Municipality of Anchorage

Bikeway Design Workshop

Monday, July 25, 2016

alta PLANNING + DESIGN

AGENDA

- Introduction
- Design Guidance
- Bicycle Infrastructure
  - Bicycle Boulevards
  - Bike Lanes
  - Protected Bike Lanes
- Intersections
- Implementation Strategies
- Winter Maintenance
- Trails

Introduction

Introduction

Introduction

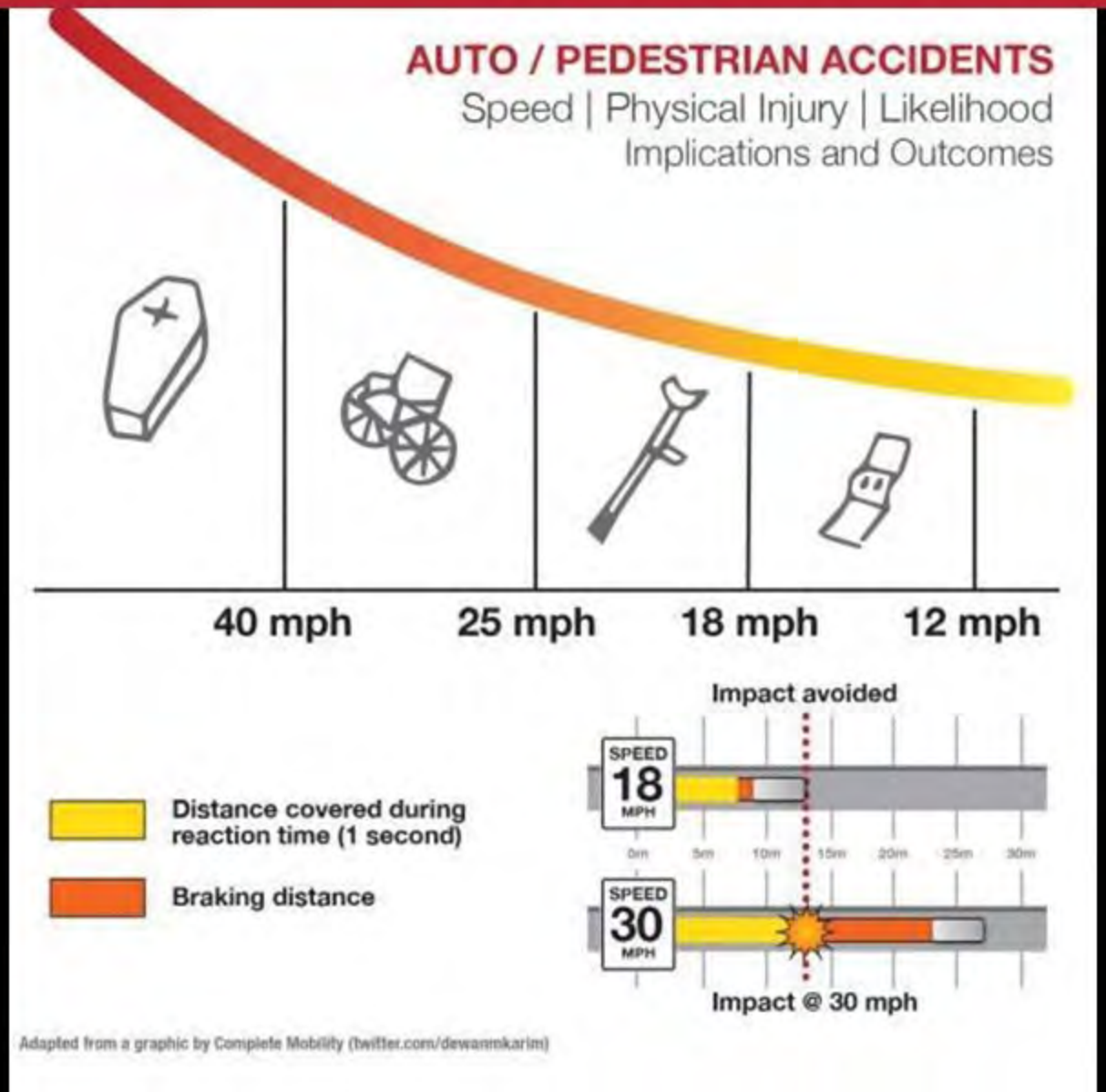
Rotterdam, NL

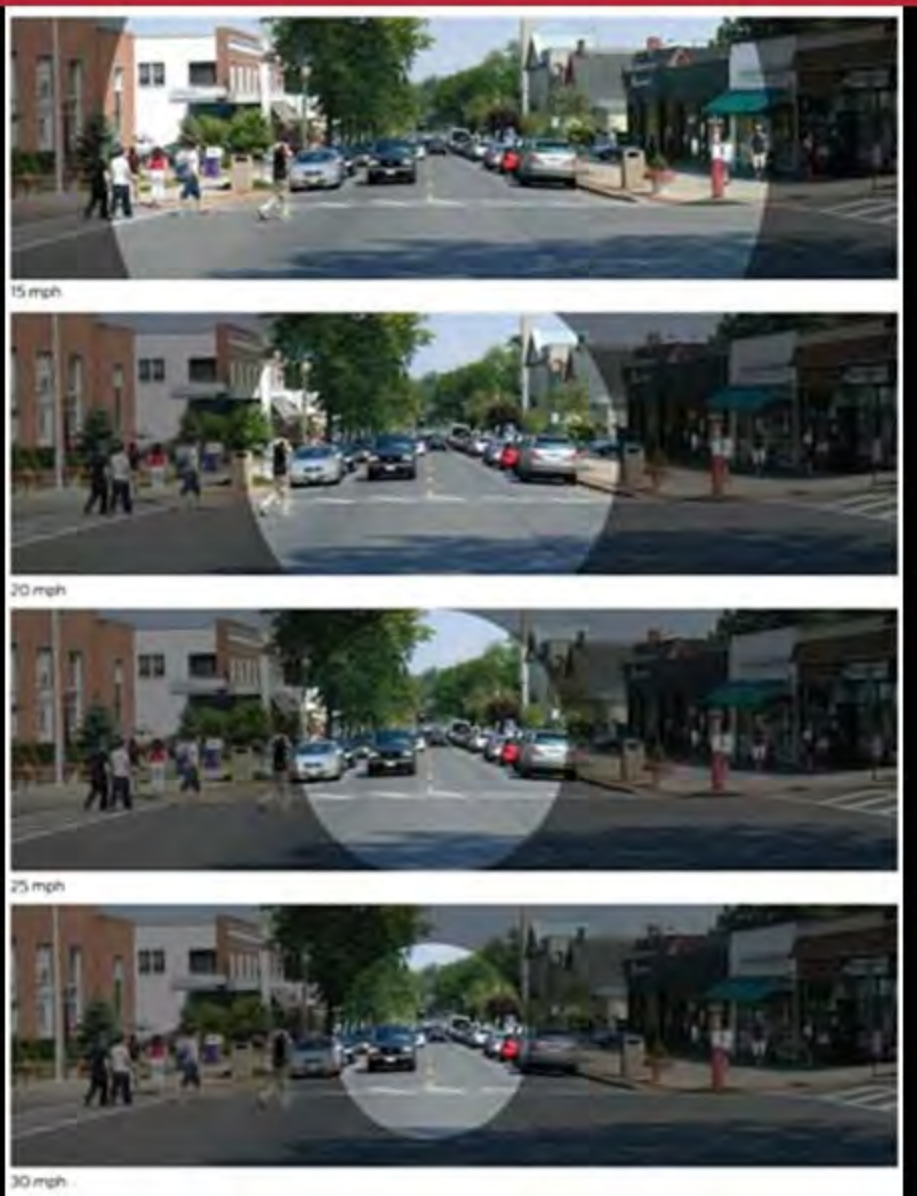
Introduction

On average, one person is injured in a car crash every day in Anchorage. A person walking is hit by a car in Anchorage on average every three days. Also, a person on a bike is hit by a car on average every three days (Municipality of Anchorage Traffic Data, 2013).

VISION ZERO
ANCHORAGE

Introduction



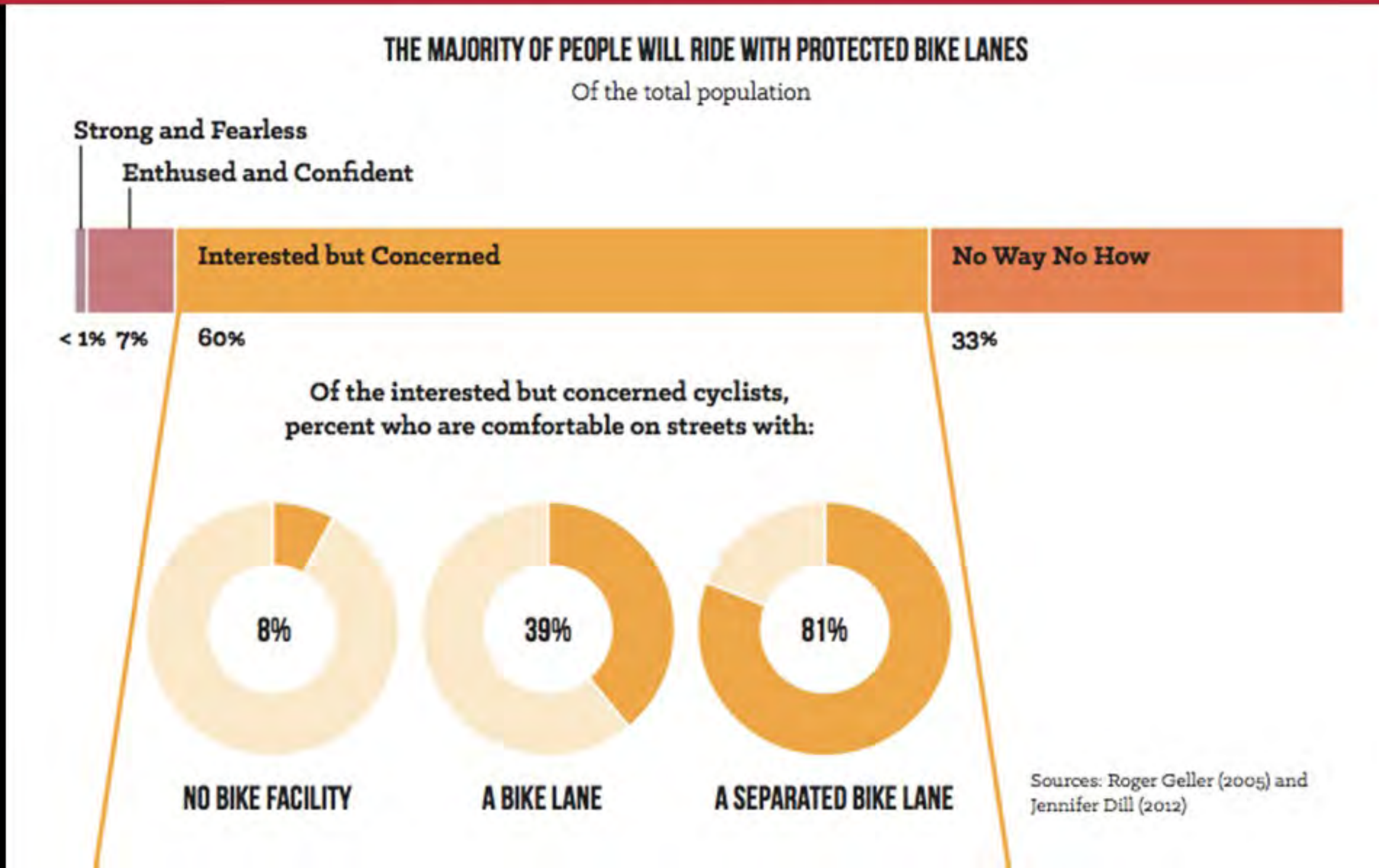


Introduction

Relative Likelihood of a Cycling Injury Crash by Bikeway and Street Type (2008 – 2009)

Source: UBC BICE data, May 2008 – November 2009

Introduction



DESIGN GUIDANCE

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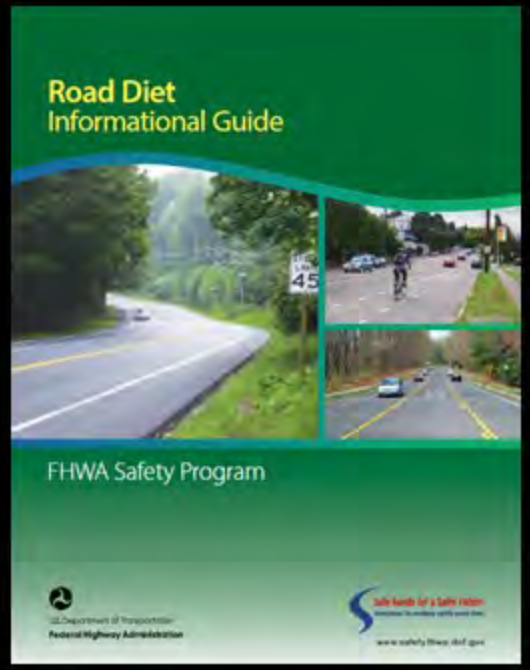
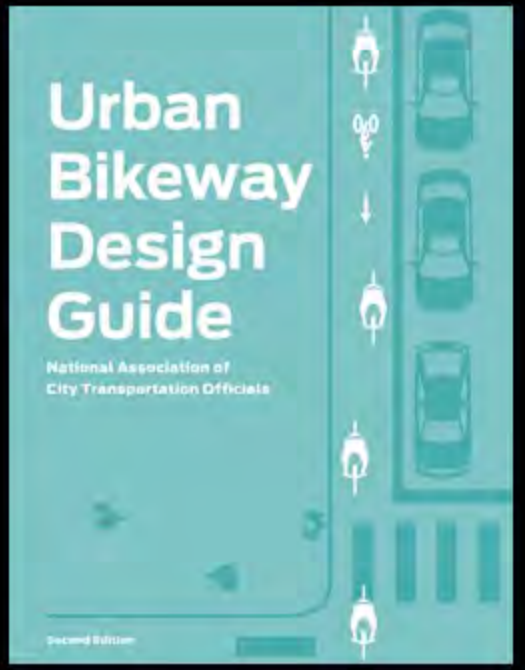
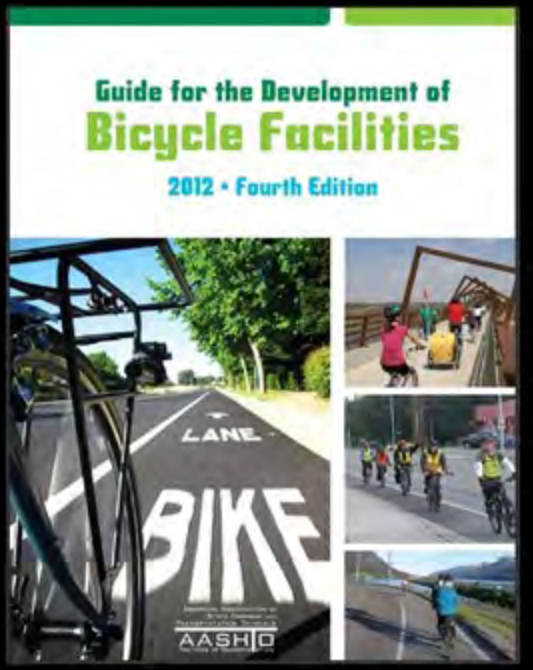






FHWA: Design Flexibility (2010)

"...DOT encourages transportation agencies to **go beyond the minimum requirements**, and proactively provide convenient, safe, and context-sensitive facilities that foster **increased use by bicyclists and pedestrians of all ages and abilities**, and utilize universal design characteristics when appropriate."

fhwa.dot.gov/environment/bicycle_pedestrian/overview/policy_accom.cfm

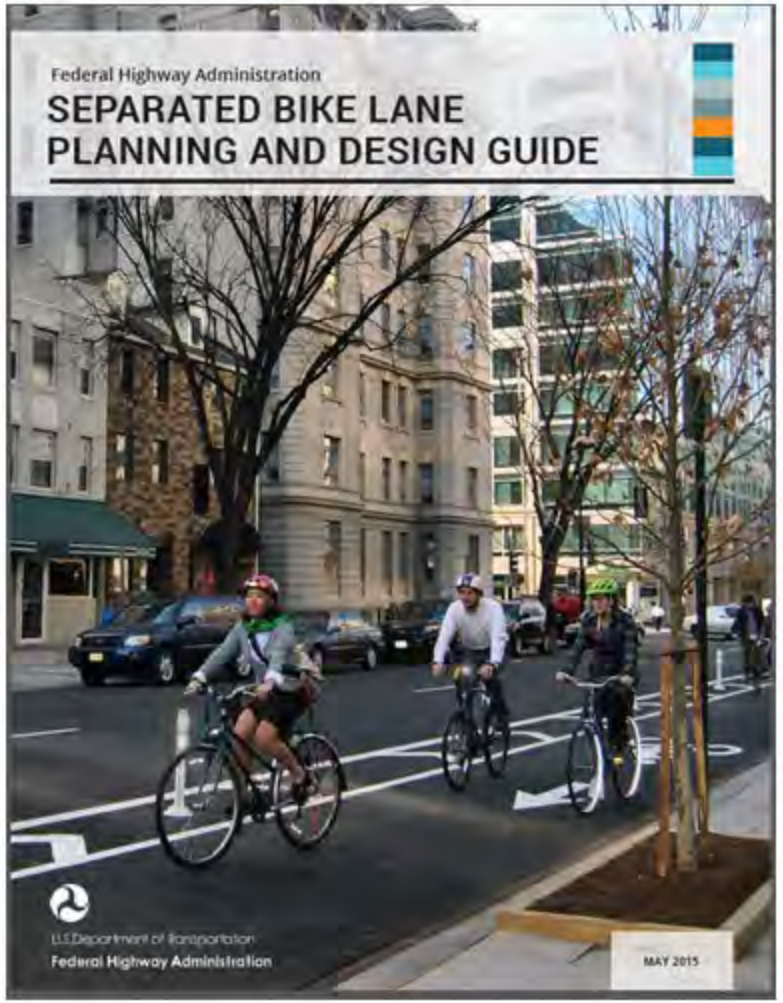
FHWA: Design Flexibility (2013)

"…support for taking a **flexible approach** to bicycle and pedestrian facility design. FHWA **supports the use of [NACTO, ITE and other] resources** to further develop non-motorized transportation networks, particularly in urban areas."

www.fhwa.dot.gov/environment/bicycle_pedestrian/guidance/design_guidance/design_flexibility.cfm

FHWA: Design Guidance (2015)

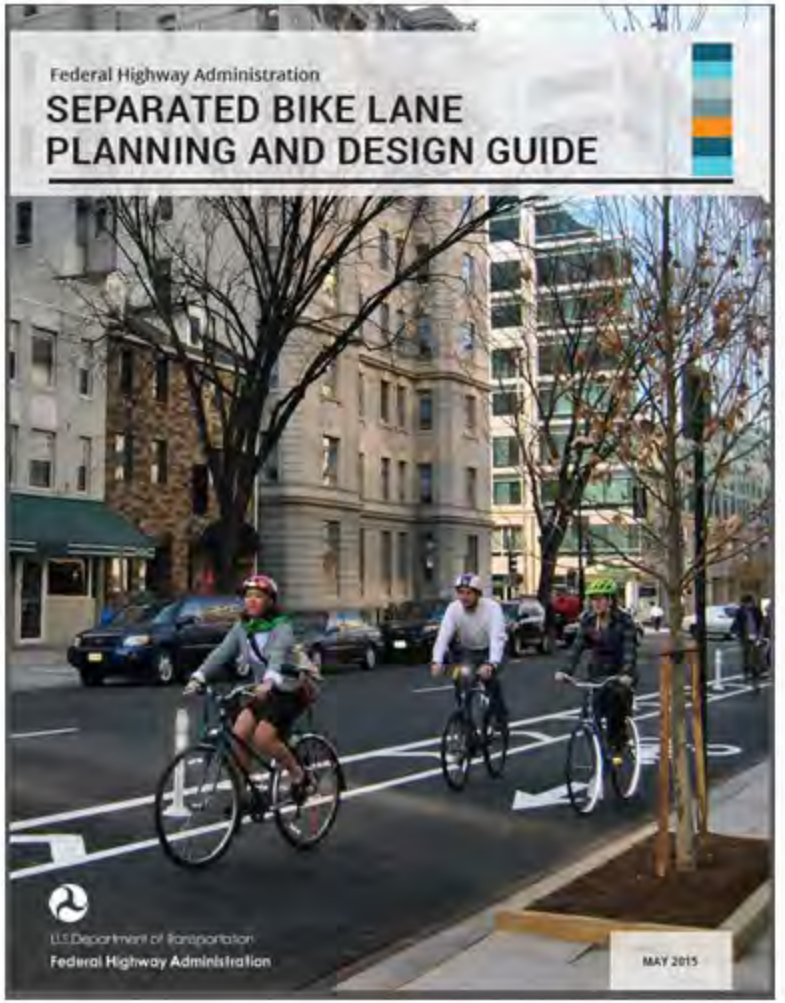
"FHWA encourages the **use of all appropriate design resources as well as continued experimentation and modifications of designs**, in order to develop safe, comfortable, and predictable separated bike lane treatments that fit unique site conditions and needs for each project."



FHWA: Design Guidance (2015)

"Bicycle and pedestrian projects, including separated bike lanes, are **eligible for Federal-aid highway and transit program funding** categories."

http://www.fhwa.dot.gov/environment/bicycle_pedestrian/funding/funding_opportunities.cfm



FHWA: Funding (2015)

Bicycle and Pedestrian Funding Opportunities: US Department of Transportation, Federal Transit, and Federal Highway Funds

Revised **August 25, 2015**, to incorporate programs authorized under the Moving Ahead for Progress in the 21st Century Act (MAP-21).

This table indicates potential eligibility for pedestrian and bicycle projects under Federal Transit and Federal Highway programs. Specific program requirements must be met, and eligibility must be determined, on a case-by-case basis. For example: transit funds must provide access to transit; CMAQ must benefit air quality; HSIP projects must be consistent with the State Strategic Highway Safety Plan and address a highway safety problem; NHPP must benefit National Highway System (NHS) corridors; RTP must benefit trails; the Federal Lands and Tribal Transportation Programs (FLTTP) must provide access to or within Federal or tribal lands. See more information about Bikes and Transit and Eligibility of Pedestrian and Bicycle Improvements under Federal Transit Law.

Bicycle and Pedestrian Funding Opportunities / Federal Transit and Federal Highway Funds

Activity	TIGER see note below	FTA	ATI	CMAQ see note below	HSIP	NHPP NHS	STP	TAP TE	RTP	SRTS until expended	PLAN see note below	402	FLTTP
Access enhancements to public transportation	$	$	$	$			$	$					$
ADA/504 Self Evaluation / Transition Plan	$plan						$	$	$		$		$
Bicycle and/or pedestrian plans	$plan	$					$	$			$		$
Bicycle lanes on road	$	$	$	$	$	$	$	$		$			$
Bicycle parking	$*	$	$	$		$	$	$	$	$			$
Bike racks on transit	$	$	$	$			$	$					$
Bicycle share (capital and equipment; not operations)	$	$	$	$		$	$	$					$

AASHTO: Travel Lane Widths (2011)

"...under interrupted-flow conditions operating at low speeds (45 mph or less) **narrower lane widths are normally adequate and have some advantages.**"

- AASHTO. Geometric Design of Highways and Streets, pg. 7-29, AASHTO, Washington, D.C., 2011.

Travel Lane Widths

Ranges for Lane Width

Type of Roadway	Urban	
	US (feet)	Metric (meters)
Freeway	12	3.6
Ramps (1-lane)	12-30	3.6-9.2
Arterial	10-12	3.0-3.6
Collector	10-12	3.0-3.6
Local	9-12	2.7-3.6

9.5 ft. travel lane

9.5 ft. travel lane

http://safety.fhwa.dot.gov/geometric/pubs/mitigationstrategies/chapter3/3_lanewidth.cfm

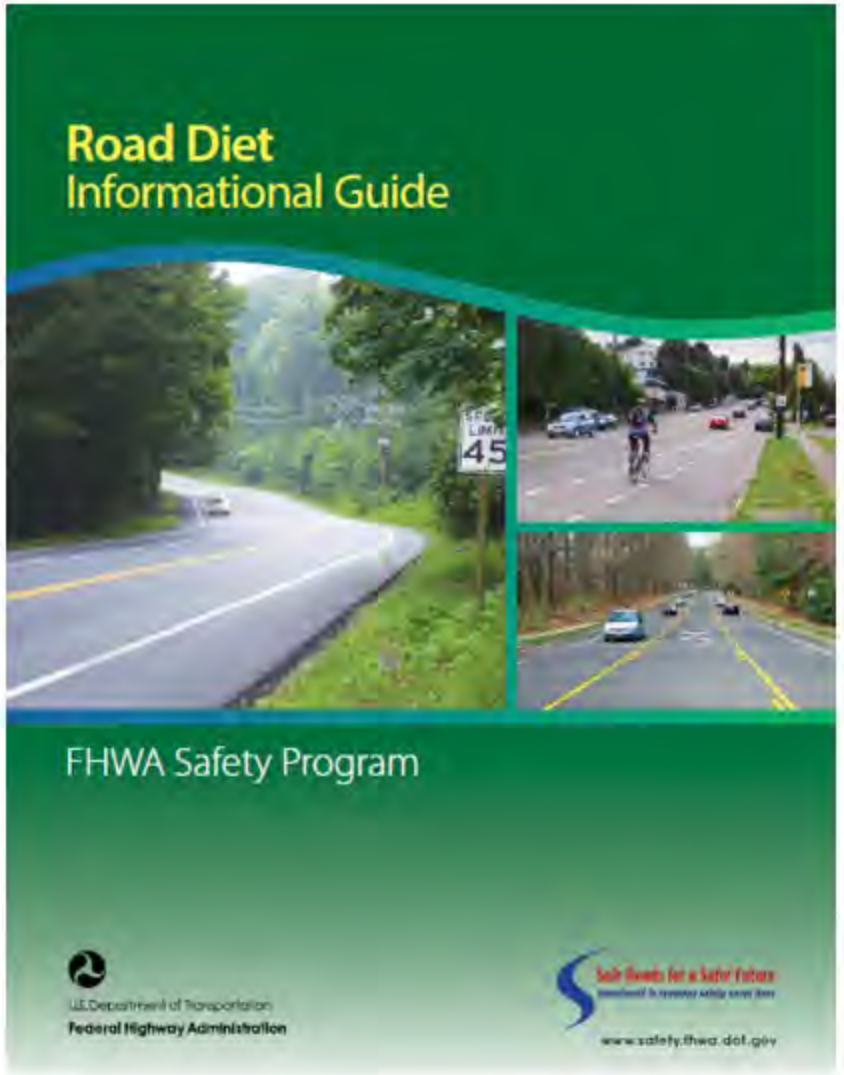
Lane Configurations

Considerations for 4-to-3 Conversion

- ADT ≤20,000 may be good candidates
- Some jurisdictions have seen success on ADTs up to 24,000
- Peak hour volume and turning movements may be more critical than ADT.

