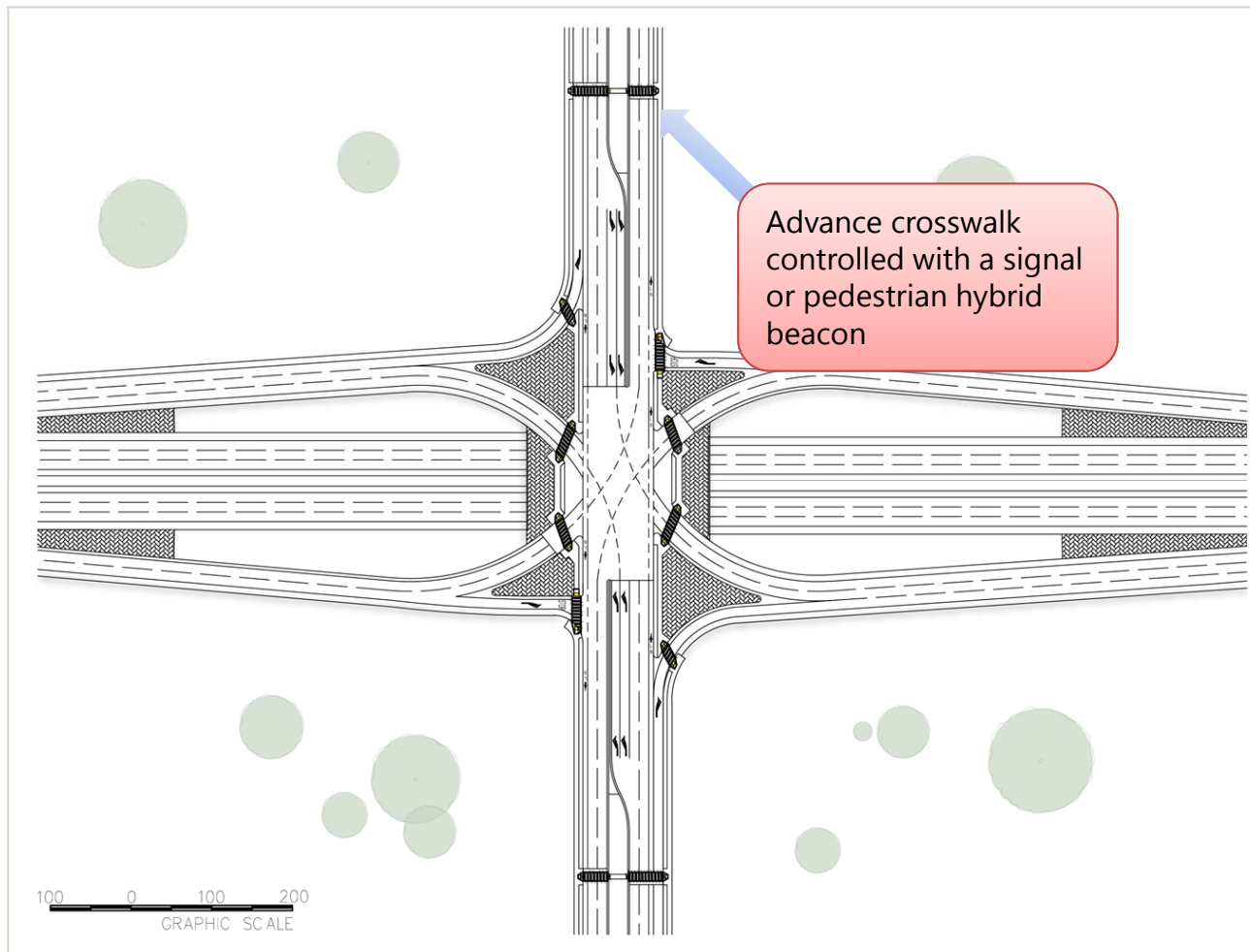


Peds with vehicle phase 2



Peds with vehicle

SPUI 2. *Advanced Crosswalk*





Caltrans Bike and Pedestrian Plan Best Practices

Recent Caltrans D11 Bike / Ped Projects



Caltrans Bike and Pedestrian Plan Best Practices

North Coast Corridor: Bike/Ped Improvements

San Elijo Lagoon Bike/Ped Bridge



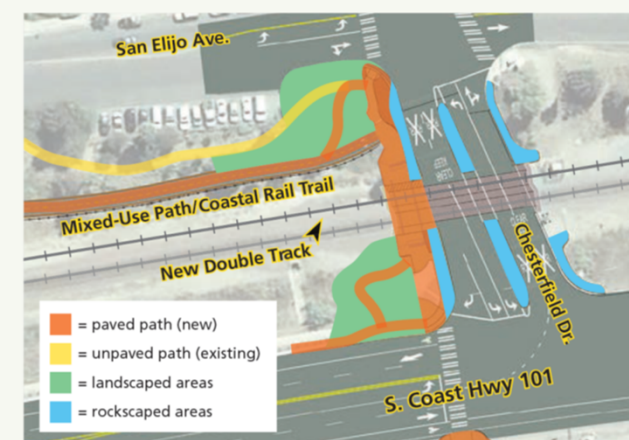
Batiquitos Lagoon Bike/Ped Bridge



North Coast Bike Trail



Coastal Access Improvements



Santa Fe Dr. Improvements

After





SR-15 Commuter Bikeway



Final construction wrapping up.

Will open end of Summer

Questions ?

N. Schmidt@fehrandpeers. com

E. Barrios@fehrandpeers. com