Benefits for 4-to-3 Conversion

- 29% reduction in total crashes in urban areas
- 19 % reduction in total crashes in suburban areas
- Up to 47% reduction in crashes in small town context
- Up to 30% observed reduction in speeding at one site
- **Safe and Prudent Drivers – Right Sized Roads**



BICYCLE INFRASTRUCTURE

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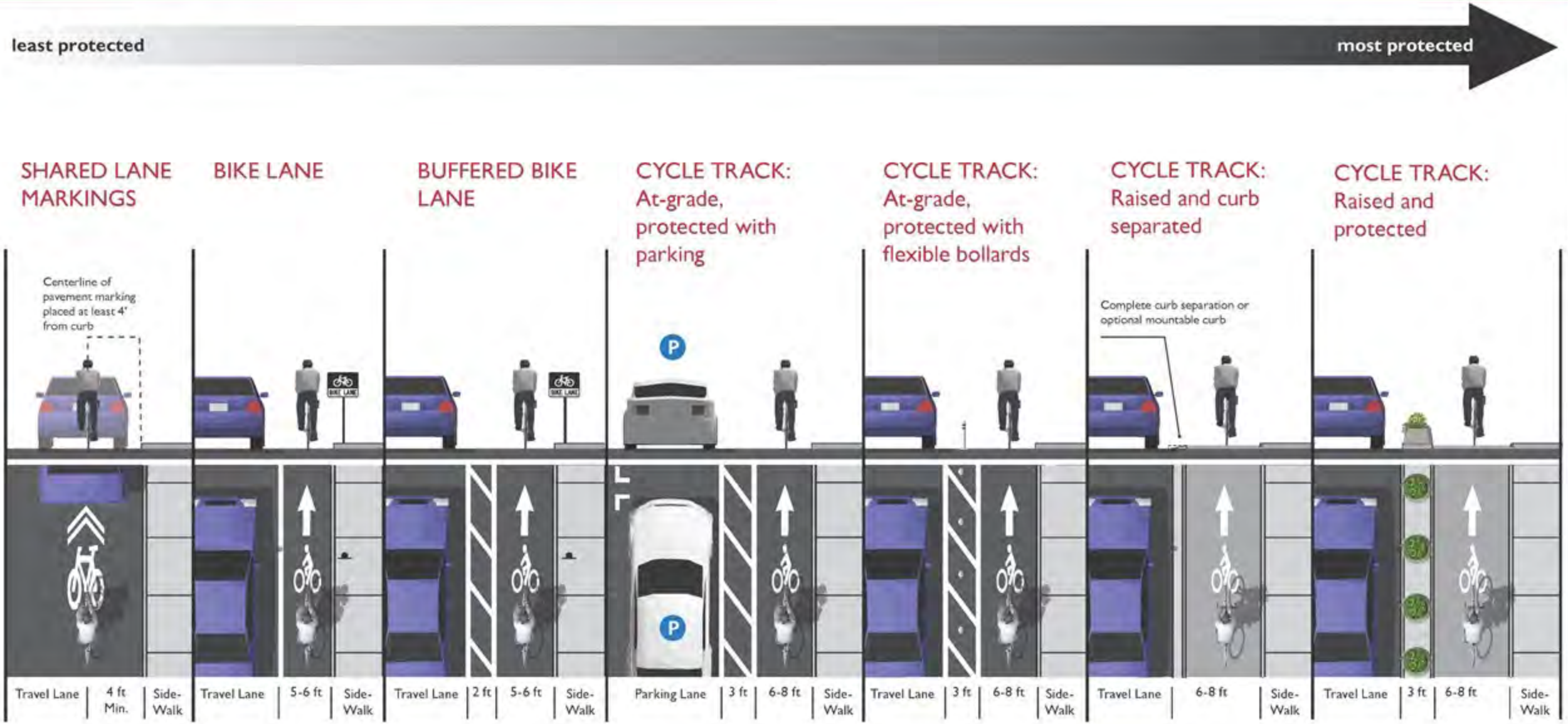
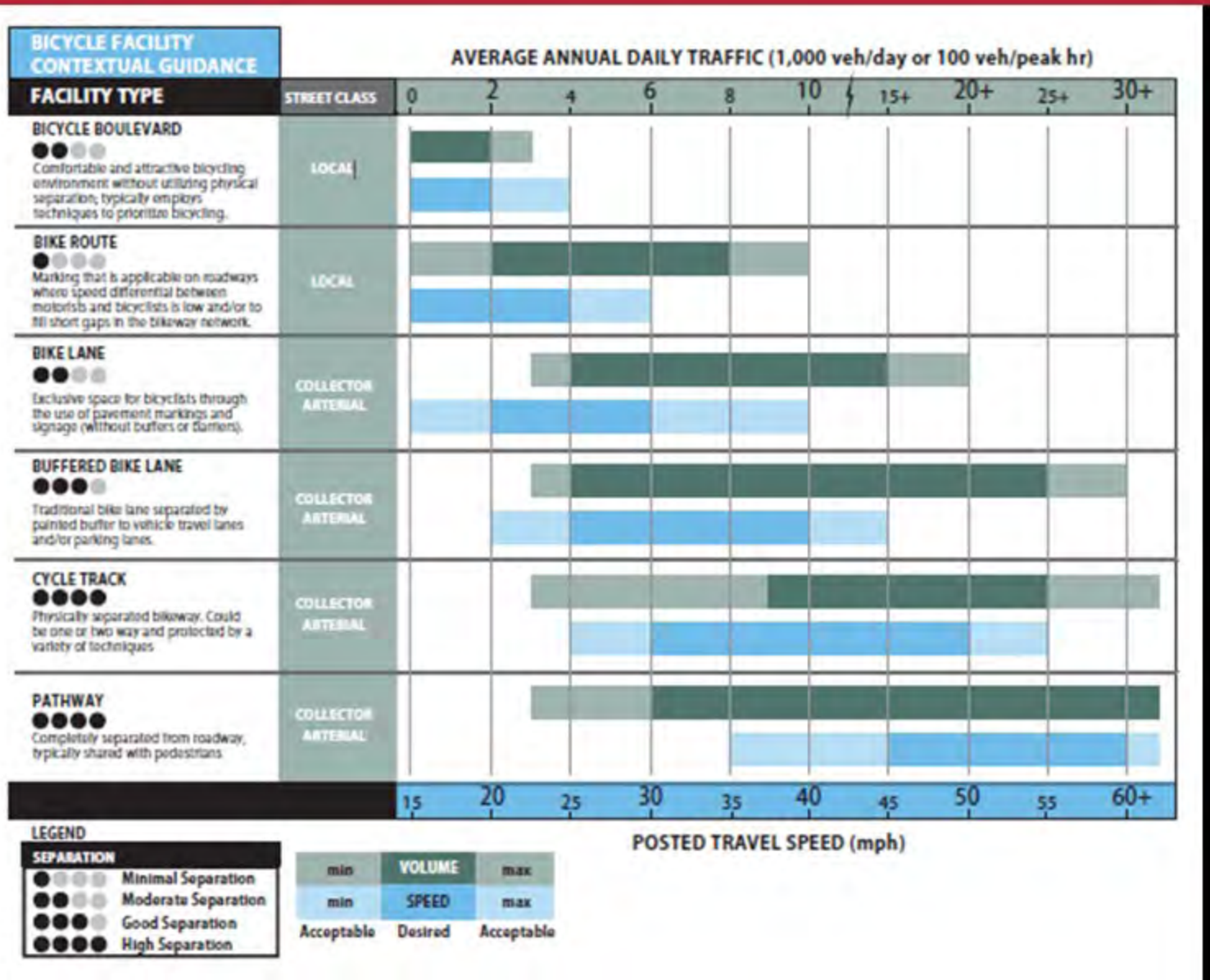
least protected → most protected

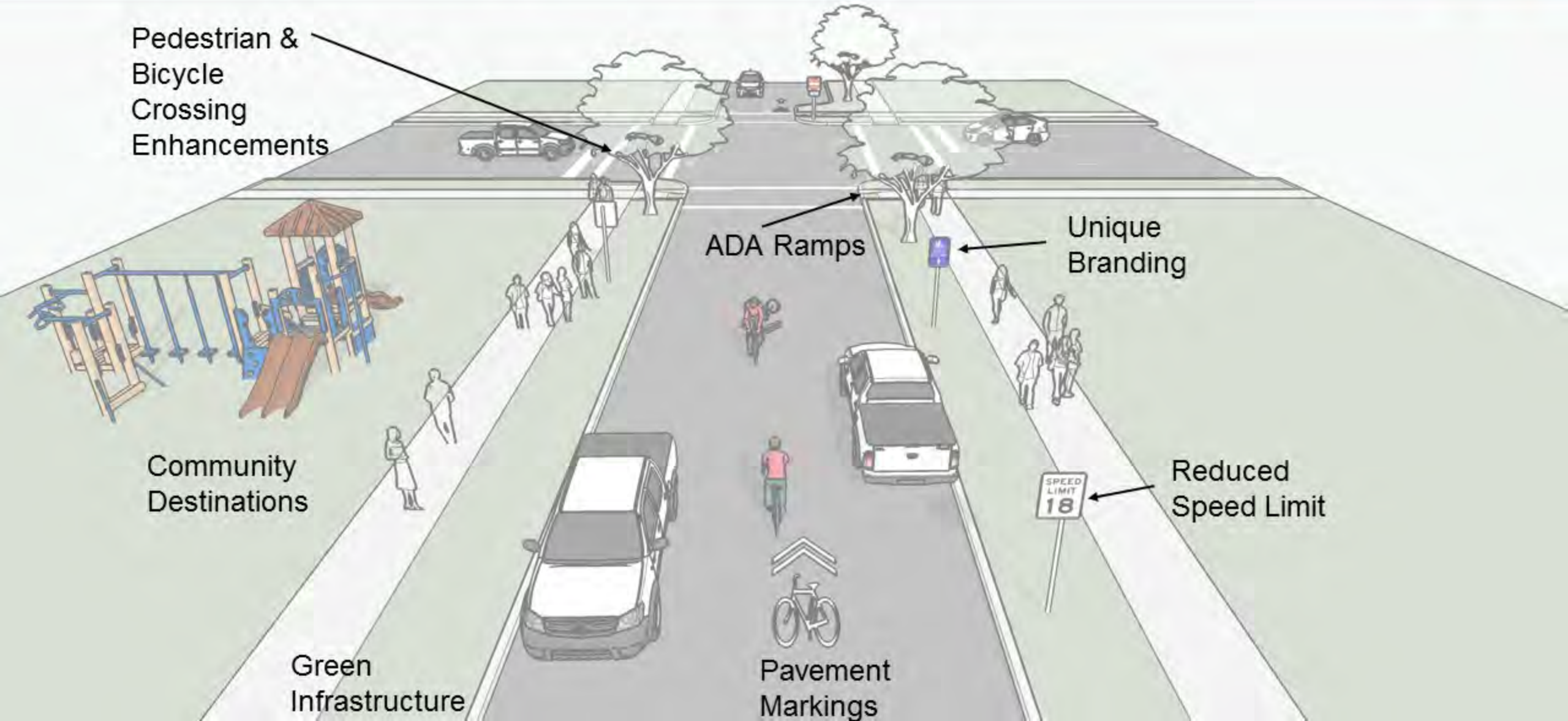


Volume & Speed



BICYCLE BOULEVARDS

Bicycle Boulevard Elements



BICYCLE BOULEVARDS: Speed Management

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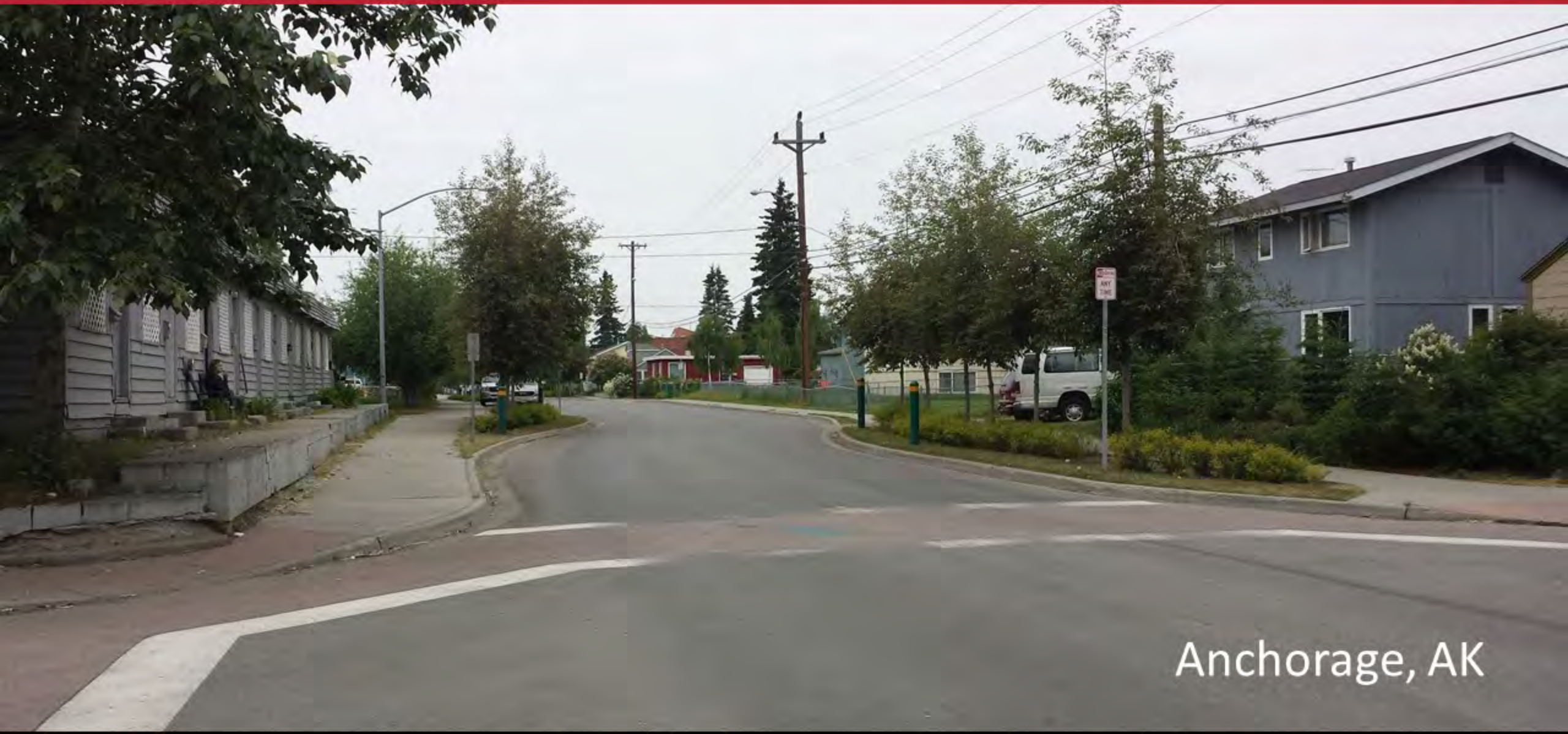
Minneapolis, MN

Toronto, ON

BICYCLE BOULEVARDS: Speed Management



BICYCLE BOULEVARDS: Volume Management

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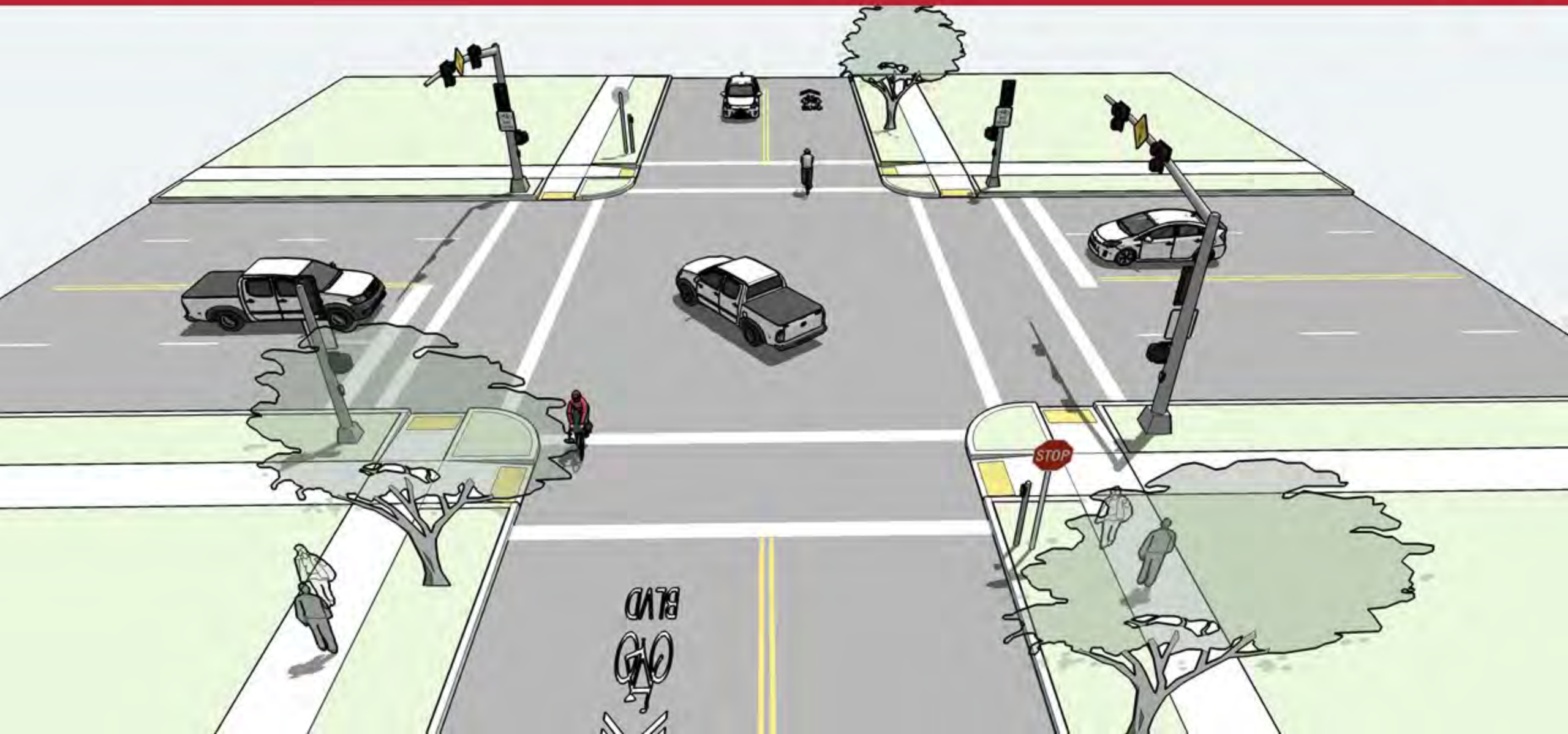
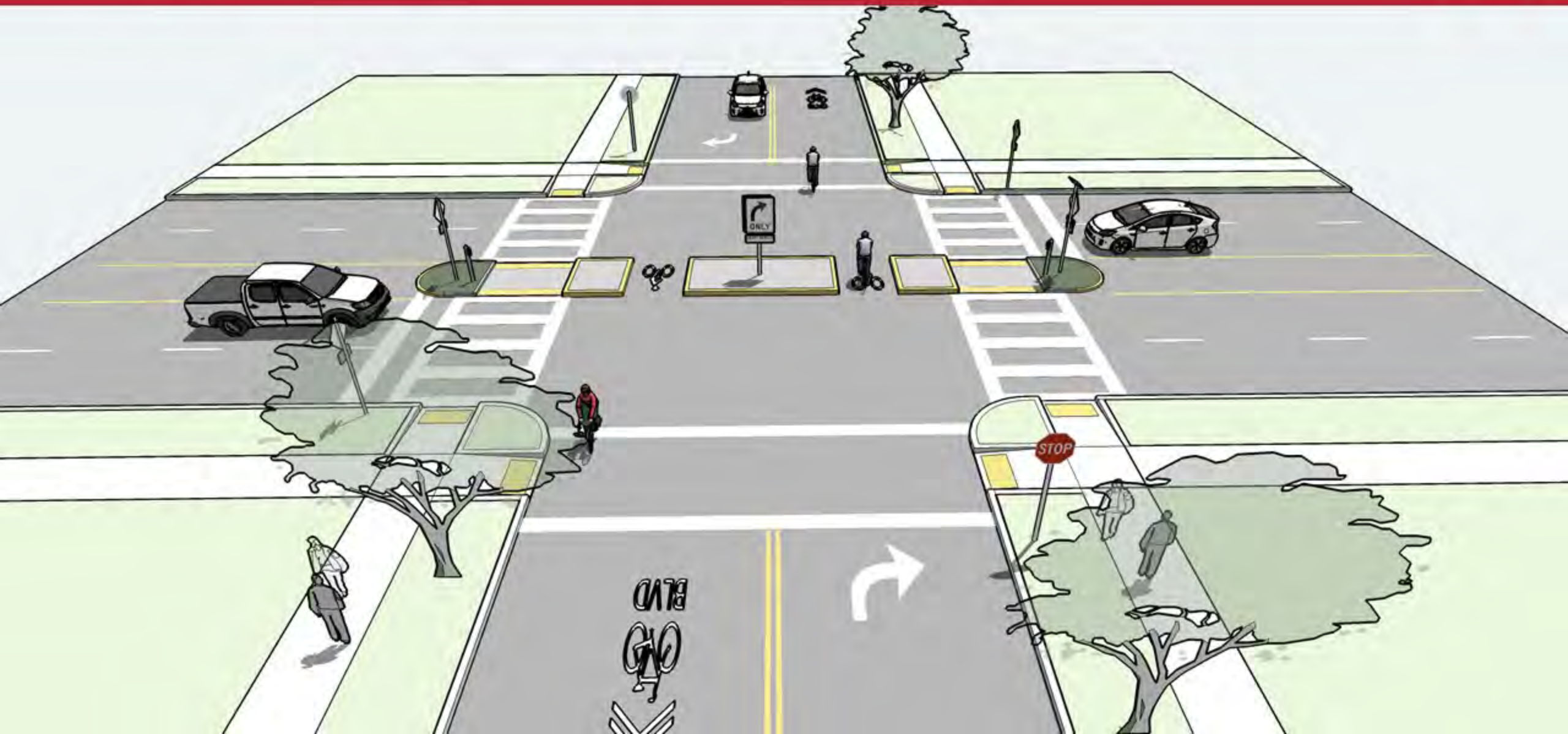
BICYCLE BOULEVARDS: Volume Management

Vancouver, BC

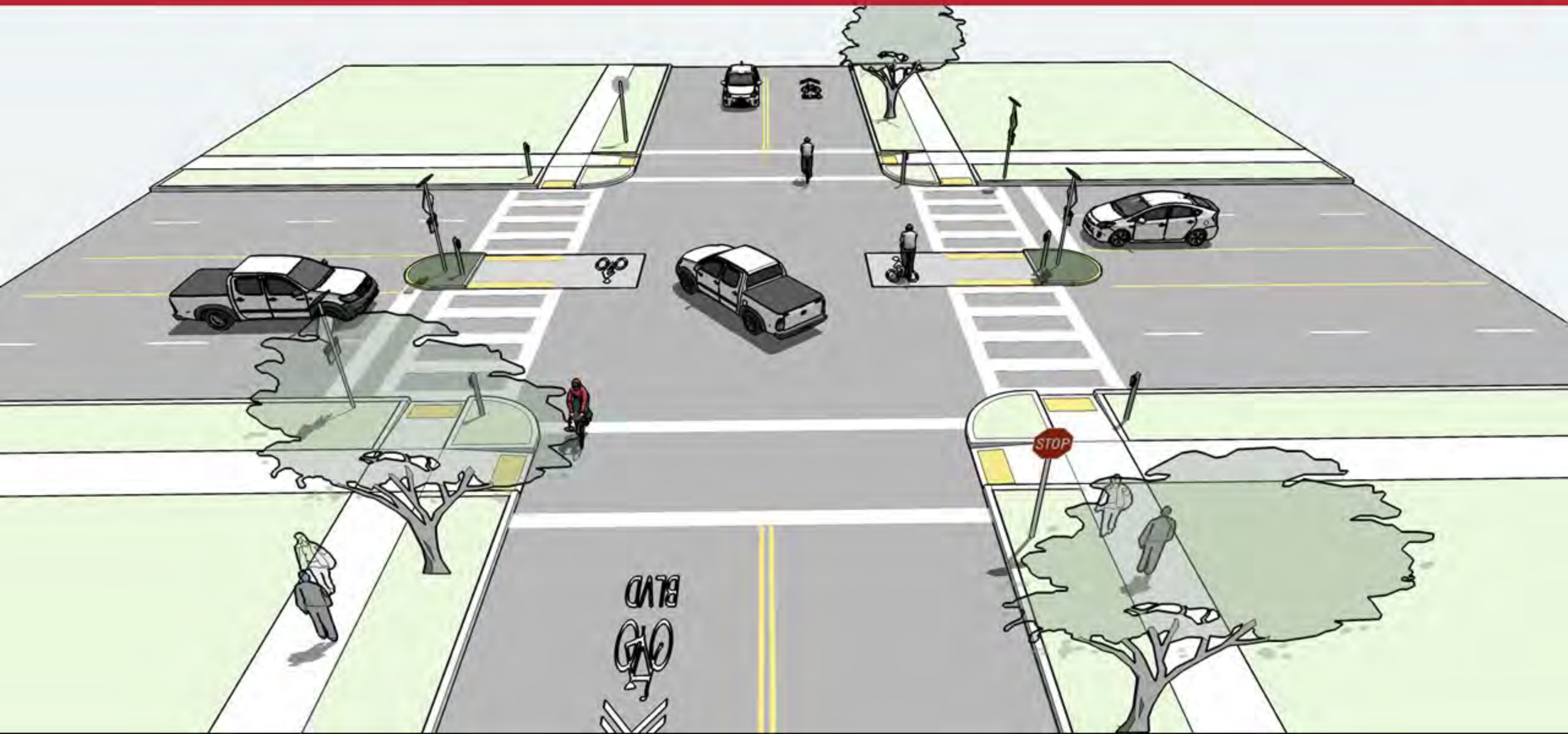
Major Crossings



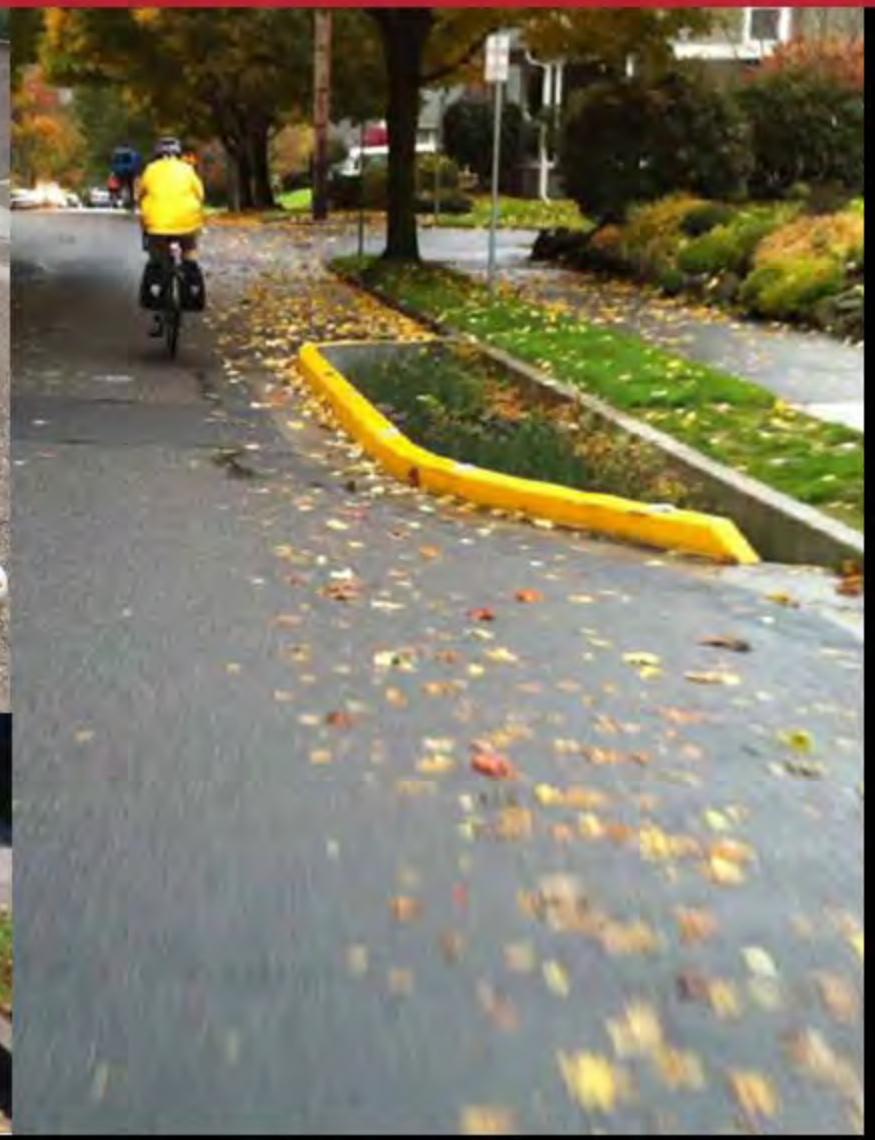
Major Crossings



Major Crossings



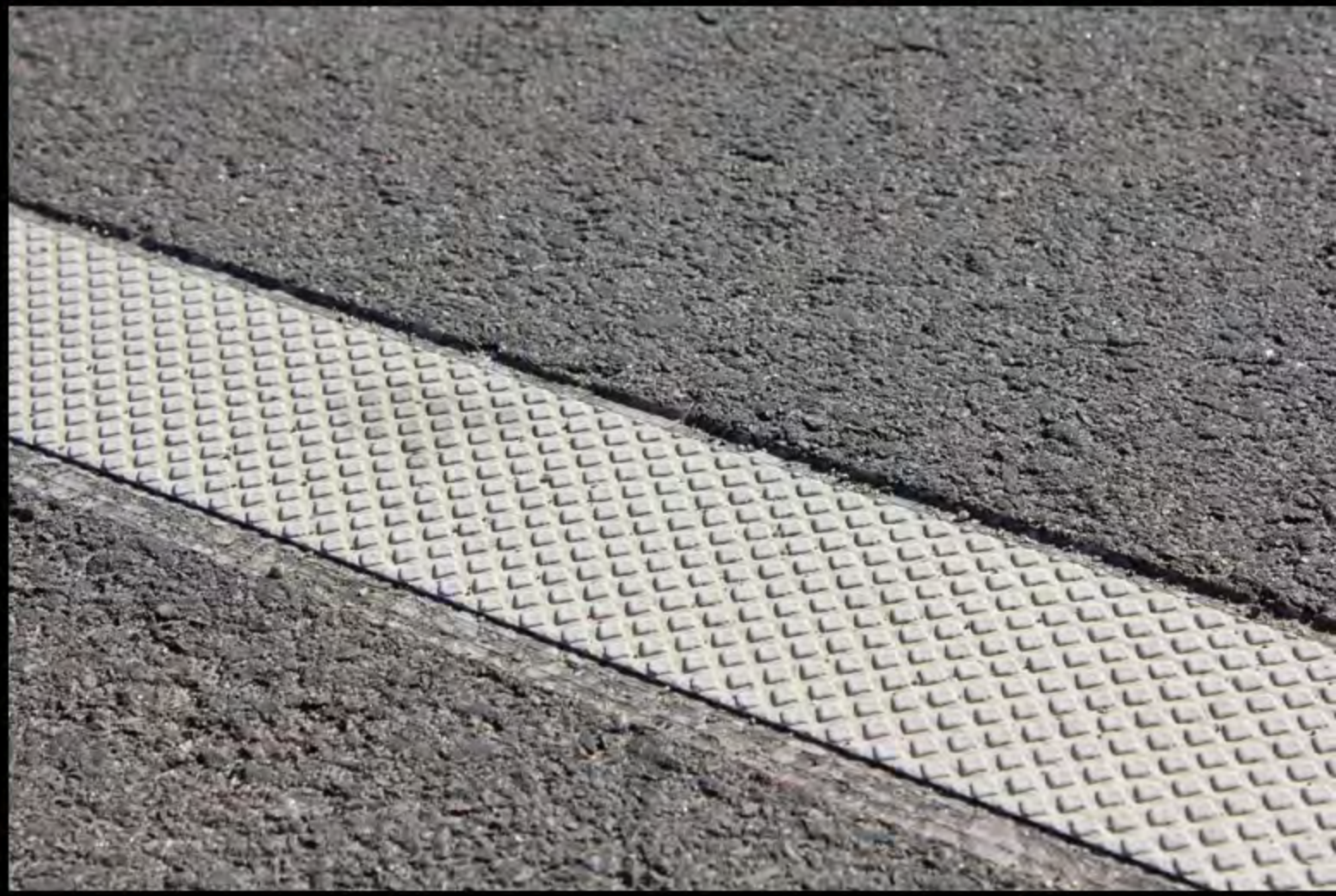
BICYCLE BOULEVARDS: Green Infrastructure



Pavement Markings

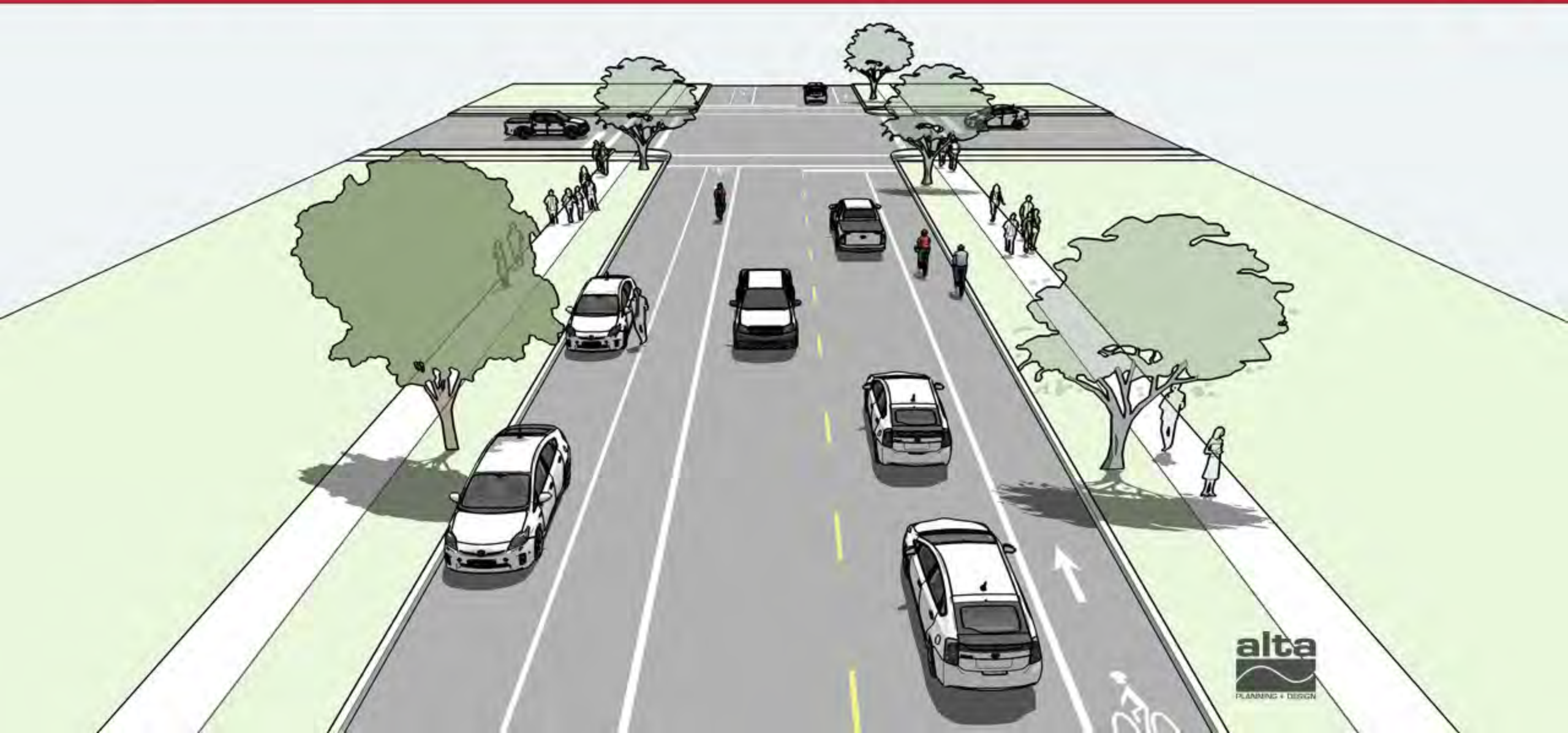
Pavement Markings

Plowable Pavement Markings

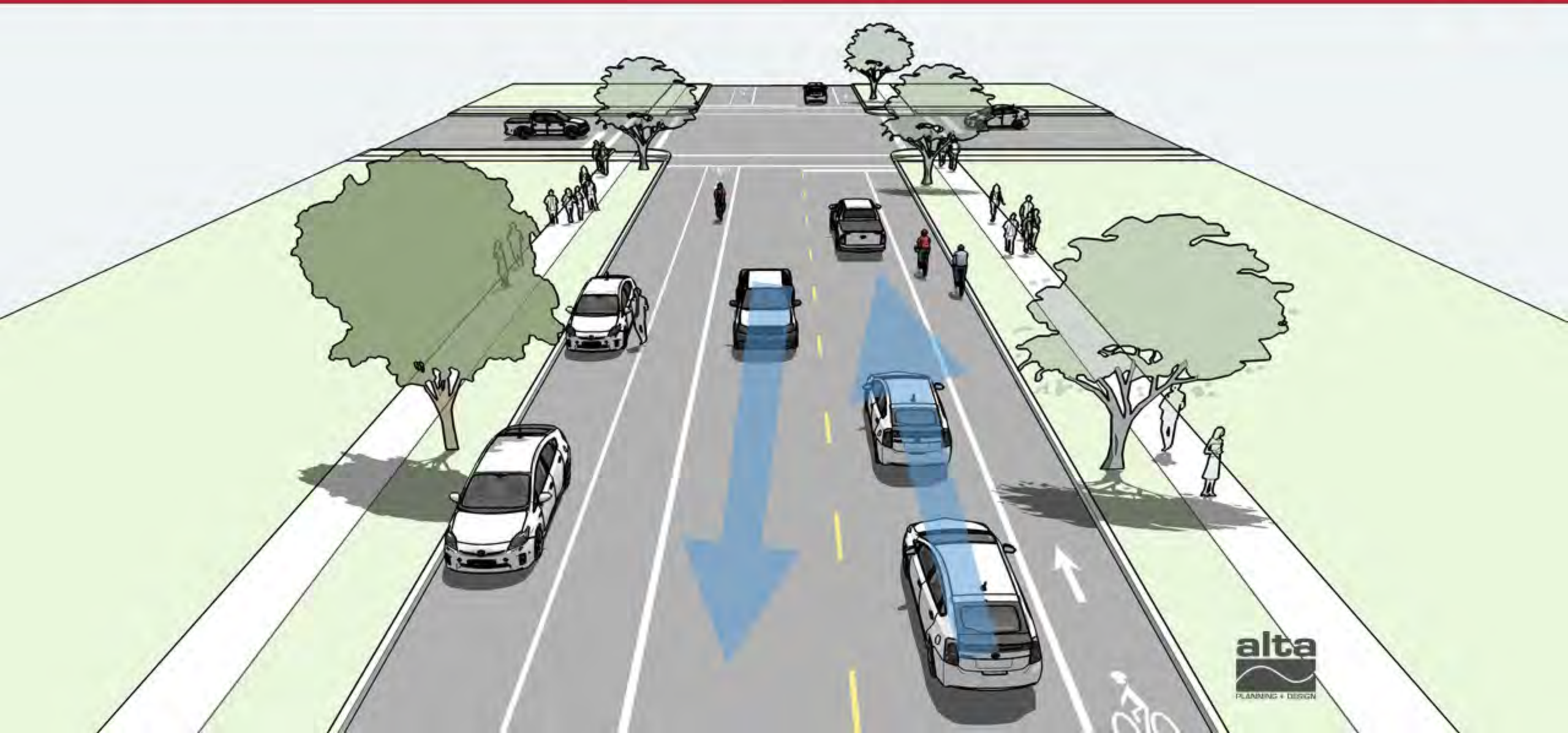


BIKE LANES

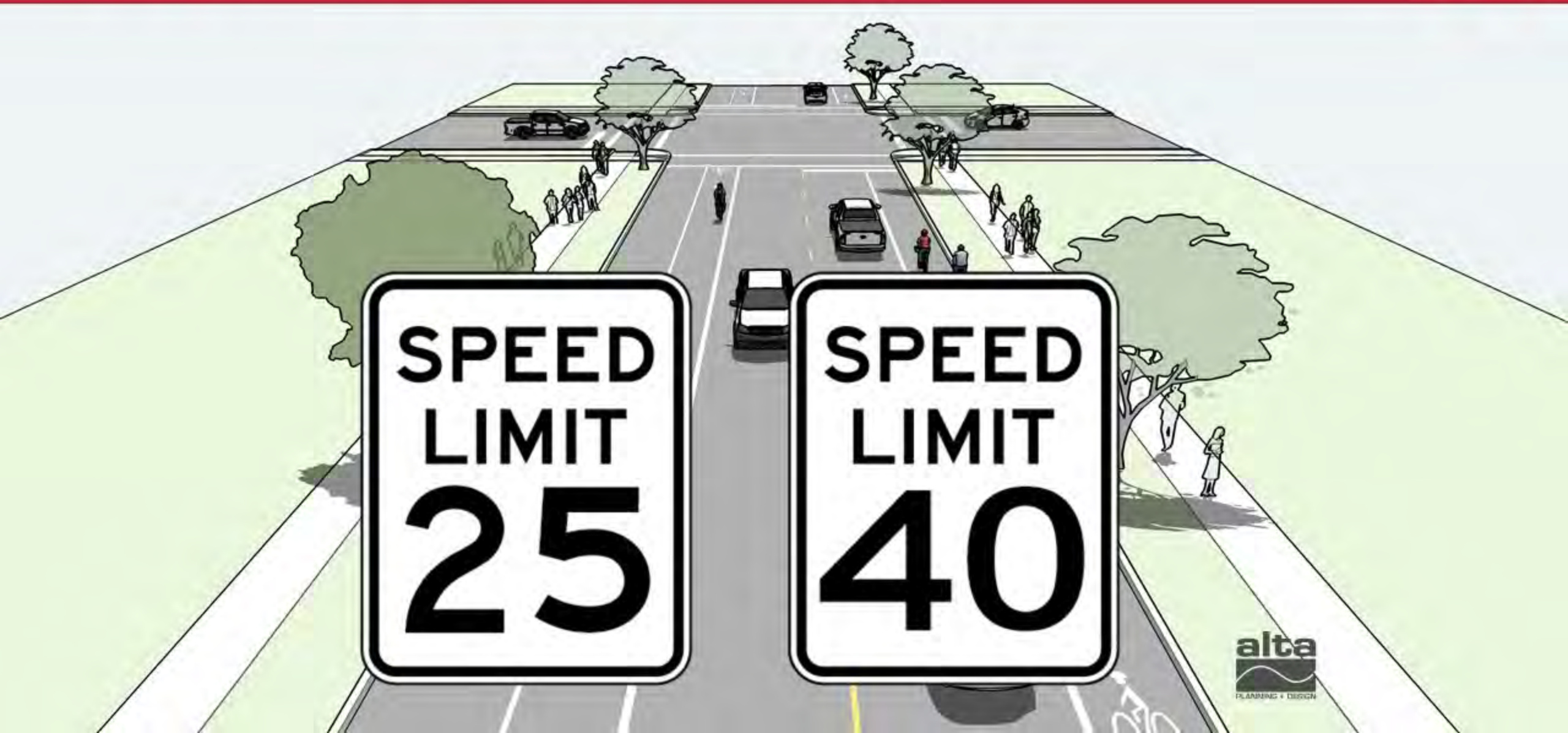
BIKE LANES



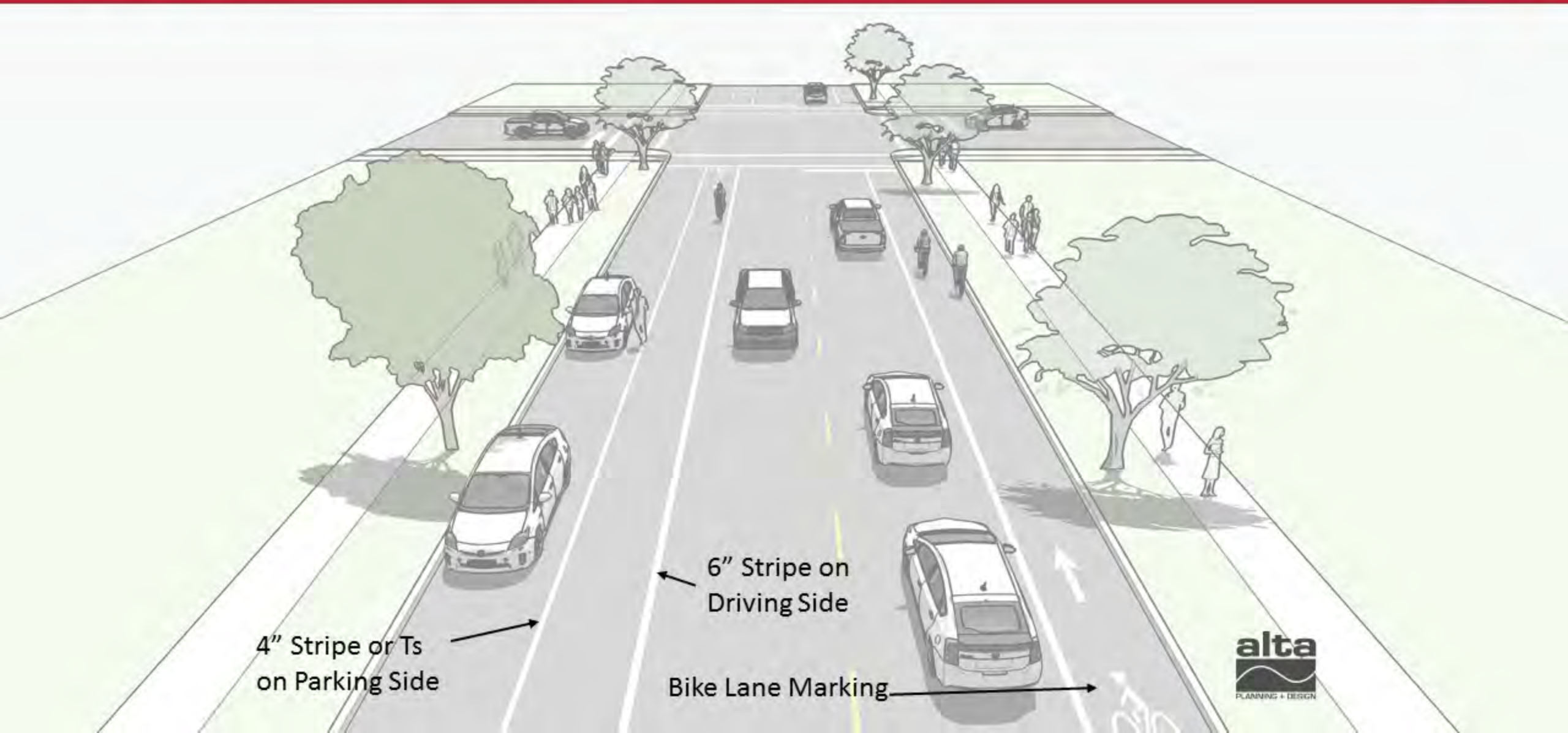
BIKE LANES: Volumes ≥ 6,000 ADT



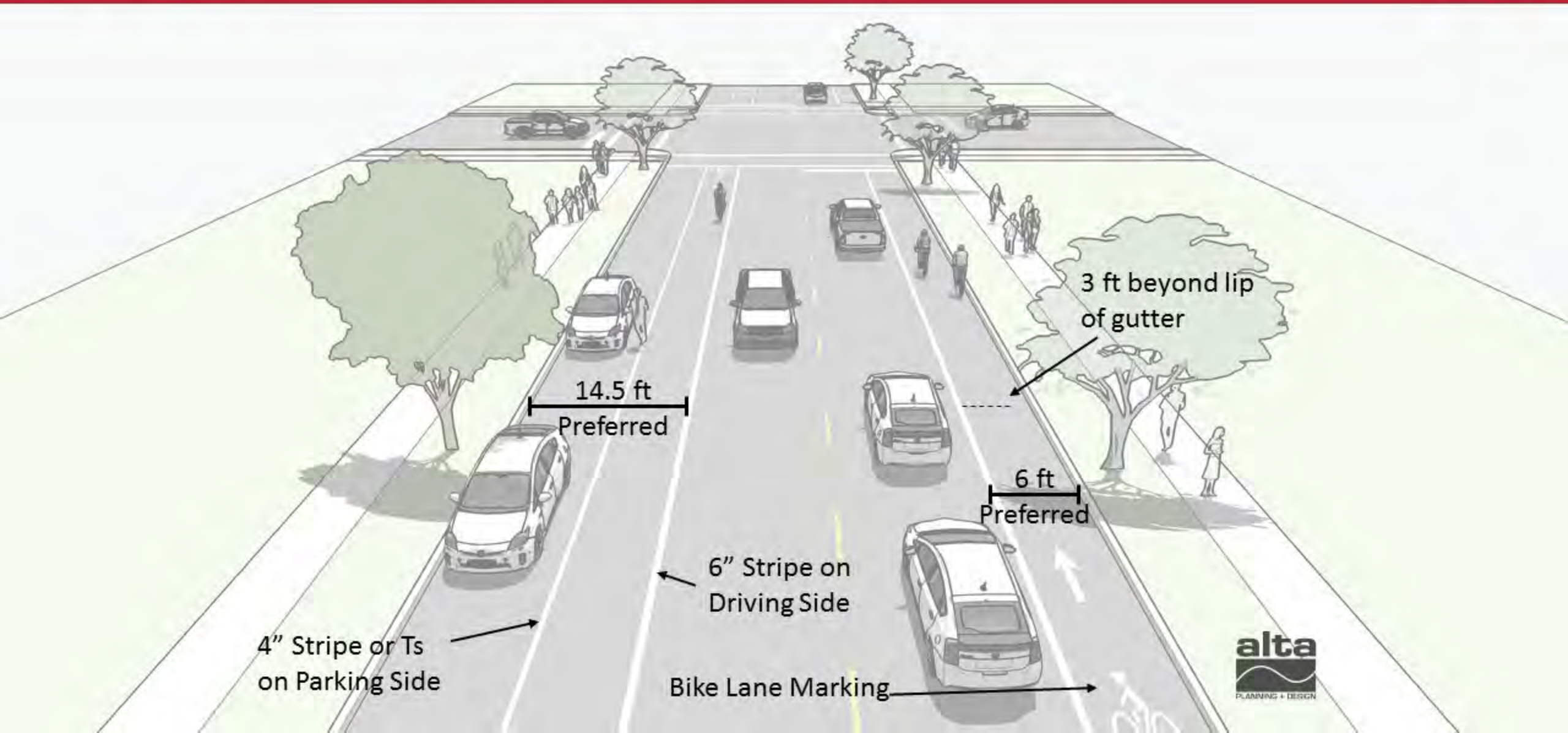
BIKE LANES: Moderate Speeds



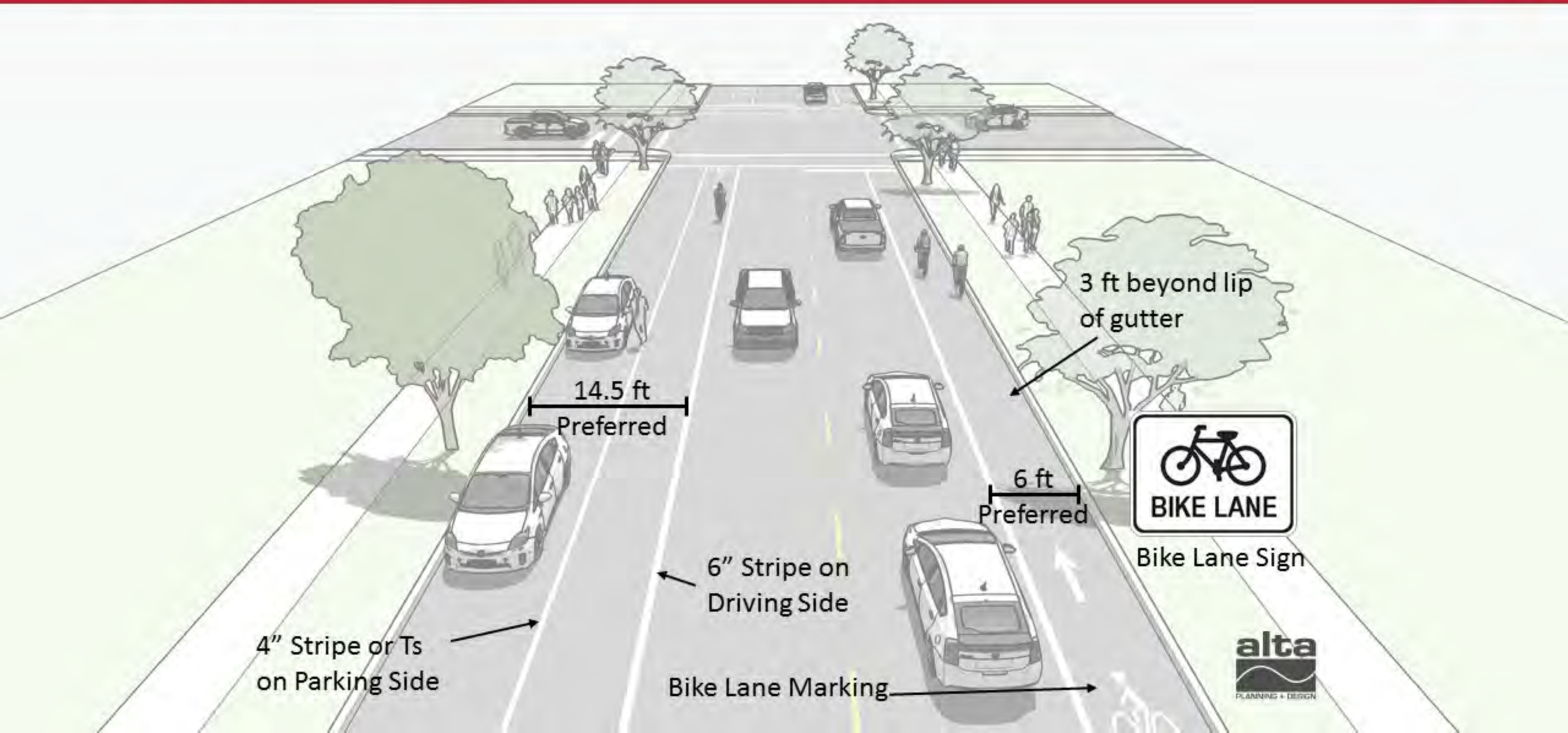
BIKE LANES: Pavement Markings



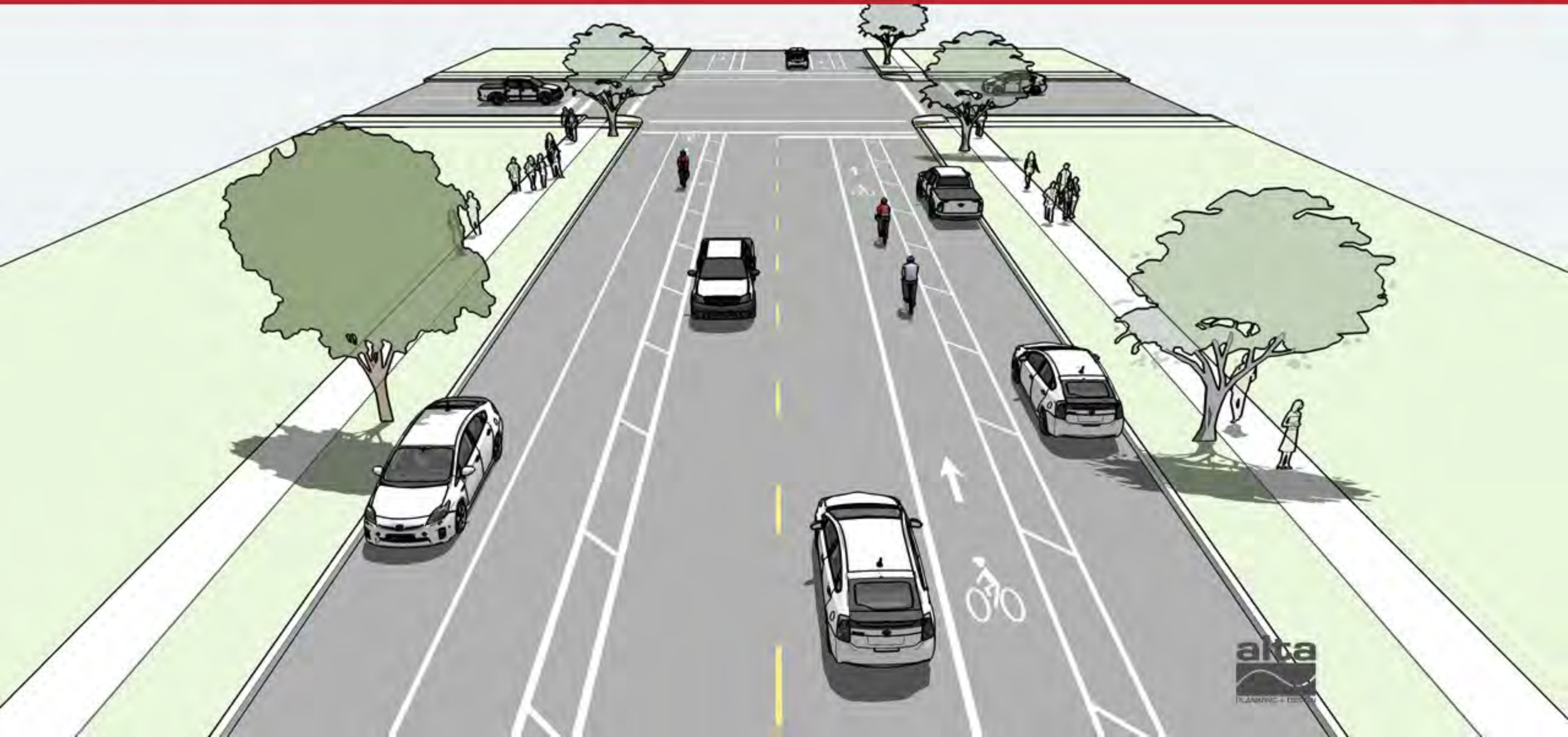
BIKE LANES: Dimensions



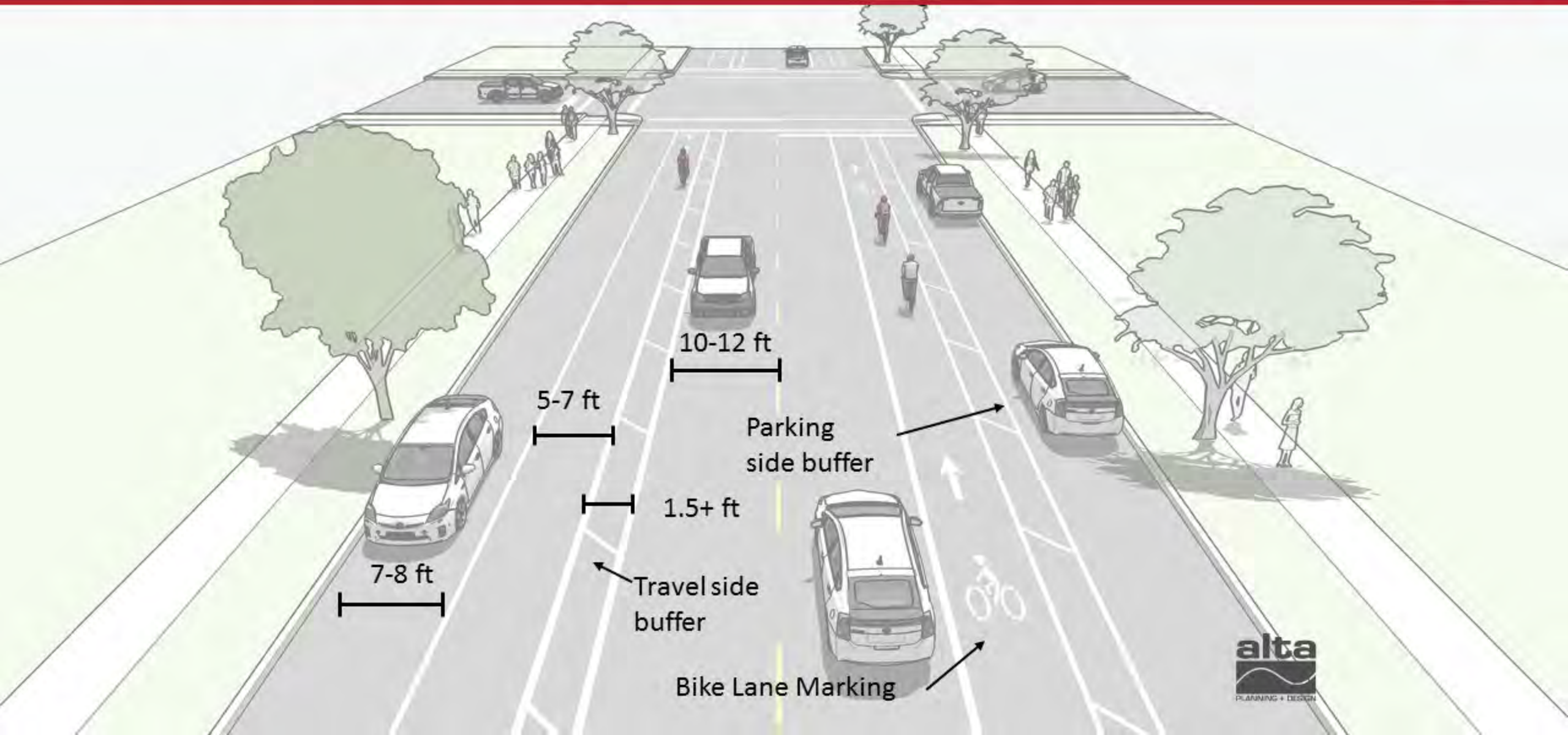
BIKE LANES: Signs



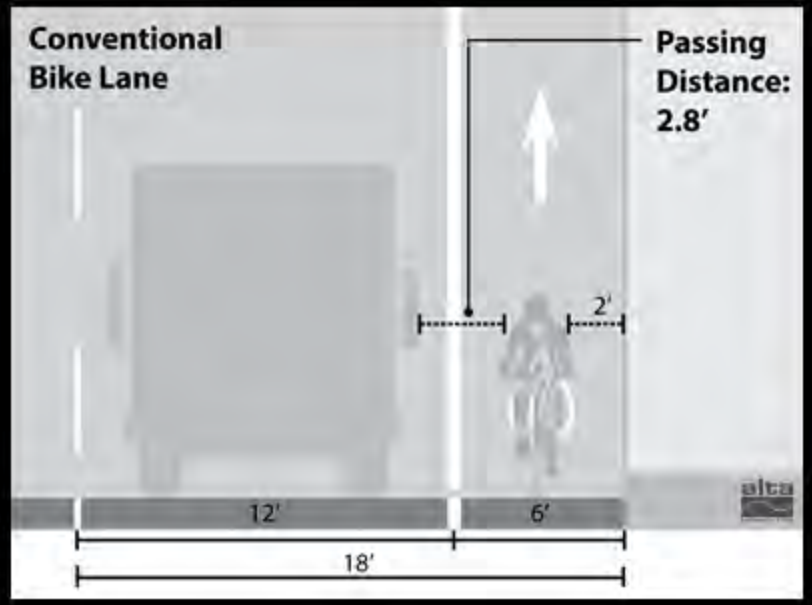
BUFFERED BIKE LANES

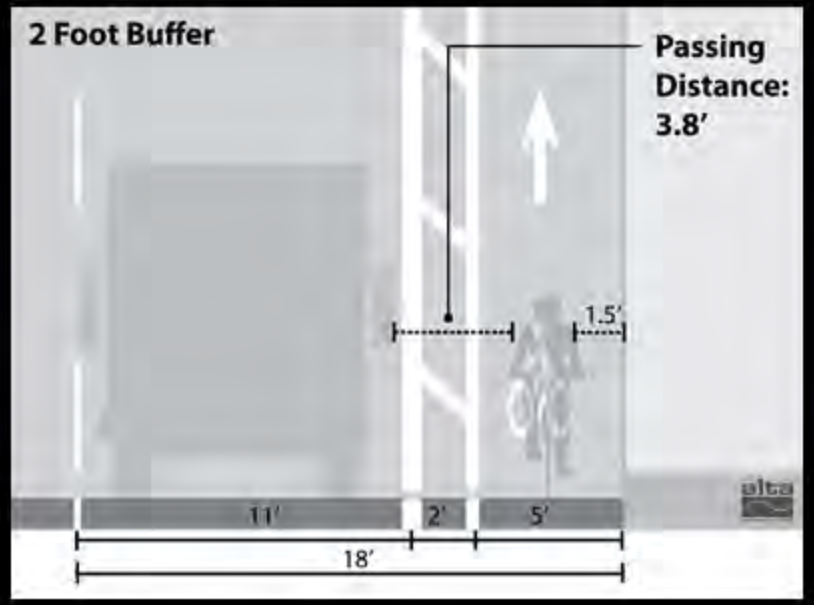


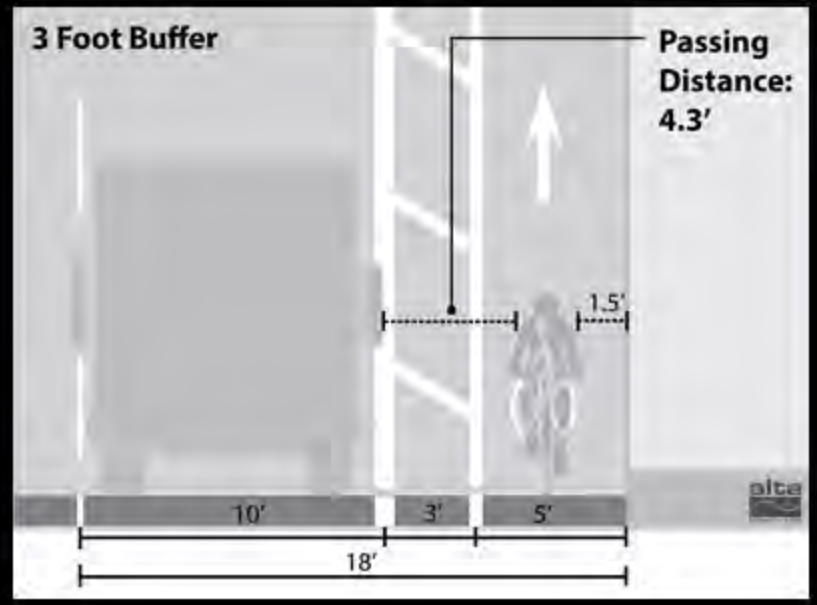
BUFFERED BIKE LANES: Dimensions



Buffer


Conventional
Bike Lane
Passing
Distance:
2.8′
2′
12′
6′
18′
alta


2 Foot Buffer
Passing
Distance:
3.8′
1.5′
11′
2′
5′
18′
alta

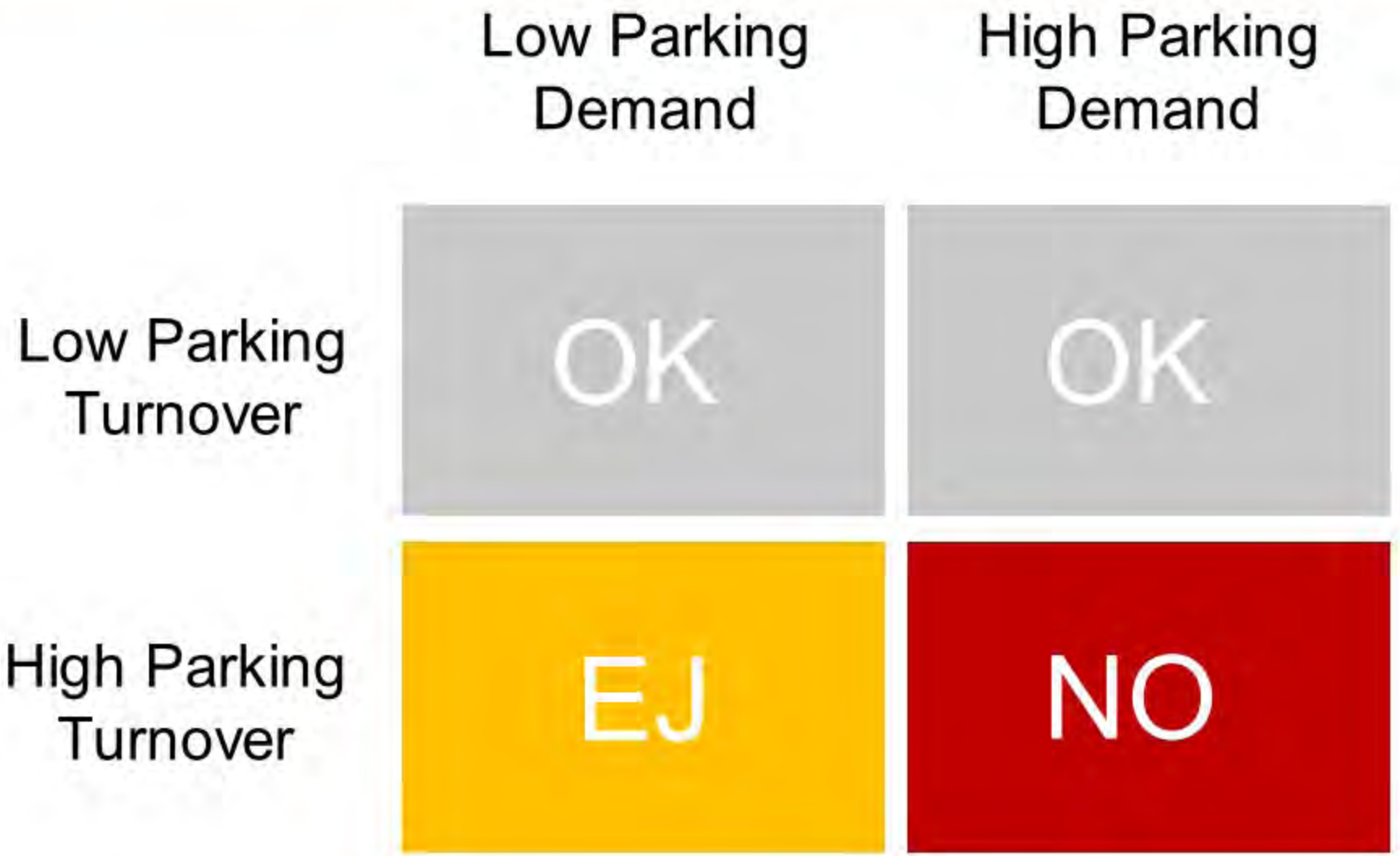

3 Foot Buffer
Passing
Distance:
4.3′
1.5′
10′
3′
5′
18′
alta

Bike Lanes: Transit Islands

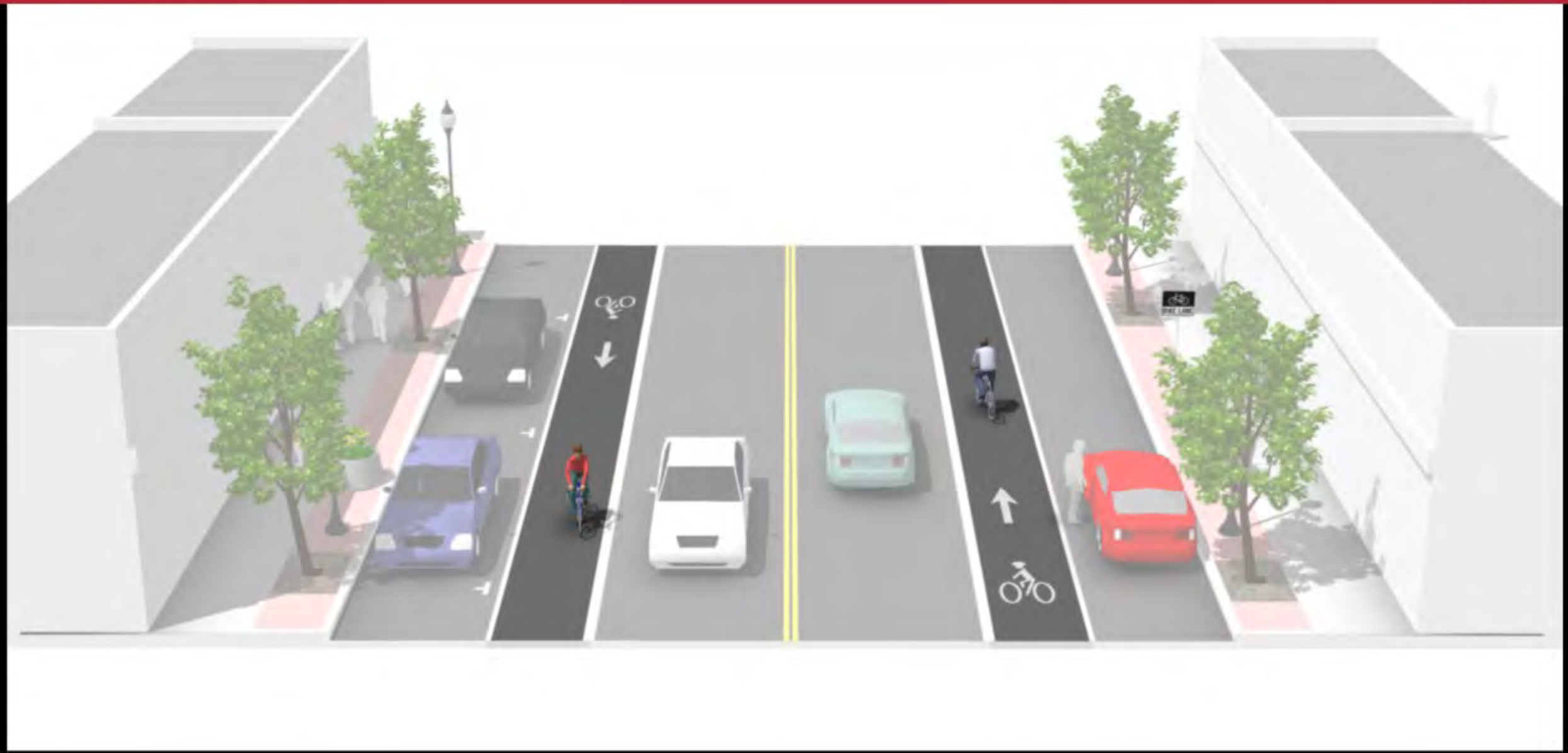
Parking

Parking

Parking and Bike Lane Suitability



Parking



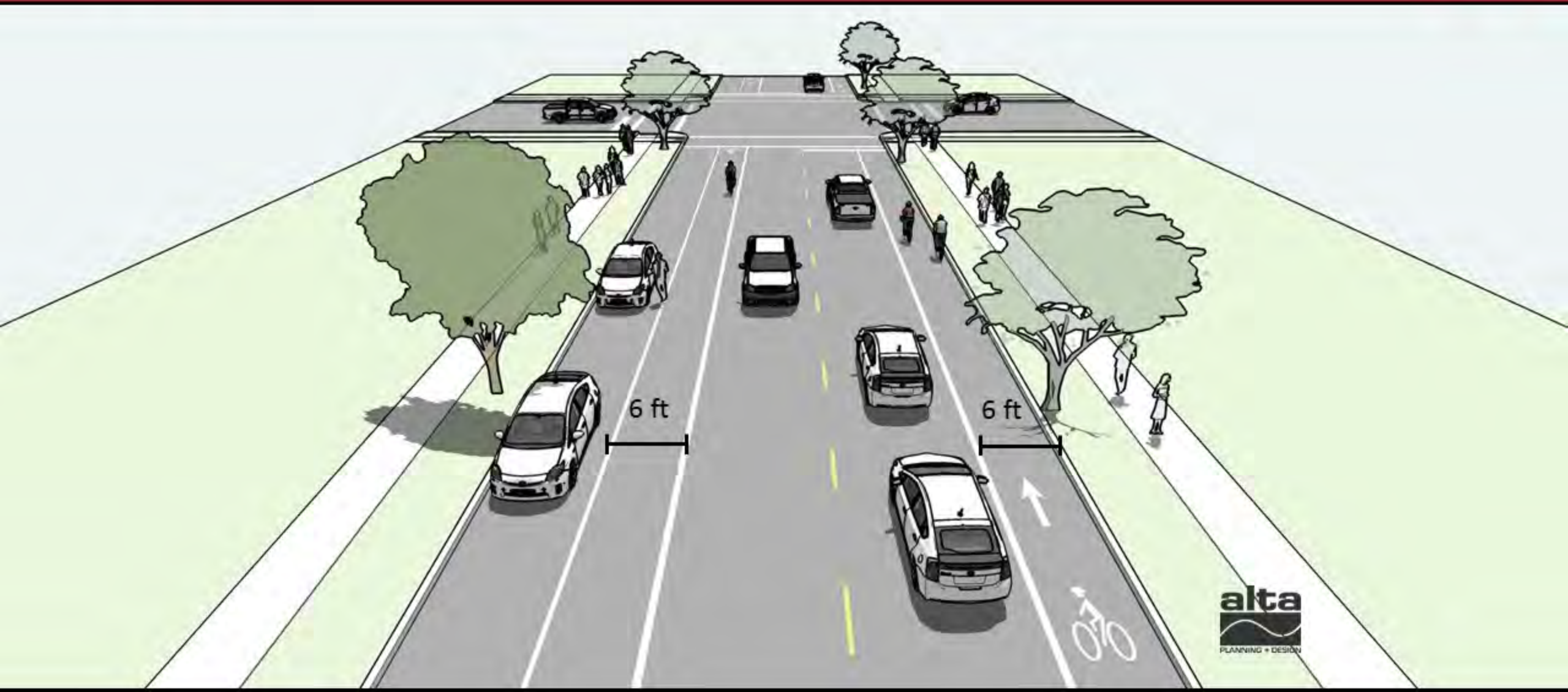
Intersection Treatments

Intersection Treatments

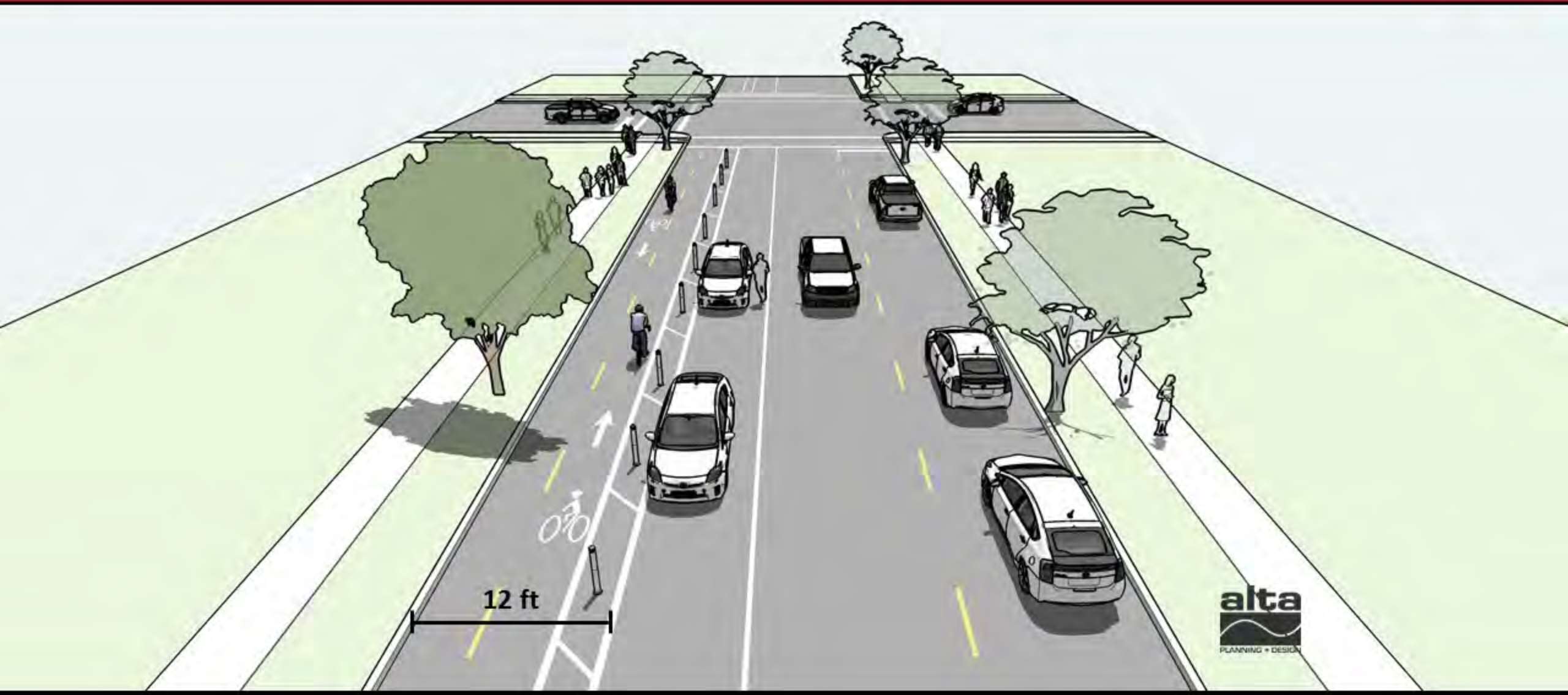
Intersection Treatments

PROTECTED BIKE LANES

Bike Lane

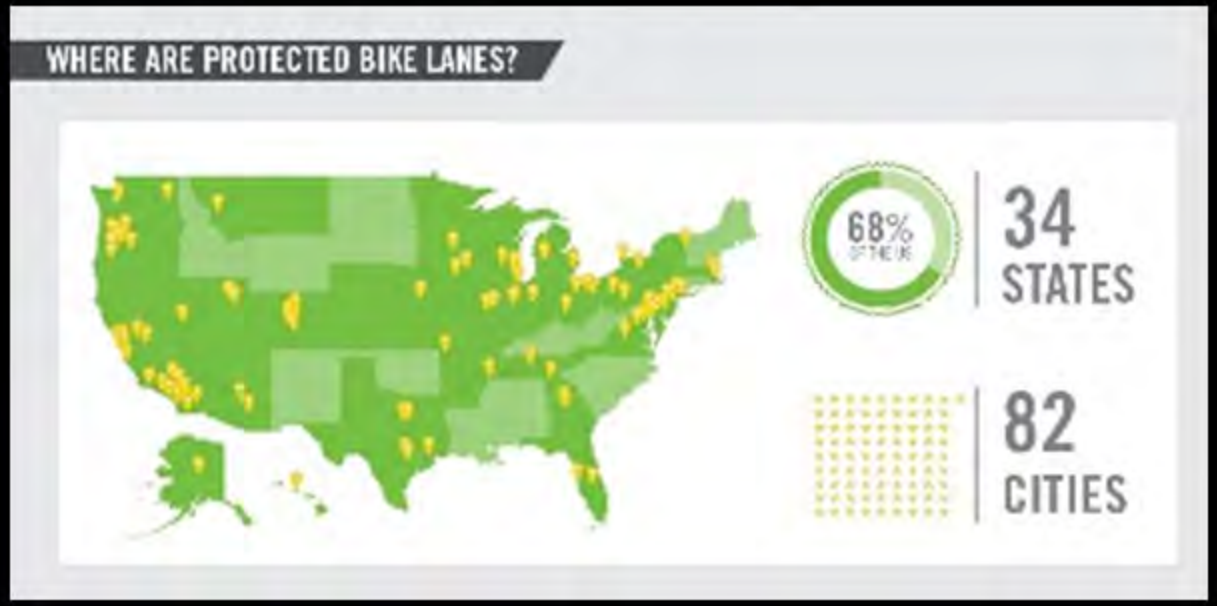


Protected Bike Lane



Protected Bike Lane

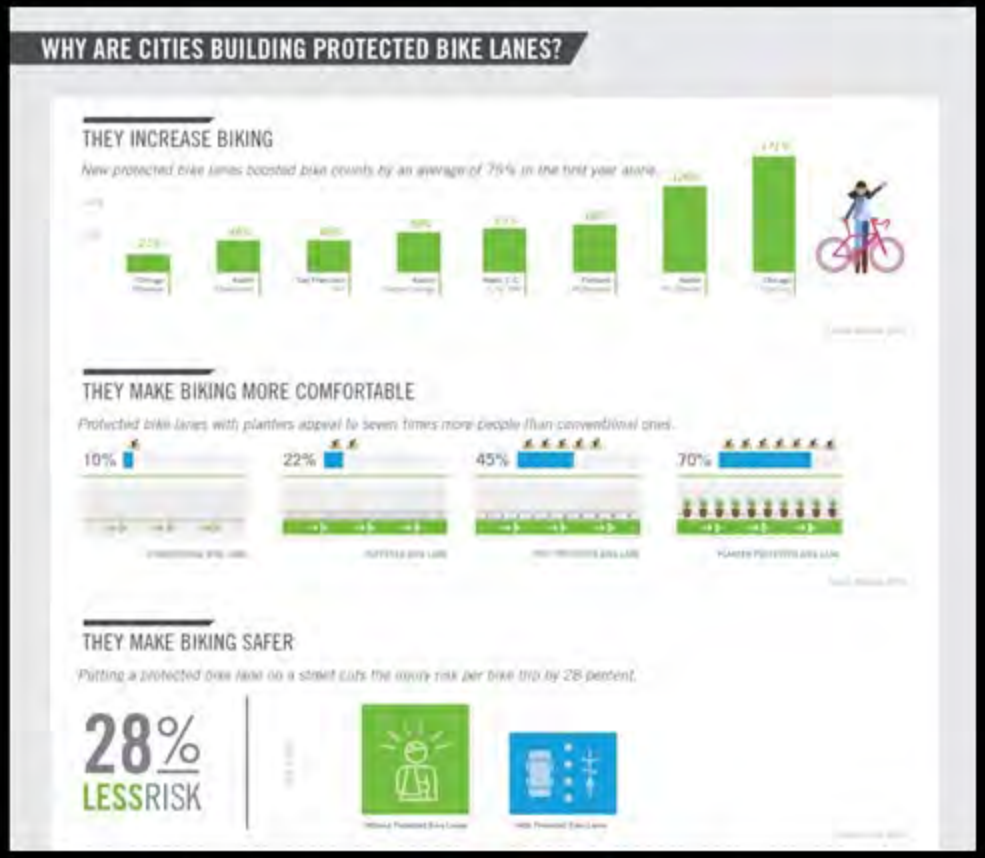
Protected Bike Lanes



People for Bikes: Green Lane Project

http://www.peopleforbikes.org/green-lane-project/pages/inventory-of-protected-bike-lanes

Protected Bike Lanes



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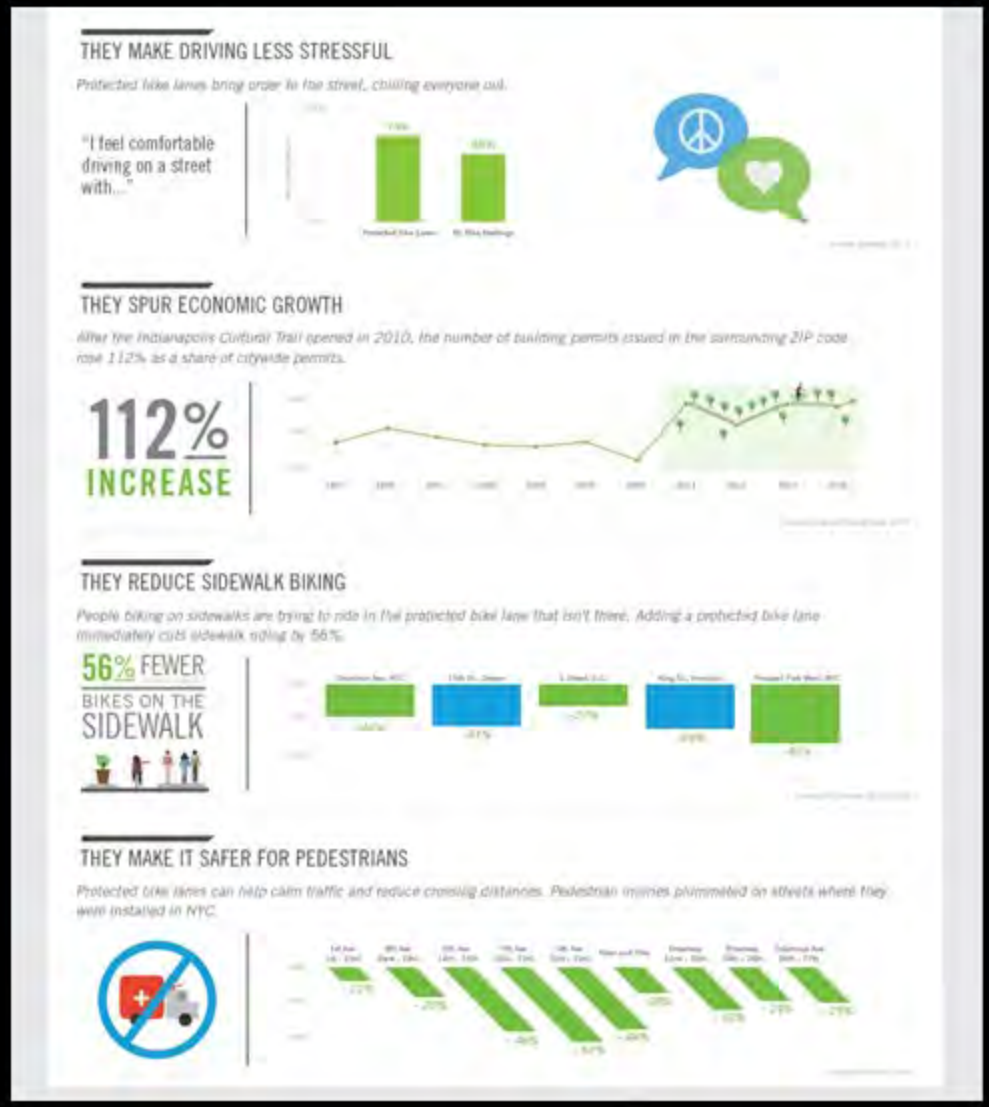


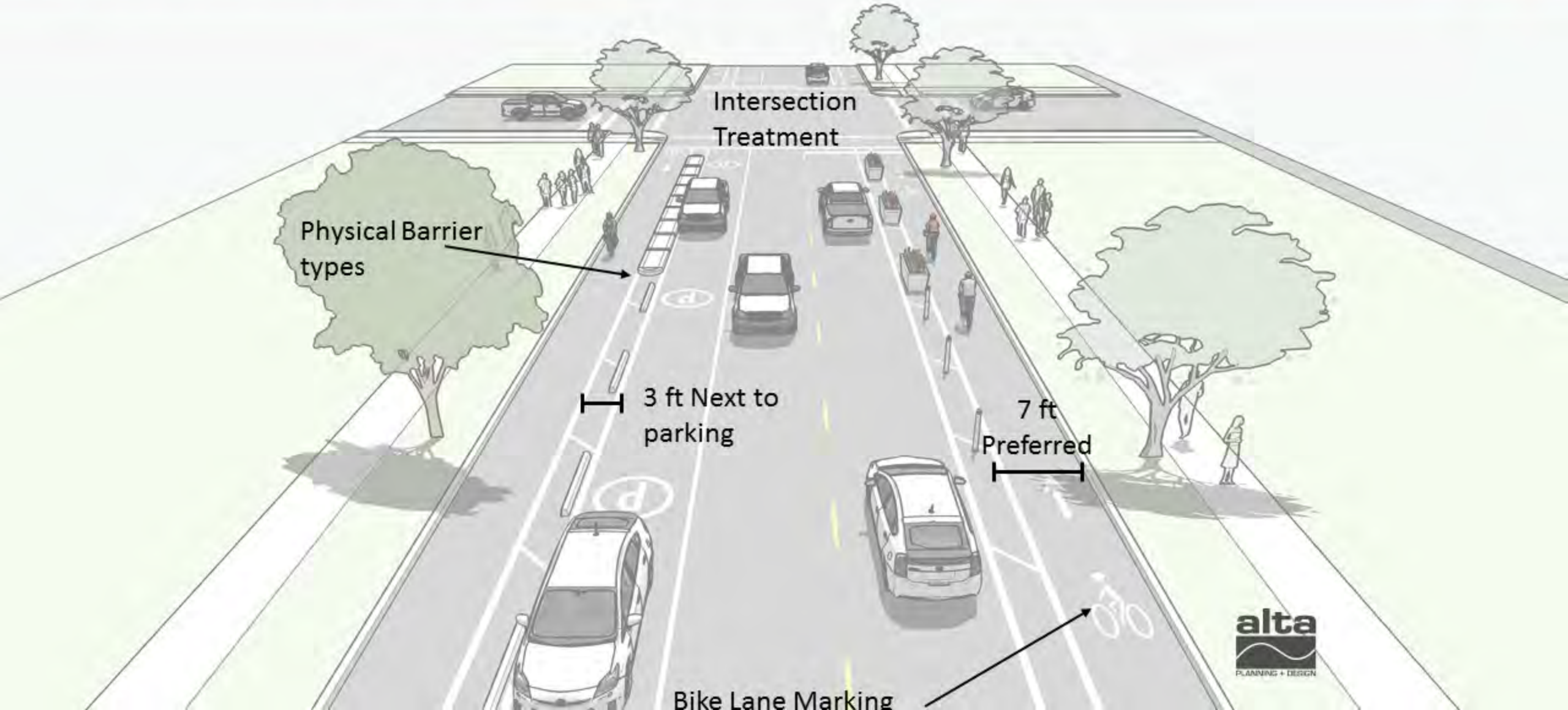
Protected Bike Lanes

People for Bikes: Green Lane Project

http://www.peopleforbikes.org/green-lane-project/pages/inventory-of-protected-bike-lanes

One-Way BPL

One-Way PBL Dimensions



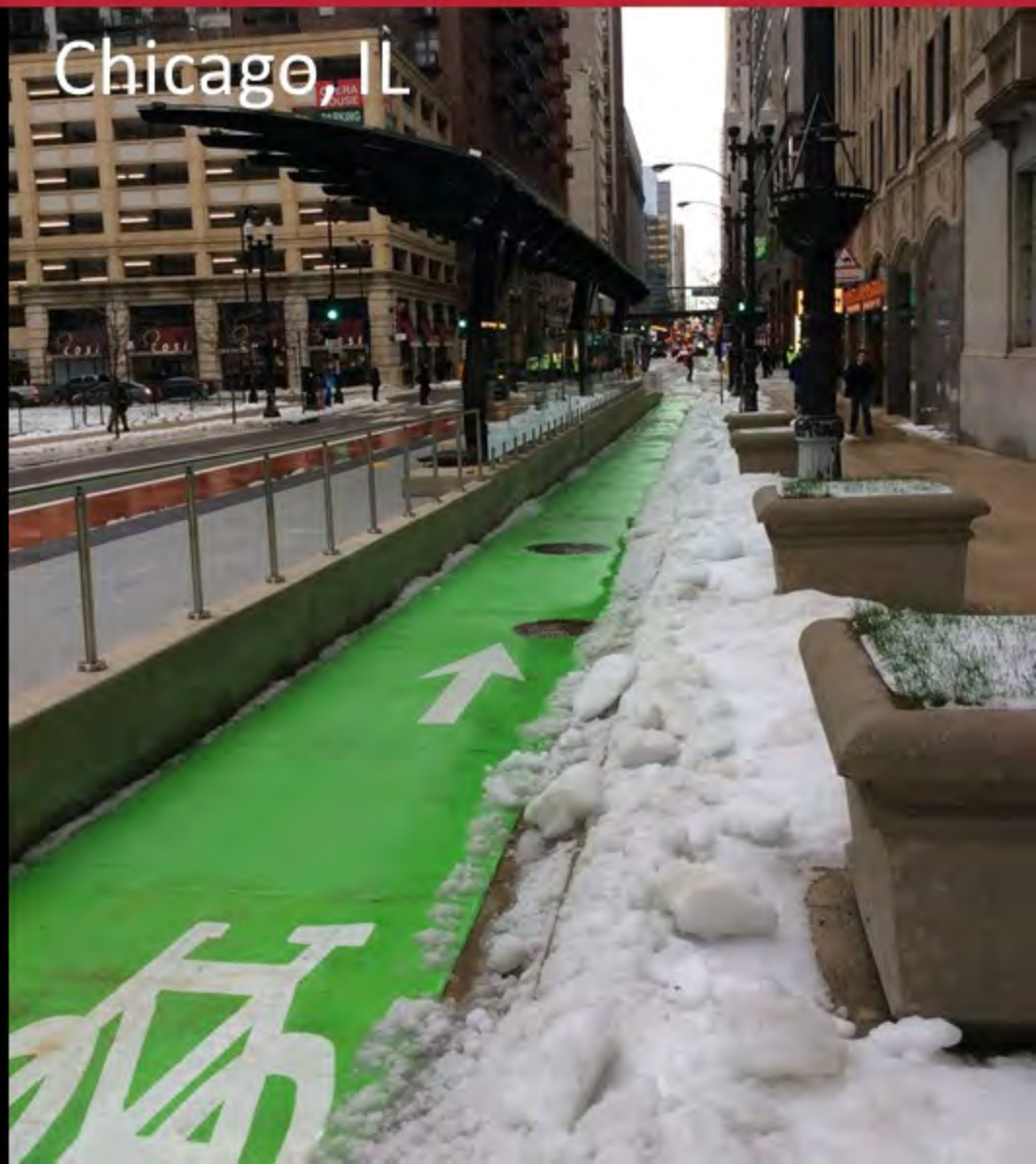
One-Way PBL

One-Way PBL

One-Way PBL


Chicago, IL
GNC
GNC
ATM
CITY INFORMATION
JCDecaux
KEEPING YOUR
BUSINESS
IN THE LOOP
FROM THE LOOP.
Grant Thornton

One-Way PBL: Transit Island



One-Way PBL

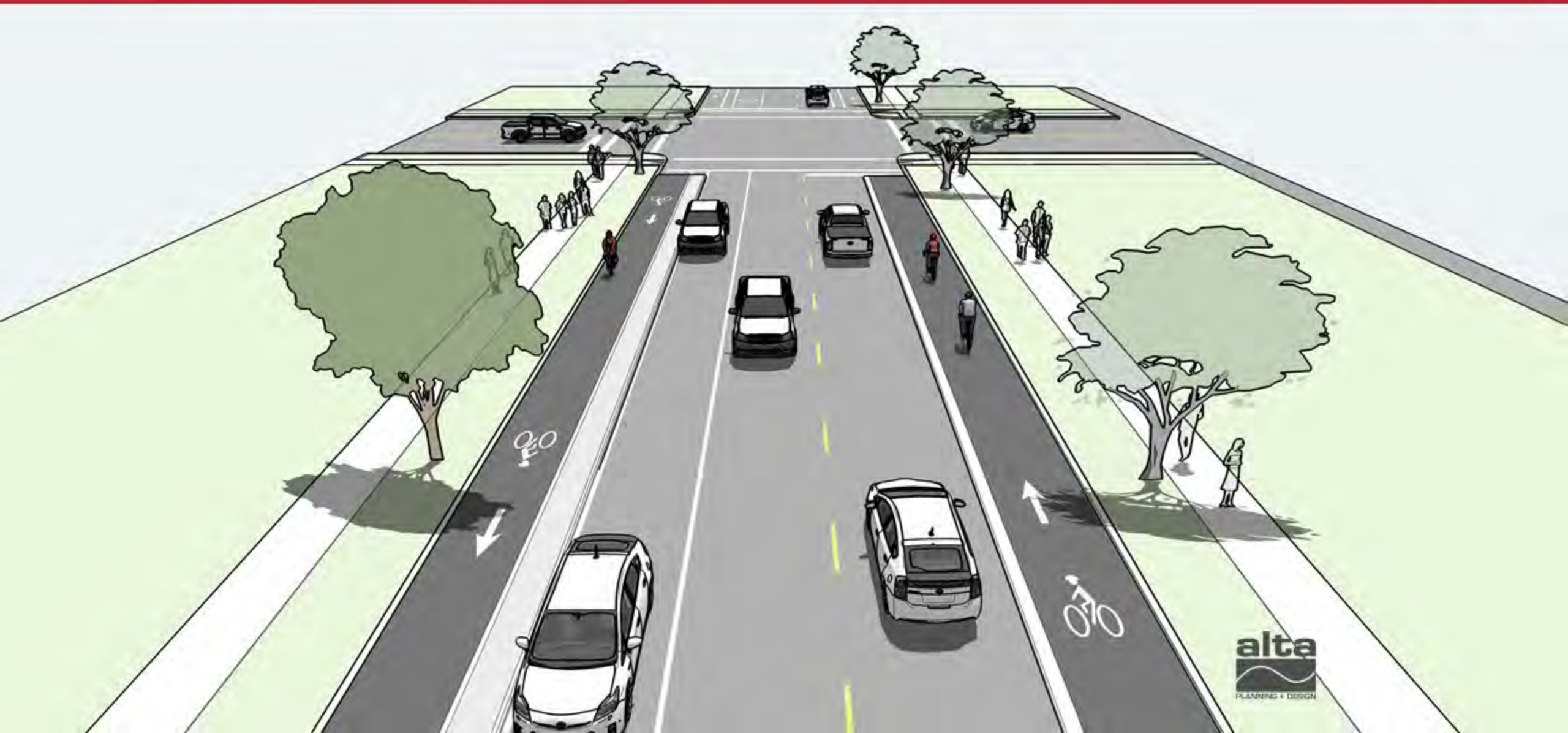
Seattle, WA

One-Way PBL: Transit Island

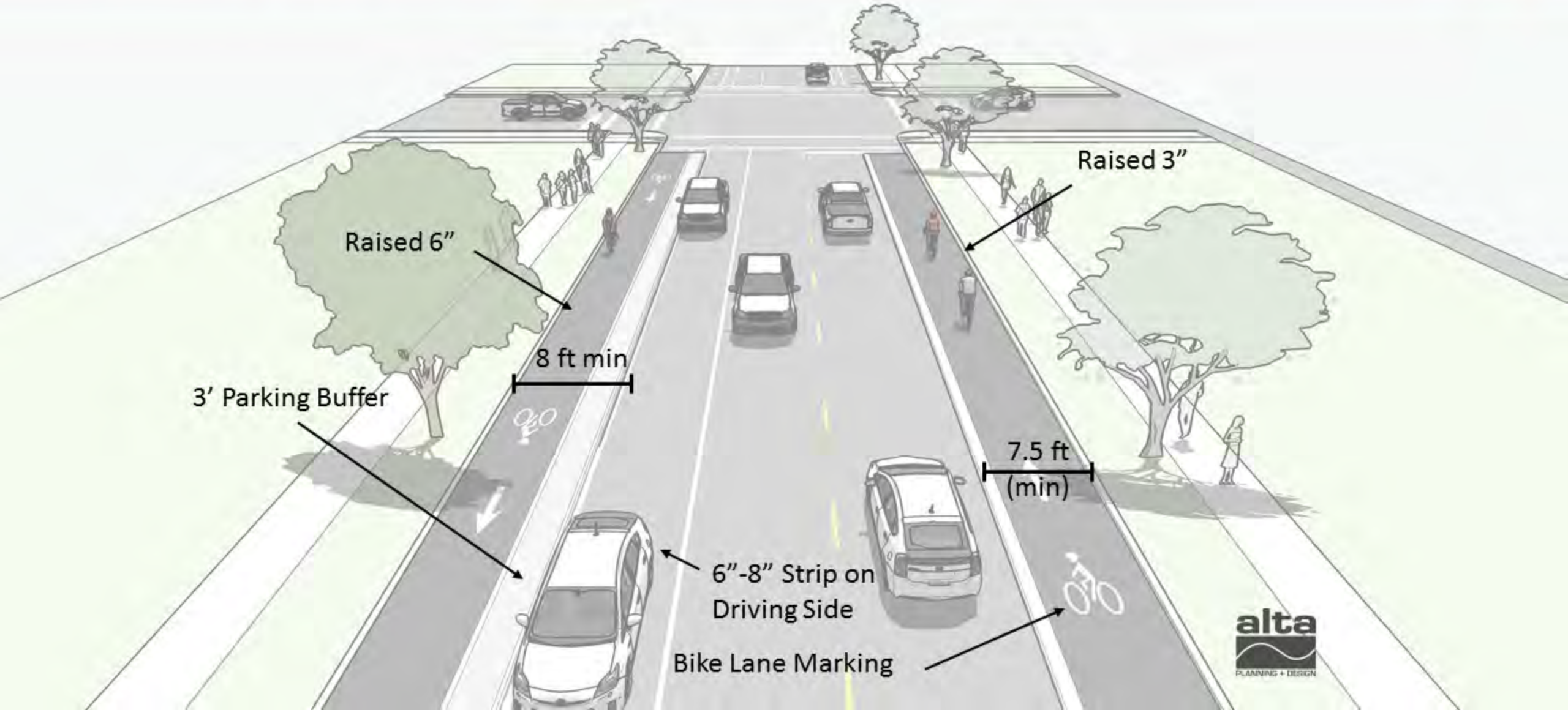
One-Way PBL

Seattle, WA

Raised One-Way PBL



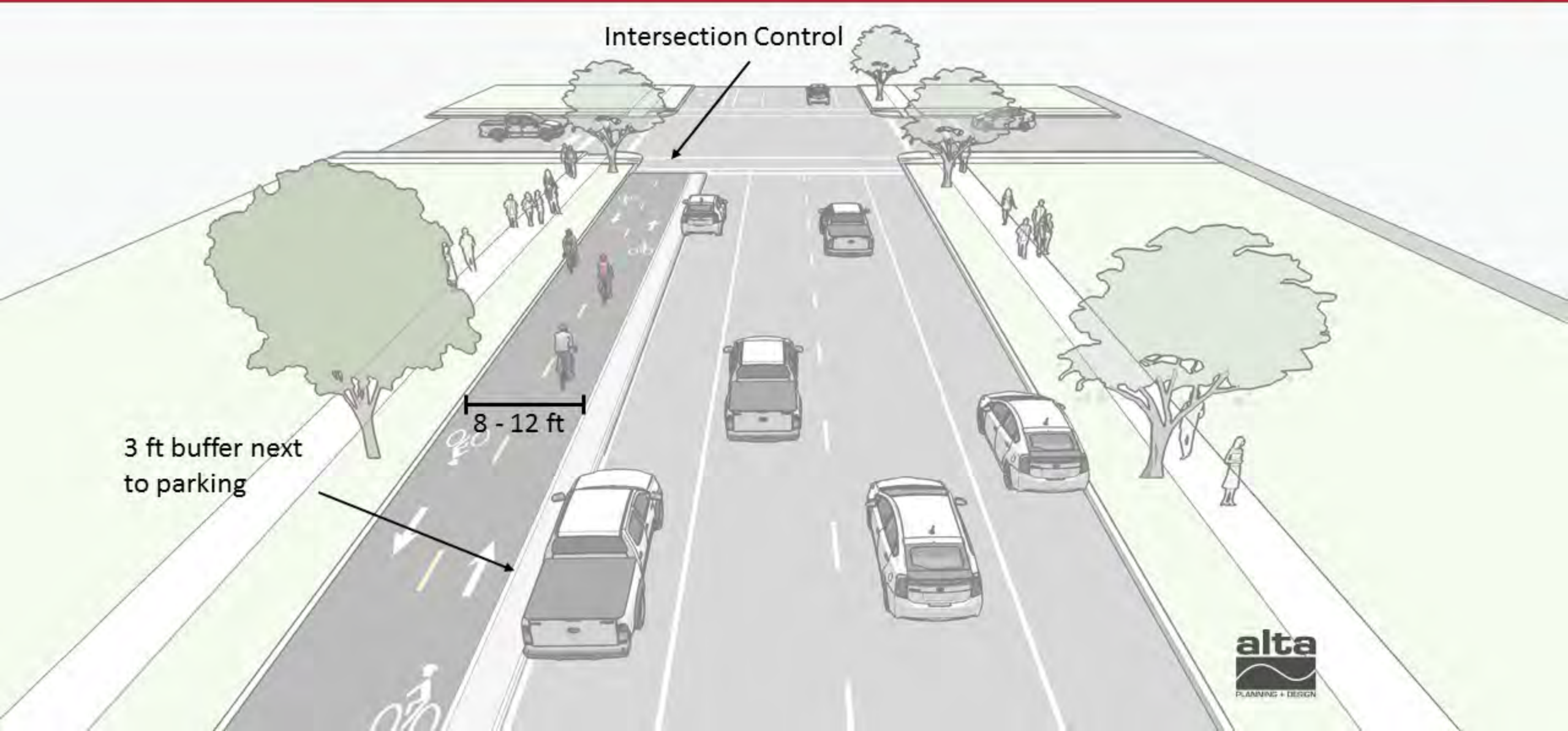
Raised One-Way PBL Dimensions



Raised One-Way PBL

Missoula, MT

Two-Way PBL Dimensions



Two-Way PBL

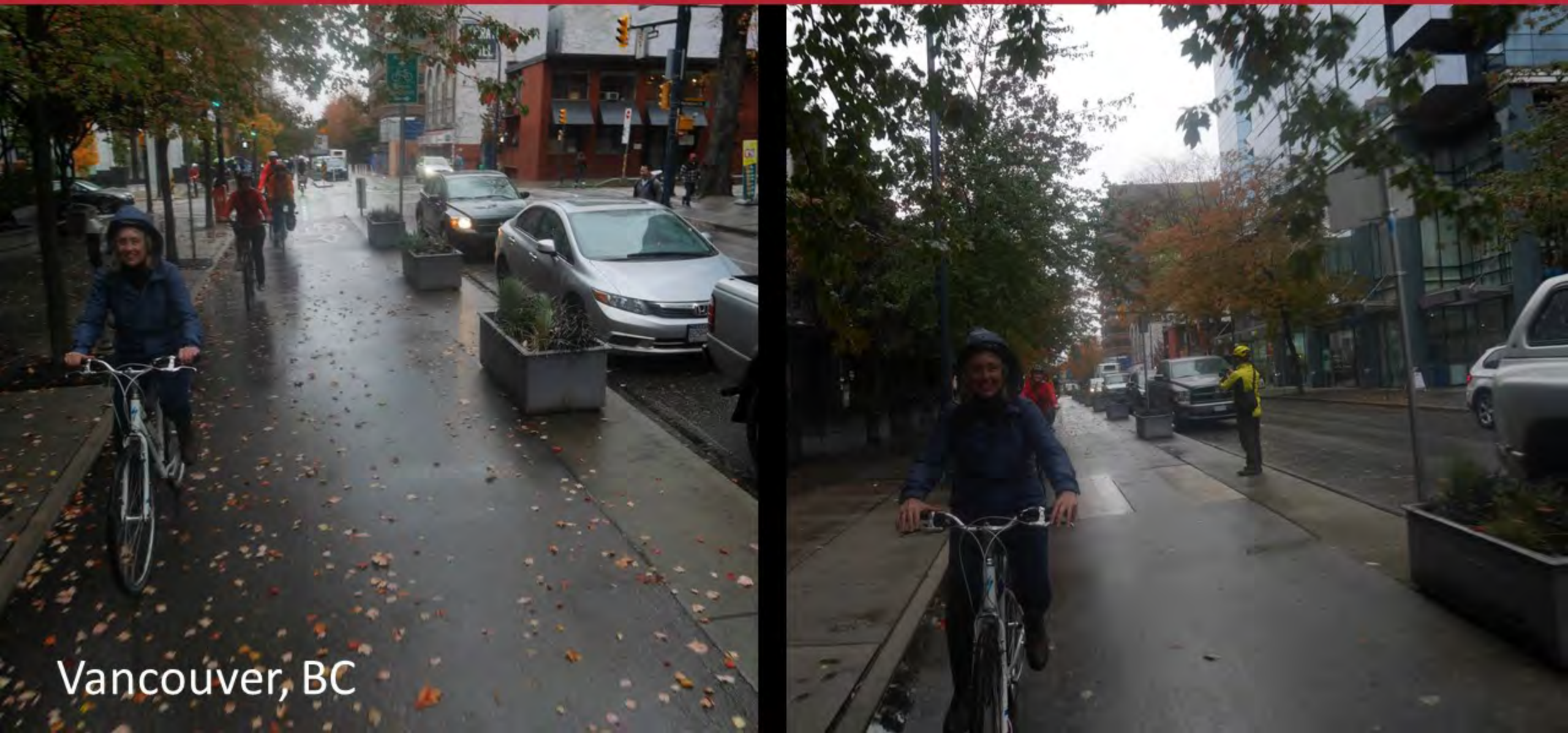
Chicago, IL

Two-Way PBL

Two-Way PBL

Two-Way PBL

Two-Way PBL



Vancouver, BC

Two-Way PBL

Vancouver, BC

Two-Way PBL

Vancouver, BC

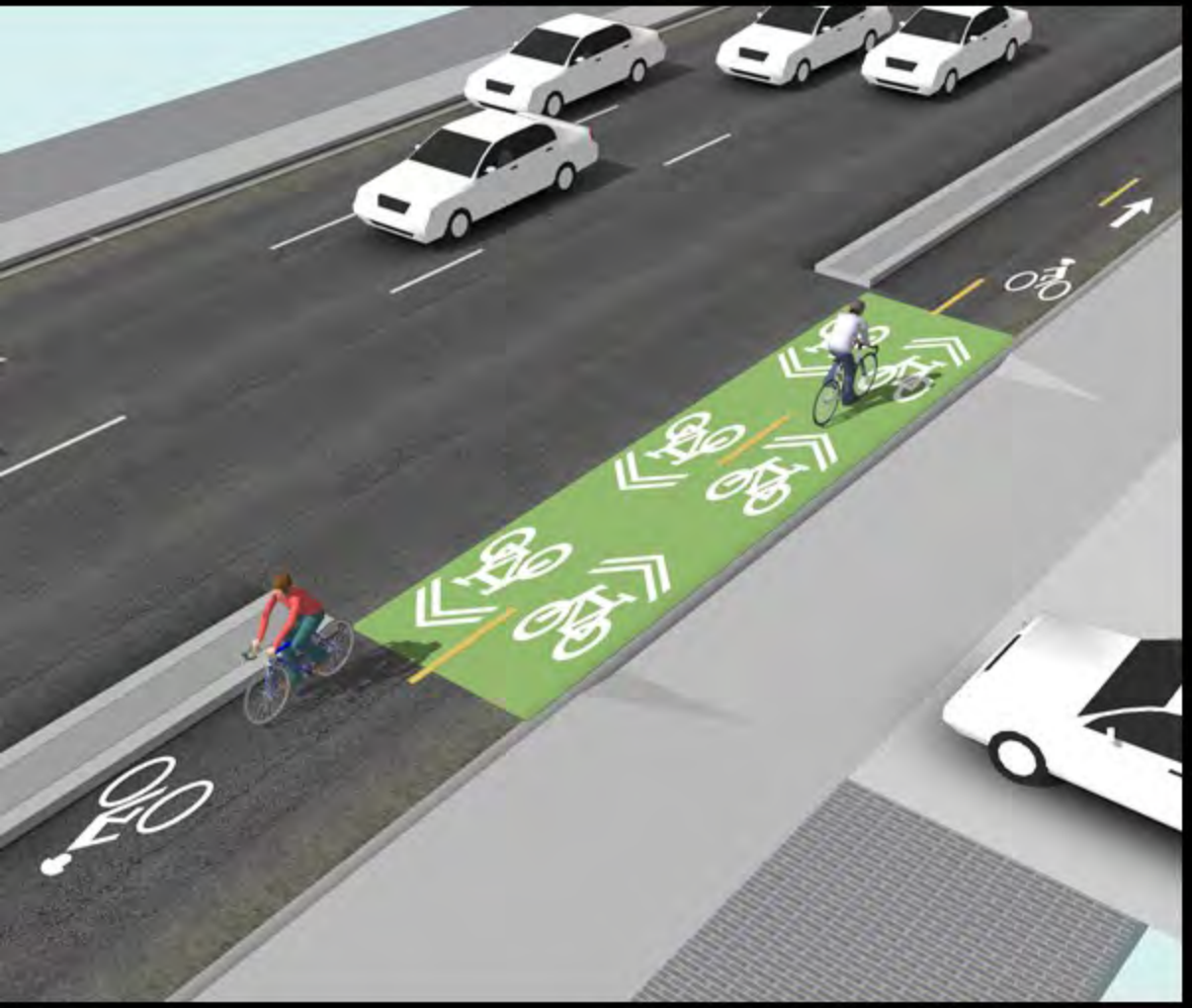
Two-Way PBL

Two-Way PBL: Transit Island

Vancouver, BC

Two-Way PBL: Transit Island

Two-Way PBL: Driveways



Two-Way PBL: Driveways

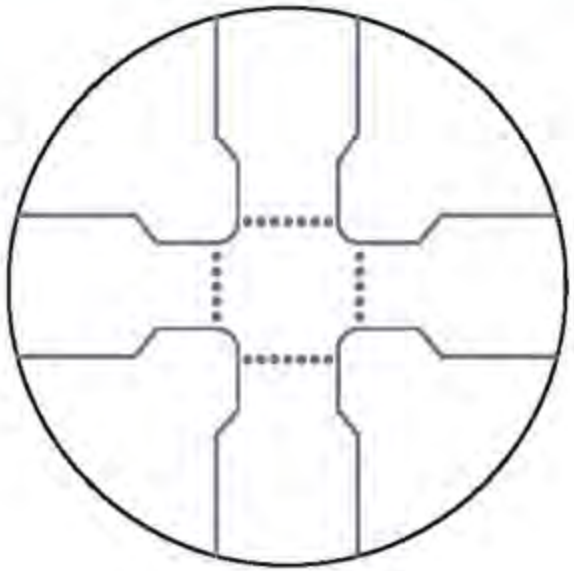
Seattle, WA

INTERSECTIONS

Design Strategies:

- Minimize Speed
- Increase Awareness
- Increase Conspicuity
- Isolate Conflicts (or… Increase Interaction)
- Clearly Assign Priority

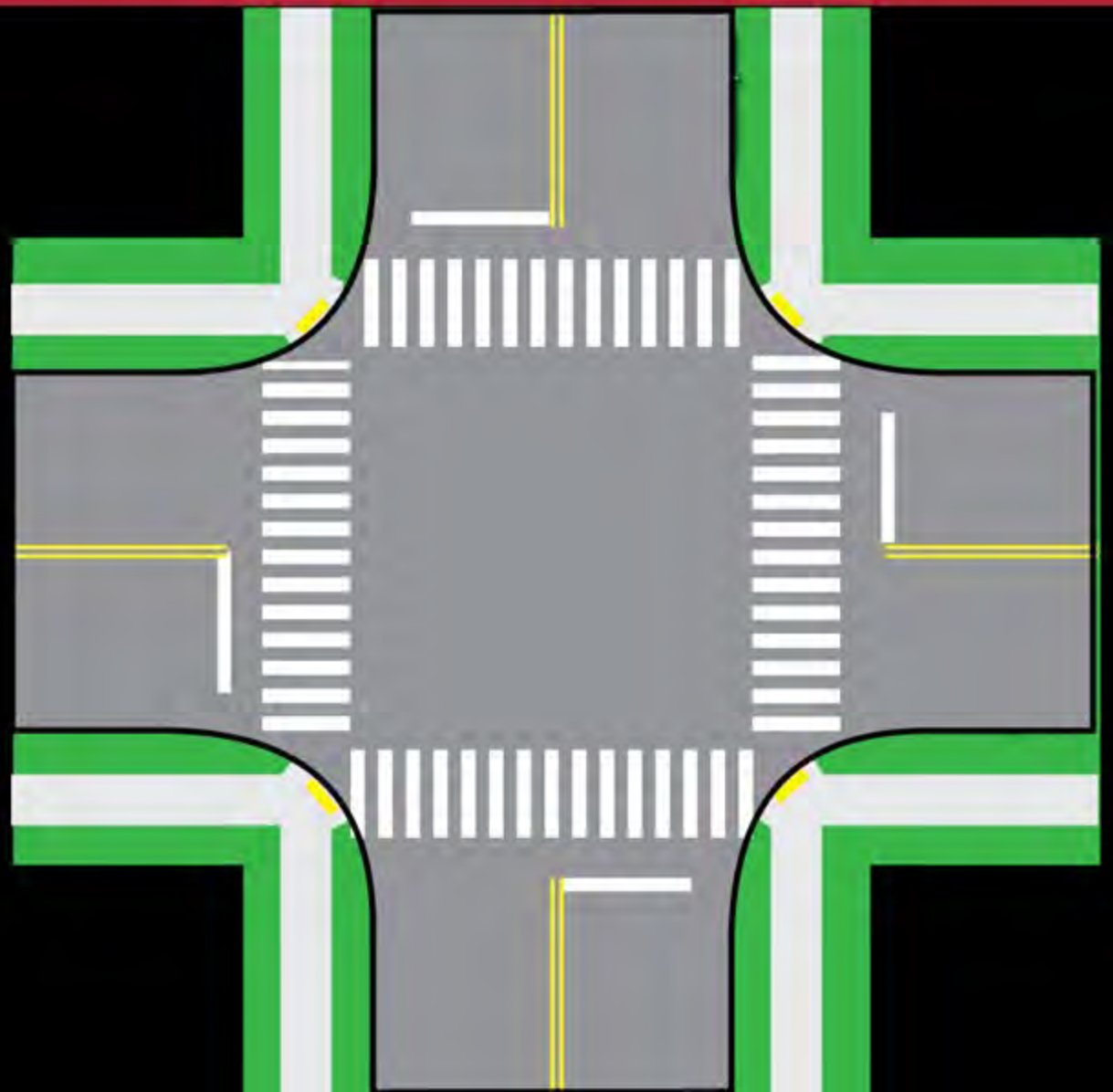
Intersection Principles



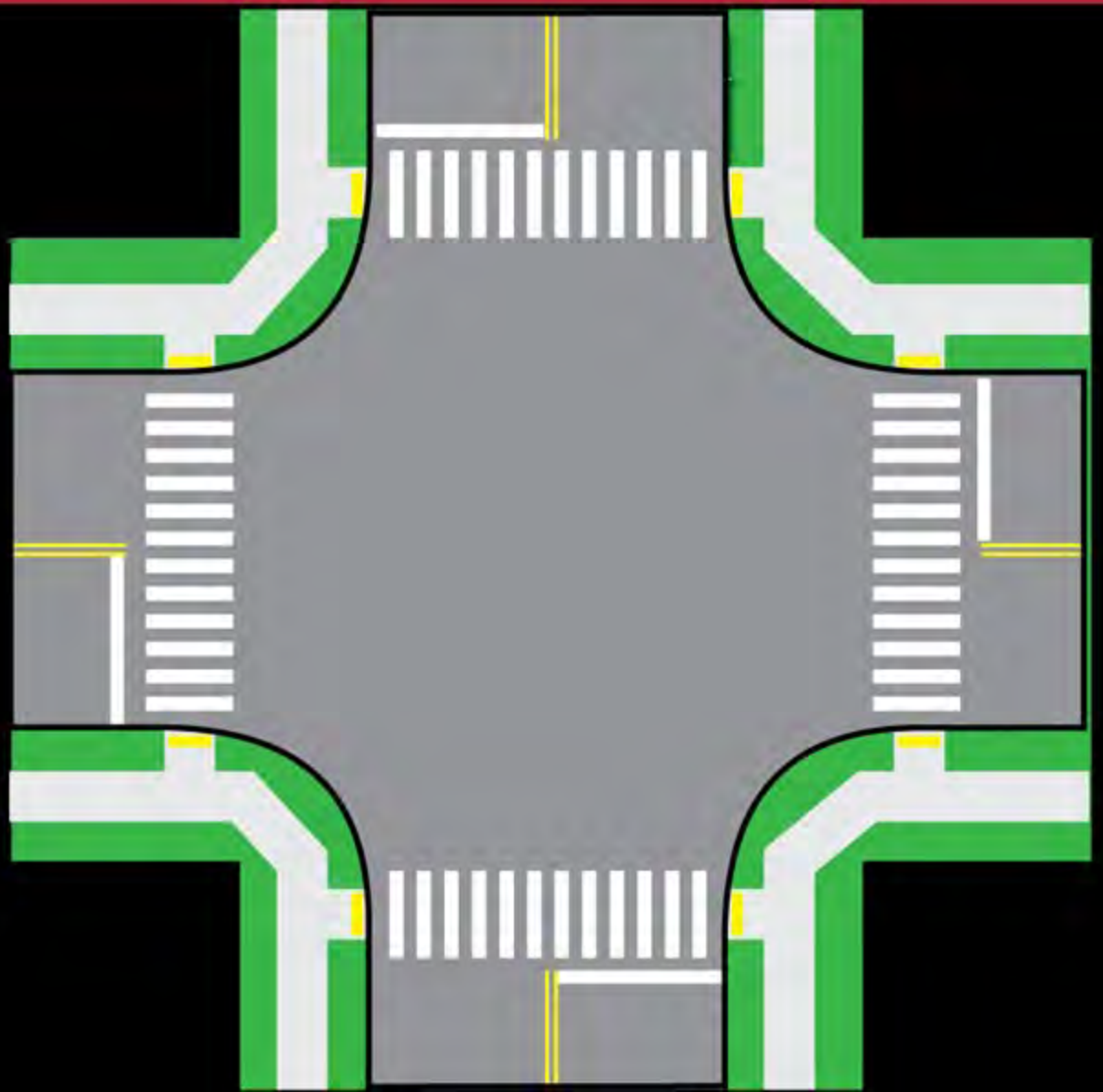
As compact as possible

- Eliminate wasted space
- use design to control speed and space
- make intersection safer - don't design for the worst case scenario

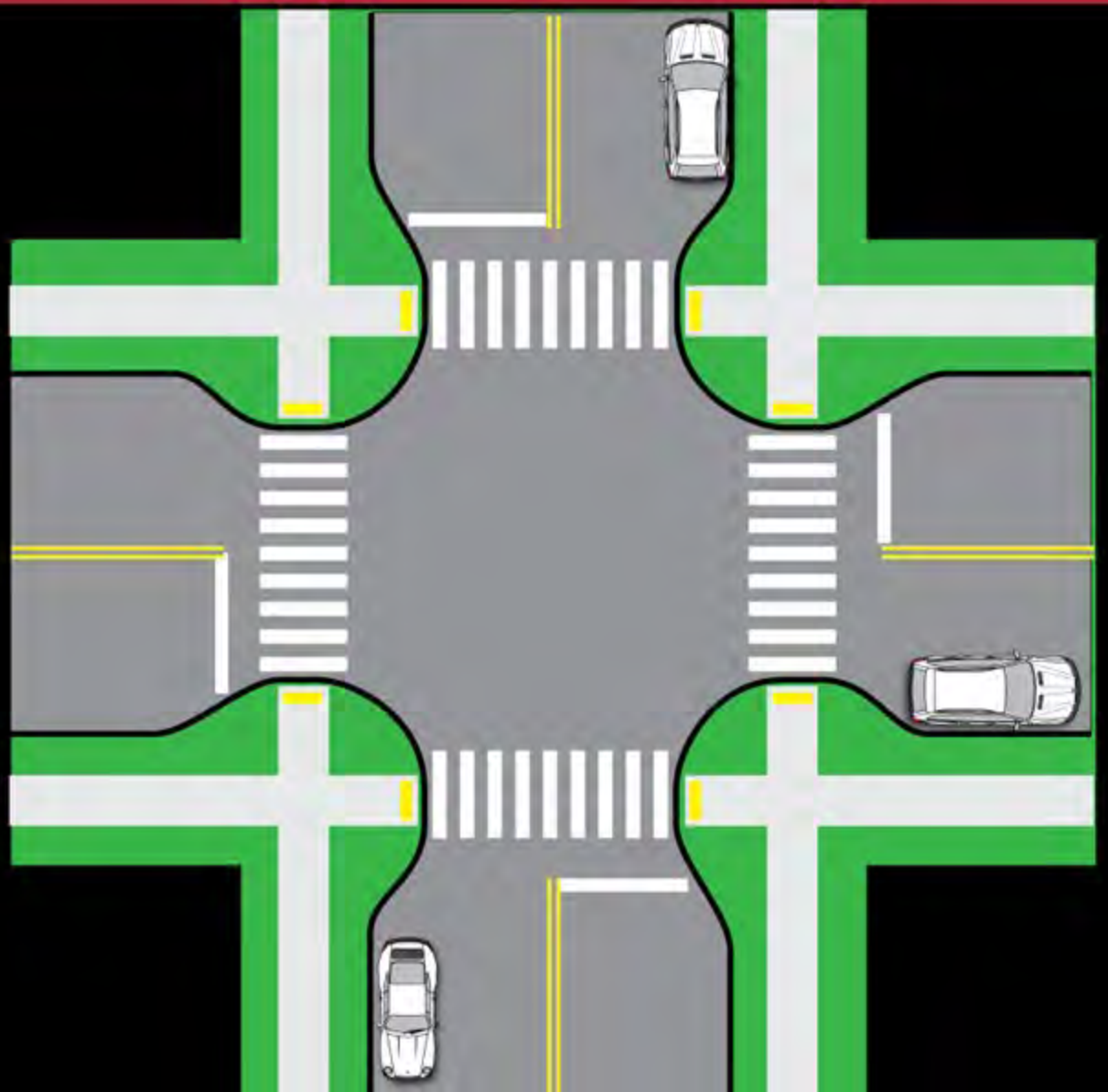
Curb Extensions



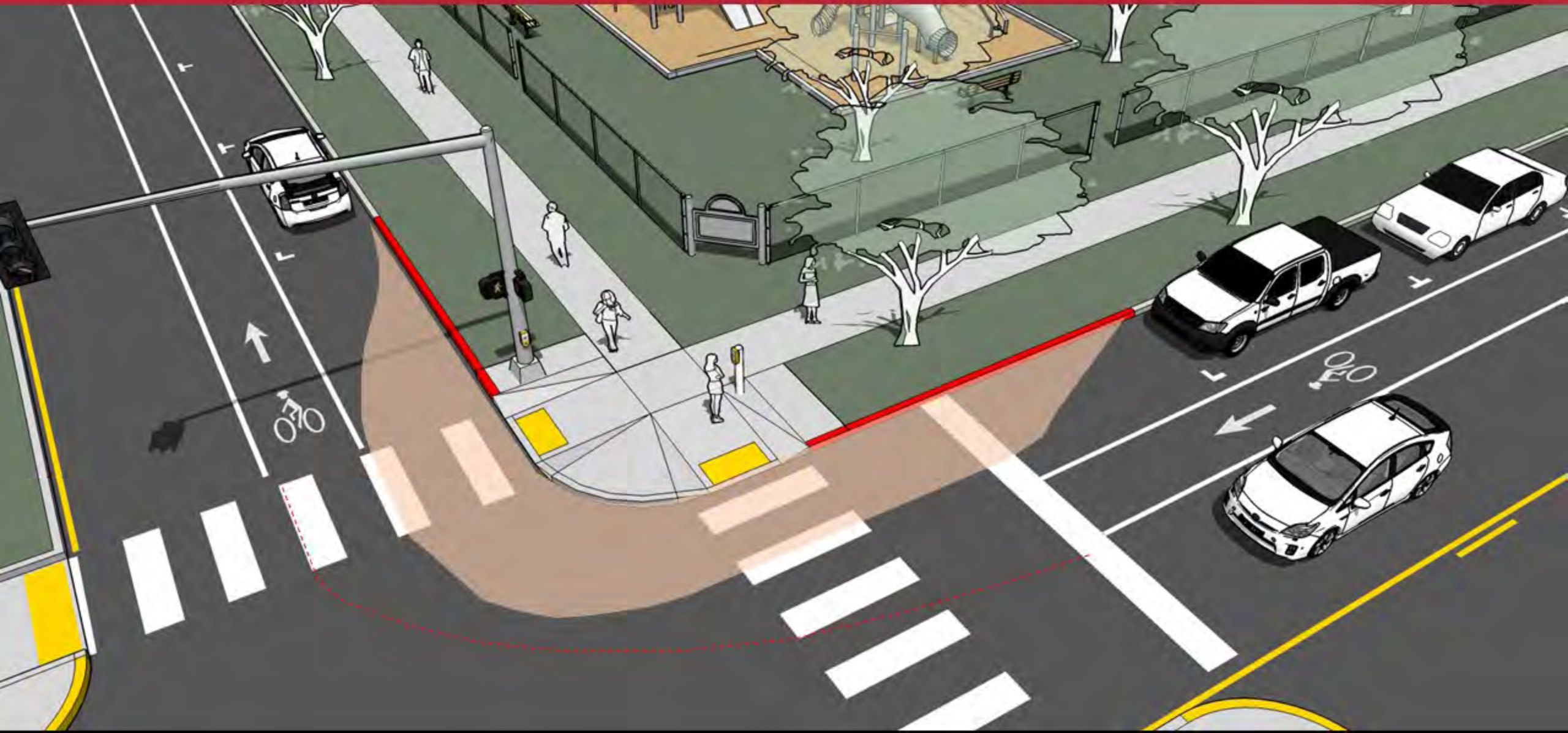
Curb Extensions



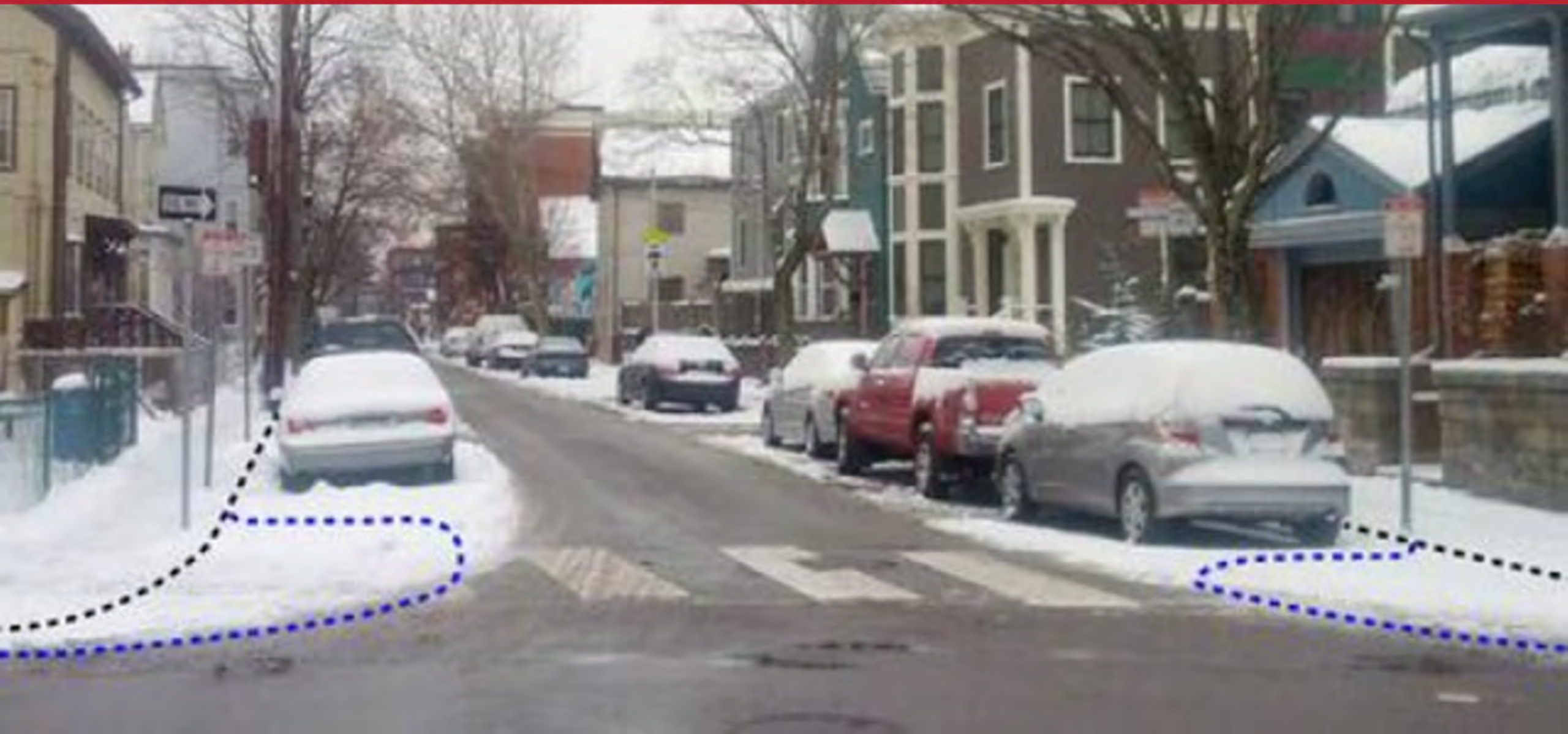
Curb Extensions



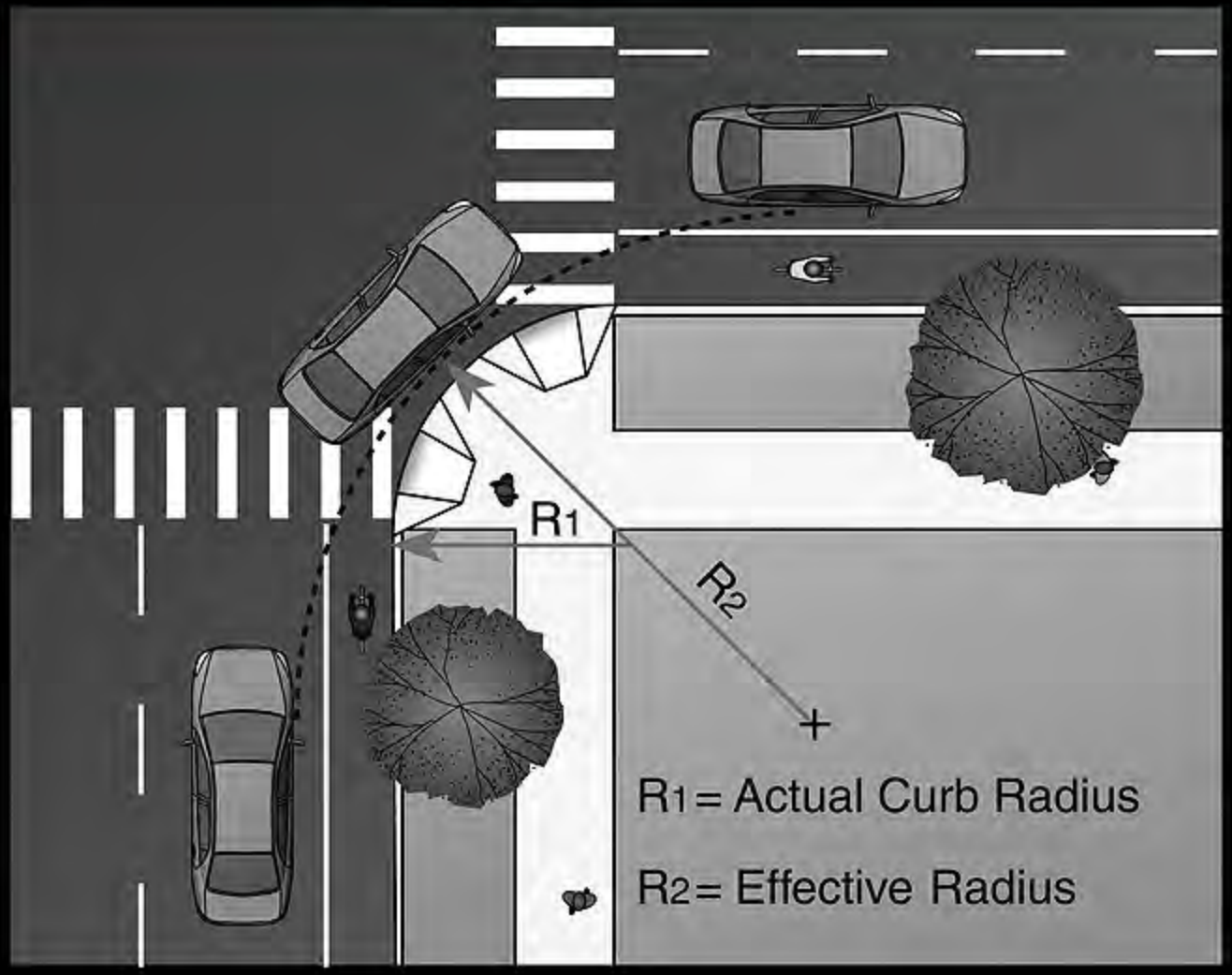
Curb Extensions



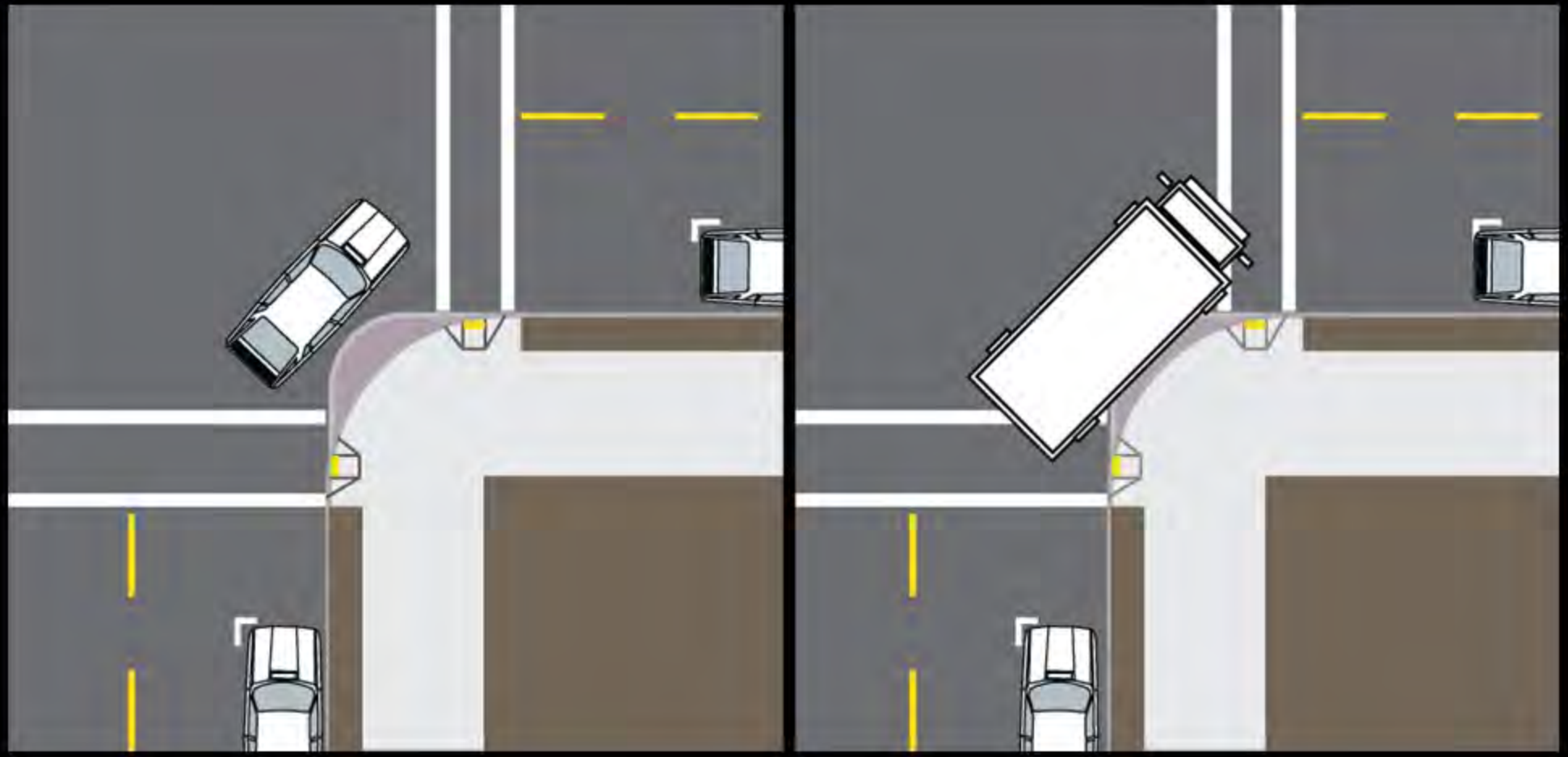
Sneckdowns!



Curb Radii

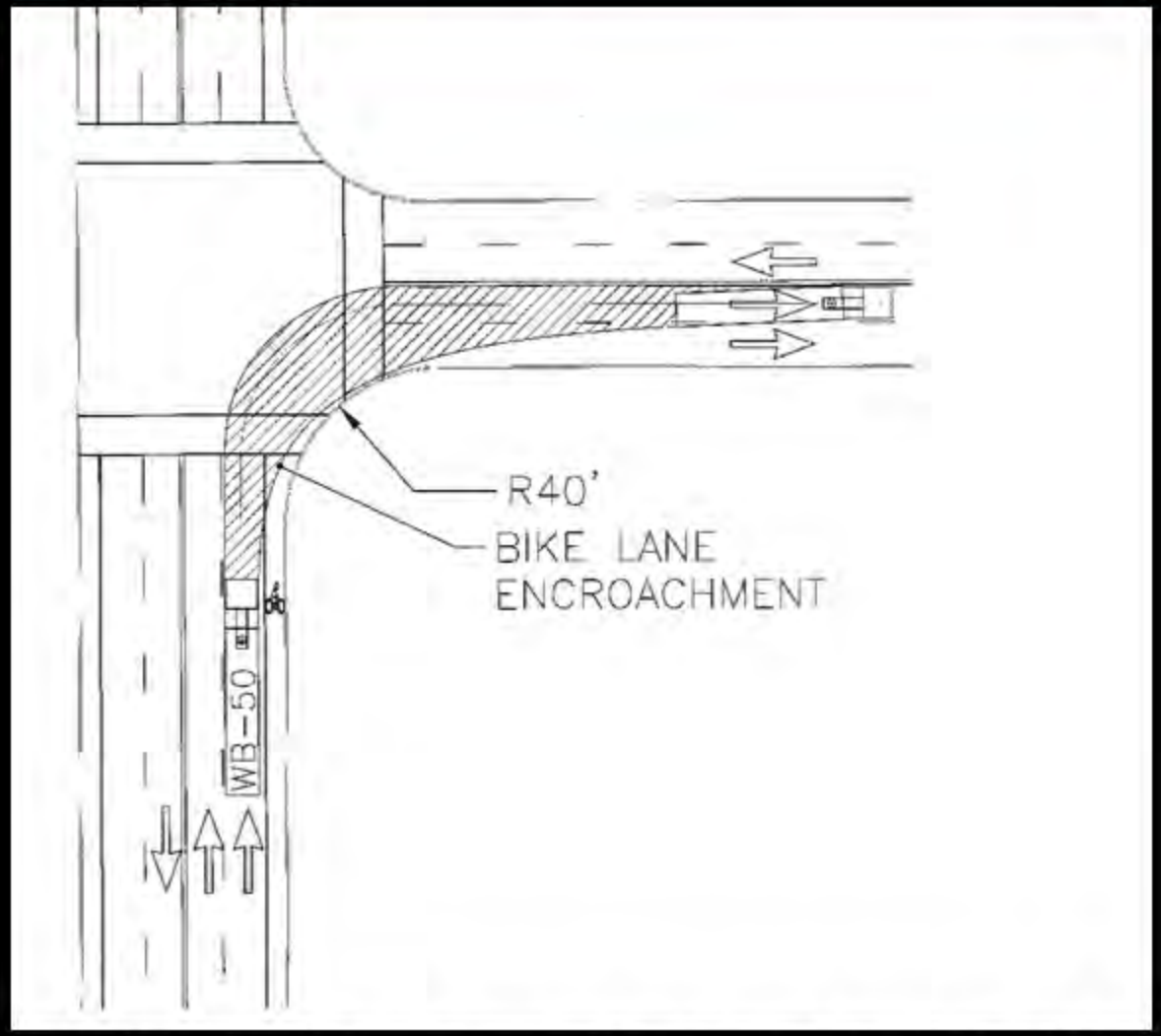


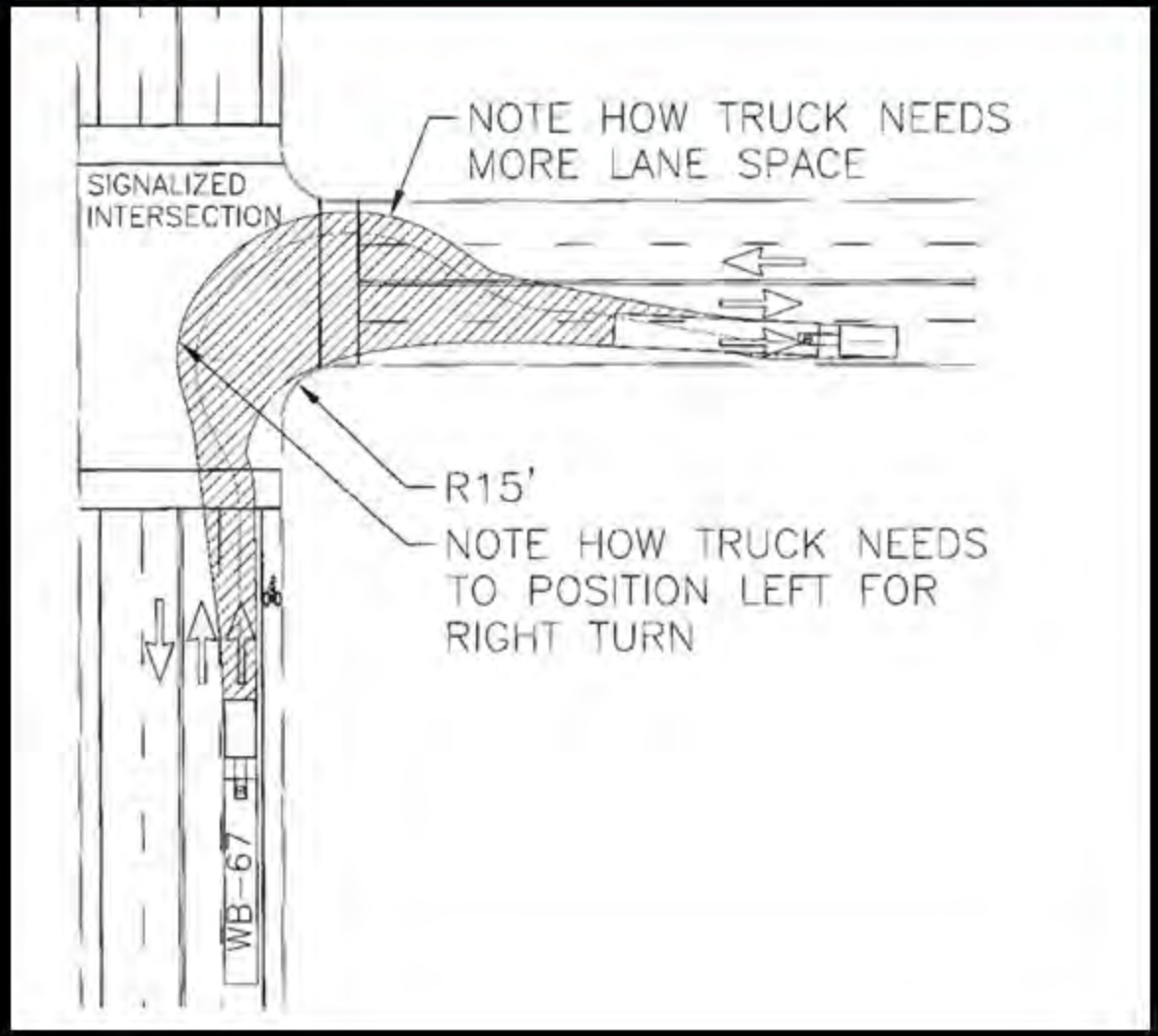
Curb Radii: Design Vehicle



Curb Radii: Mountable Curb

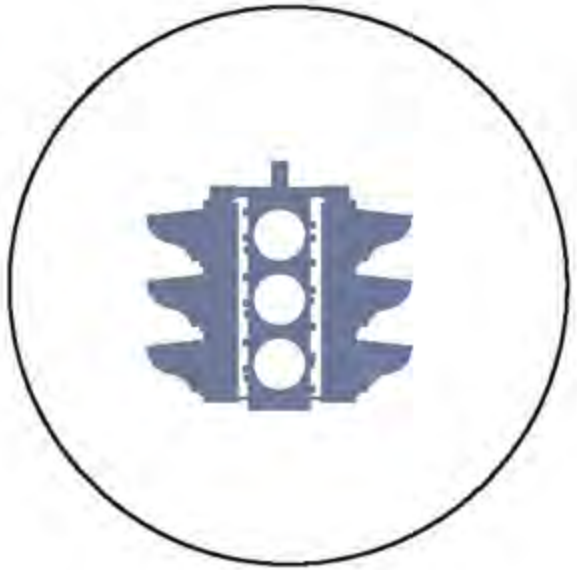
Curb Radii: Design Vehicle





City of Portland. Street Design Guidelines for Trucks. 2006

Intersection Principles

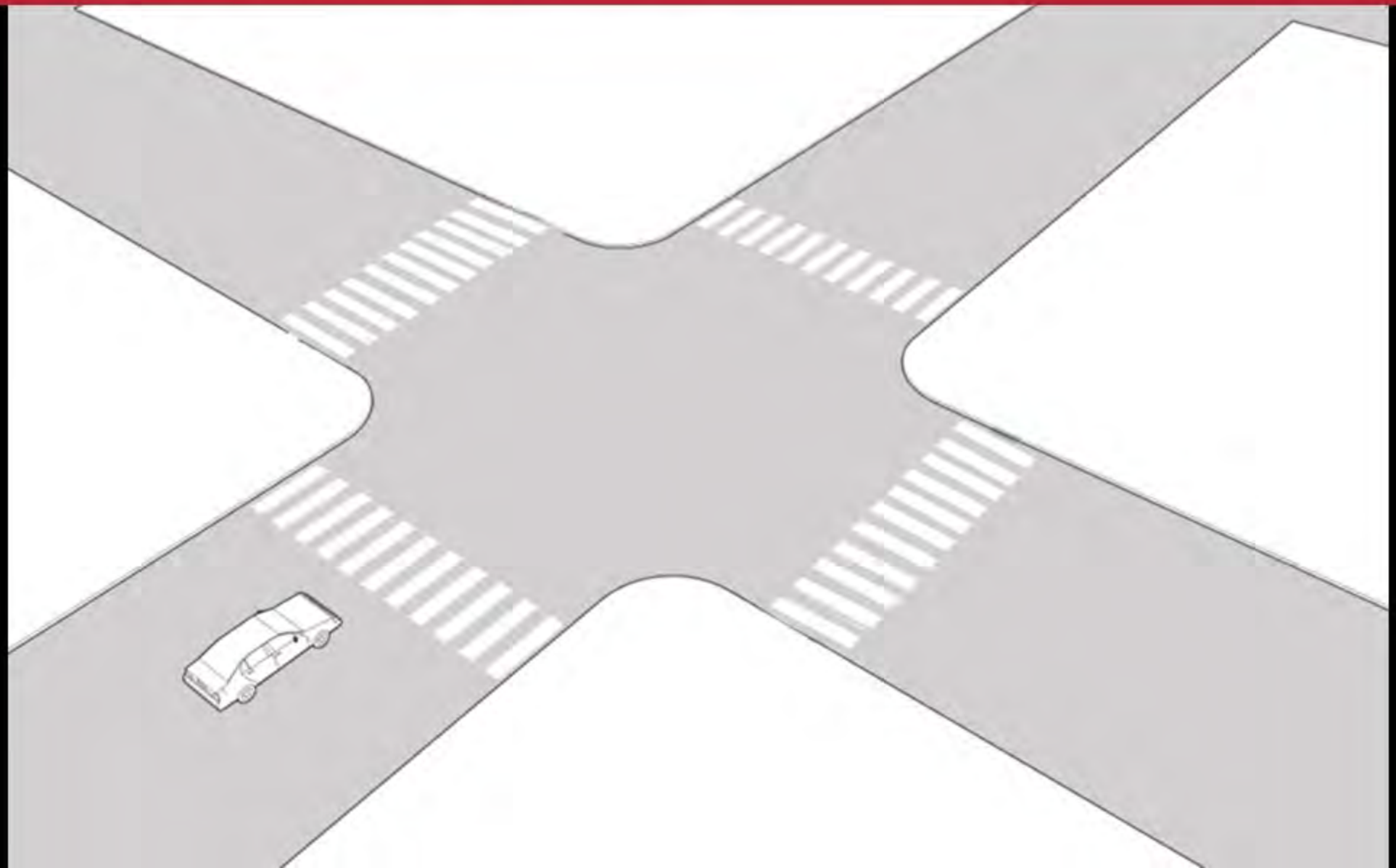


Integrate time and space

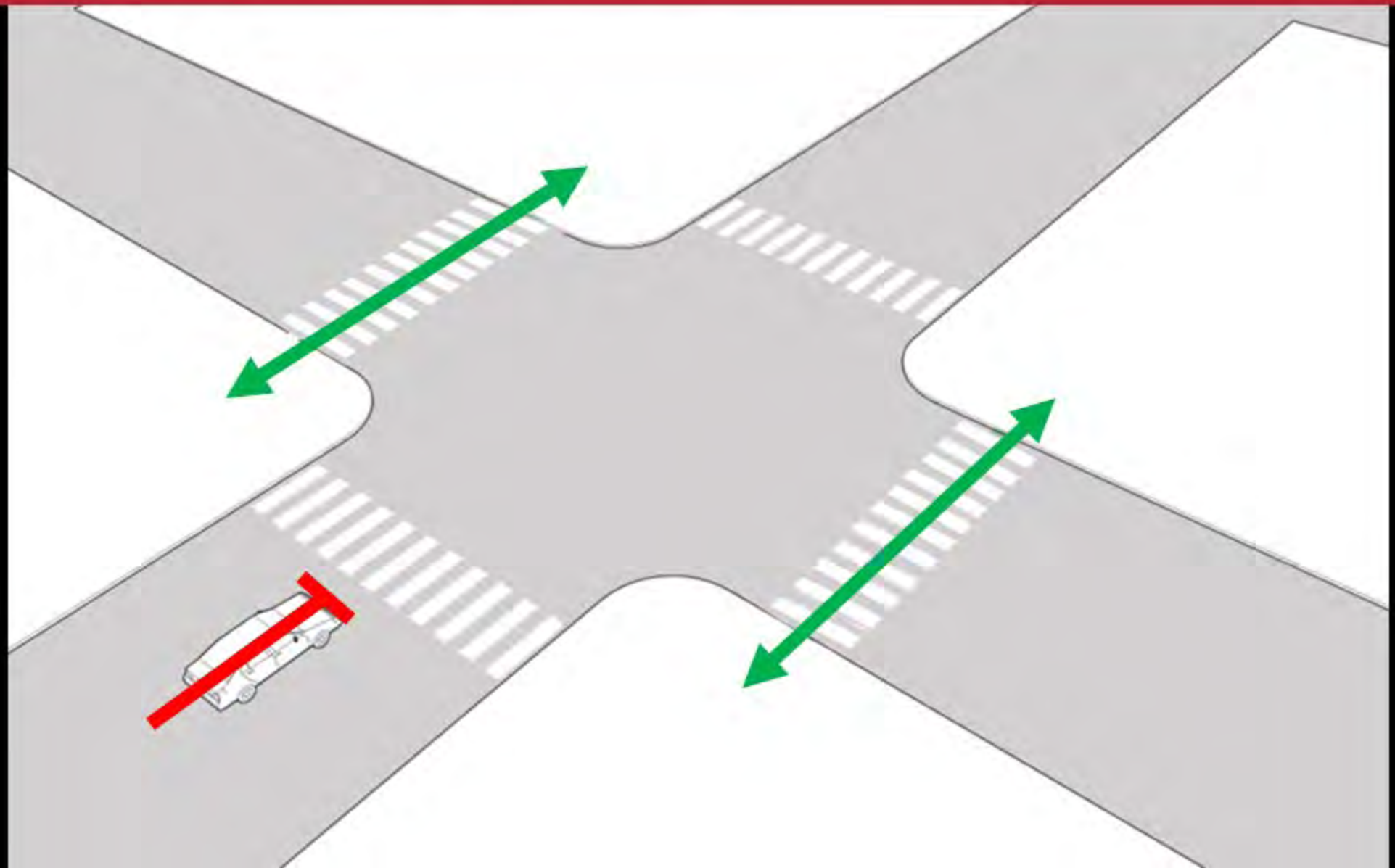
- Minimize cycle length and the number of phases
- Reduce crossing distances
- Reduce delay

Signals

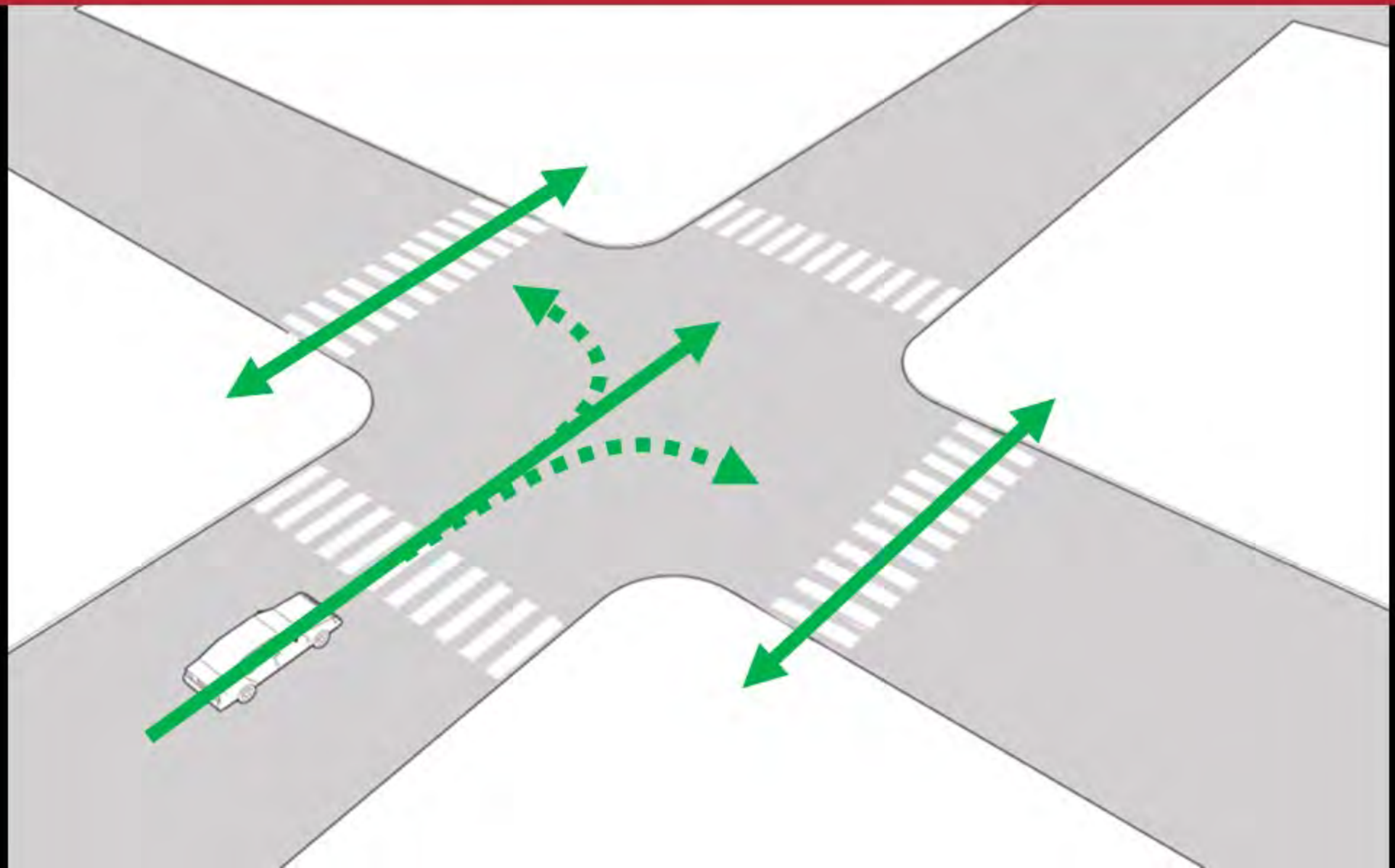
Leading Pedestrian Interval



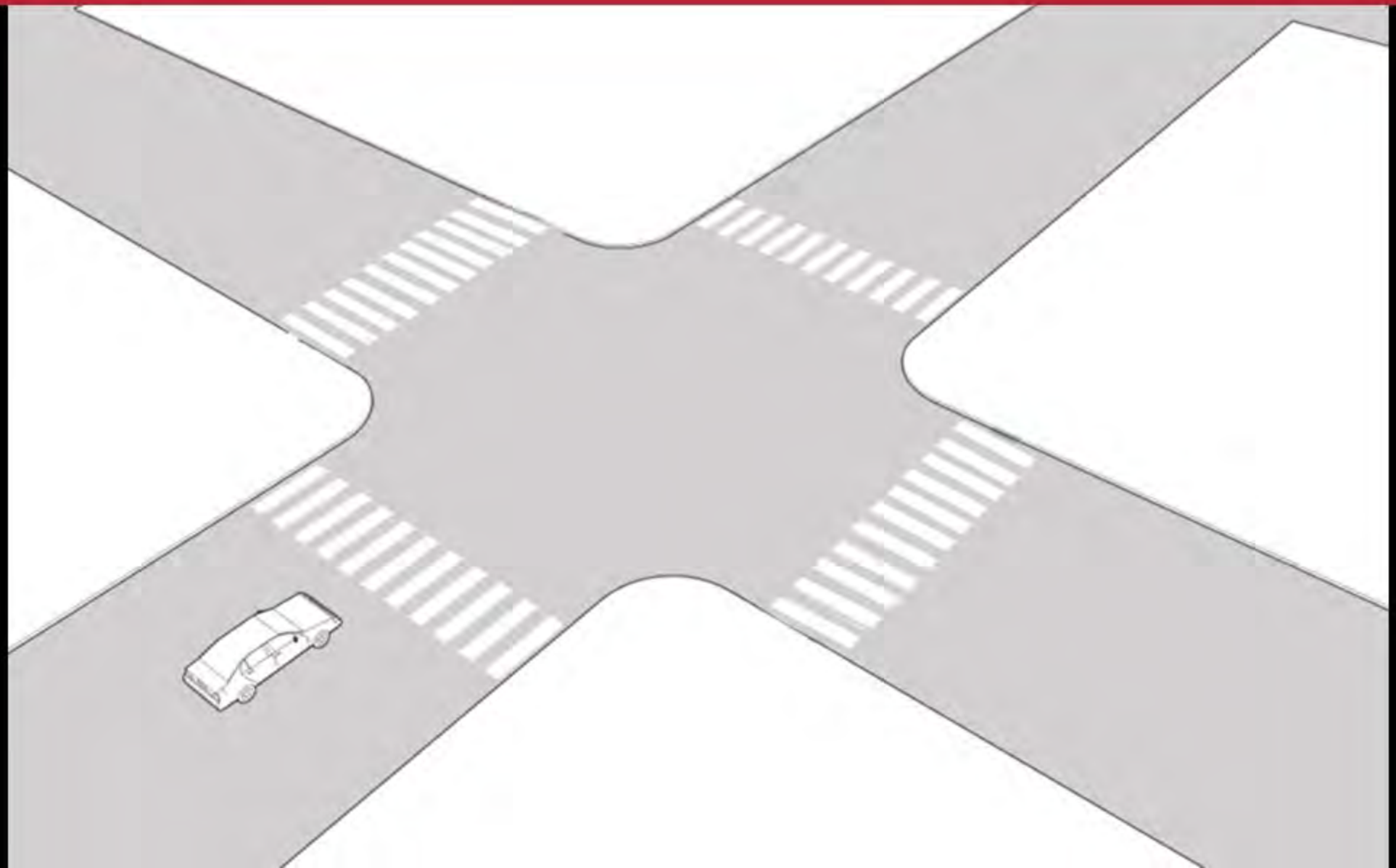
Leading Pedestrian Interval



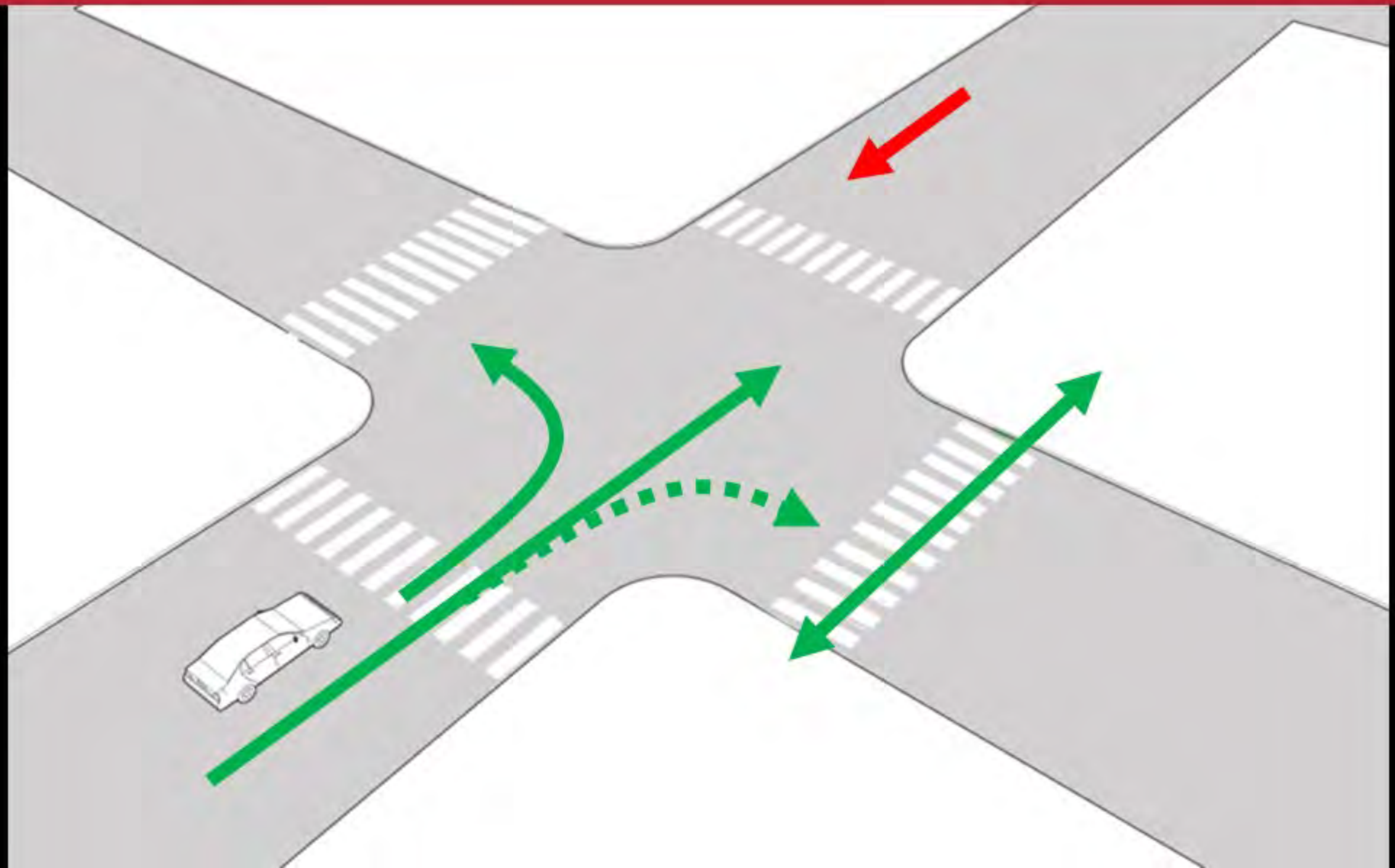
Leading Pedestrian Interval



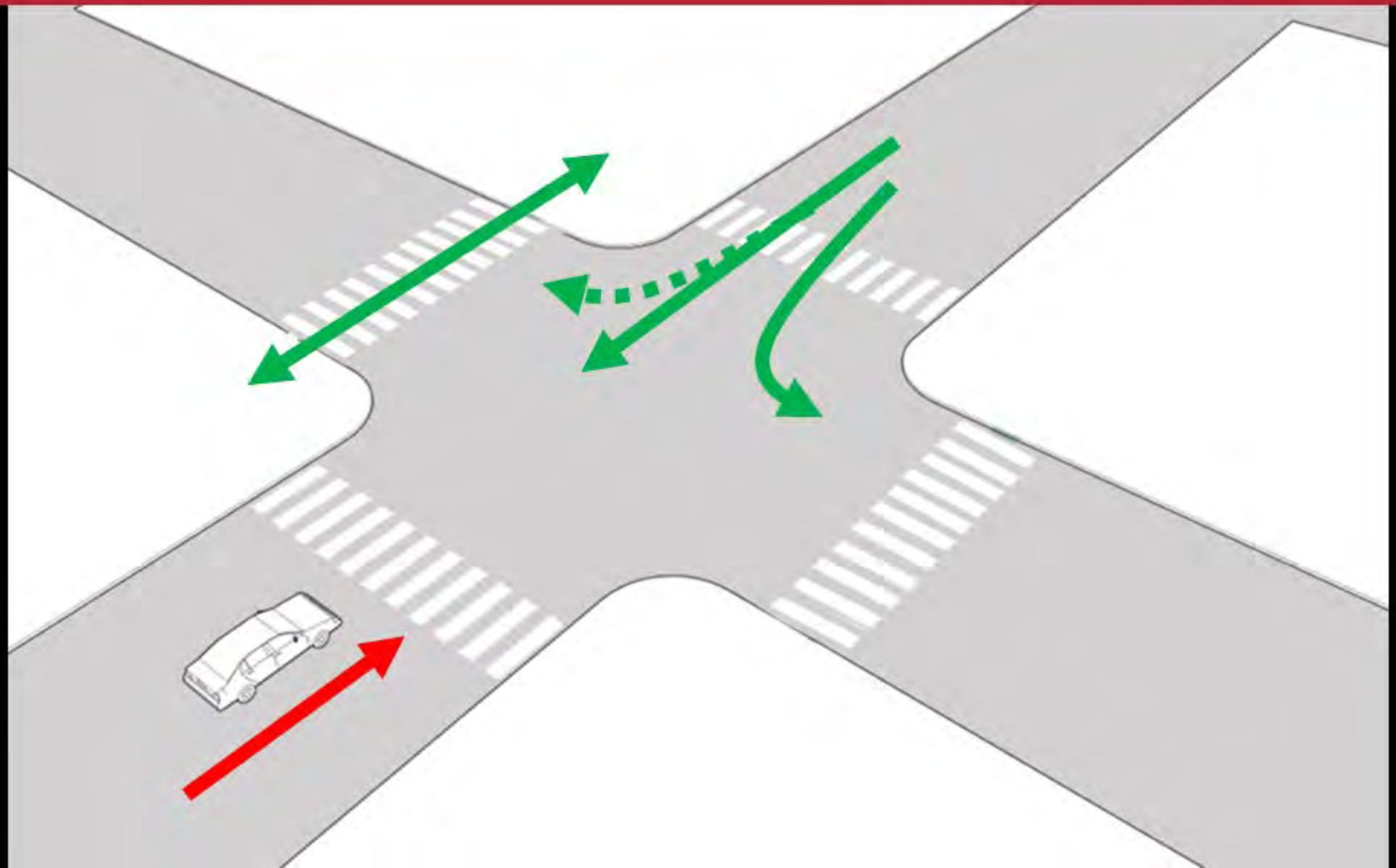
Split Phasing



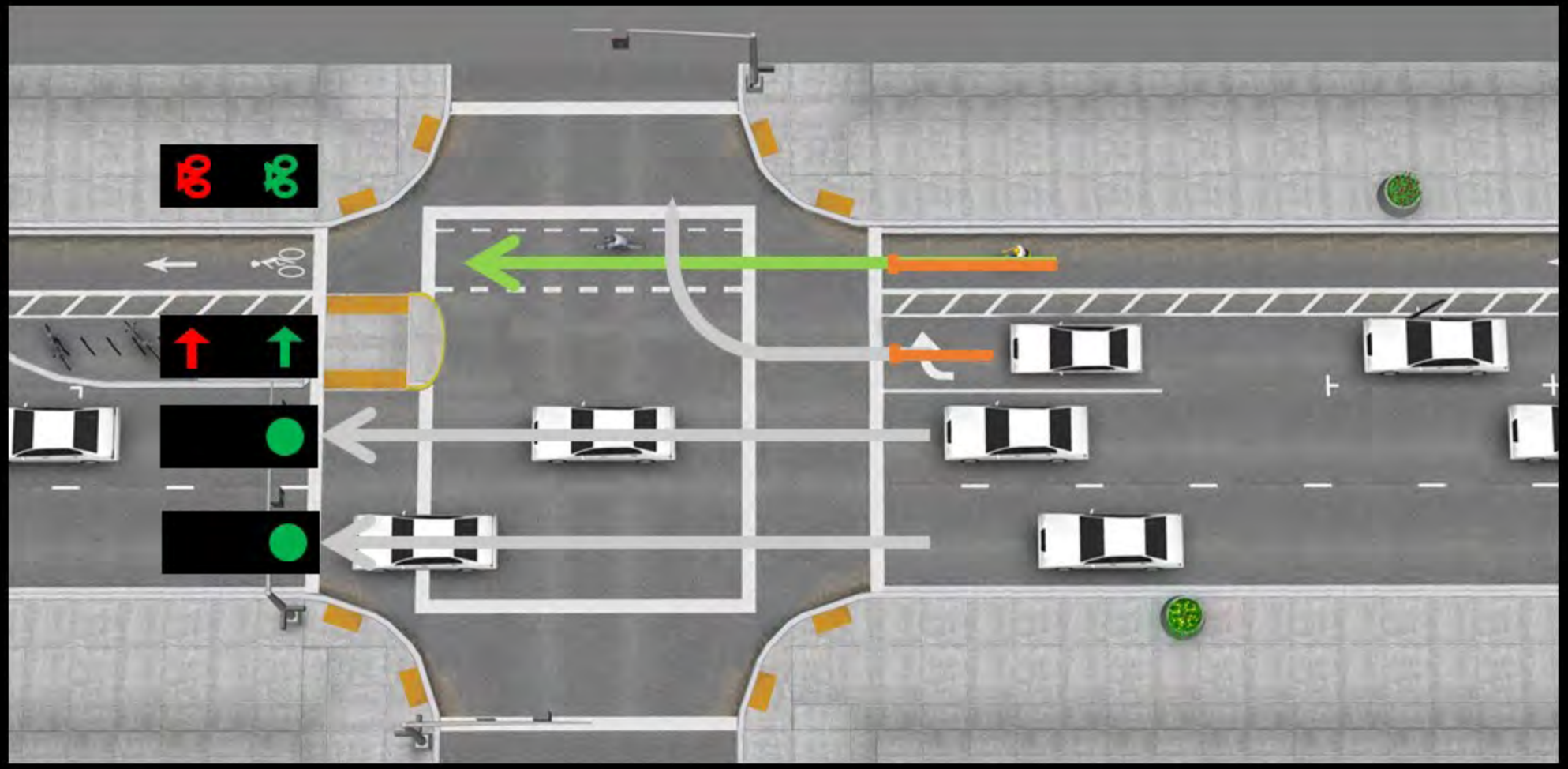
Split Phasing



Split Phasing

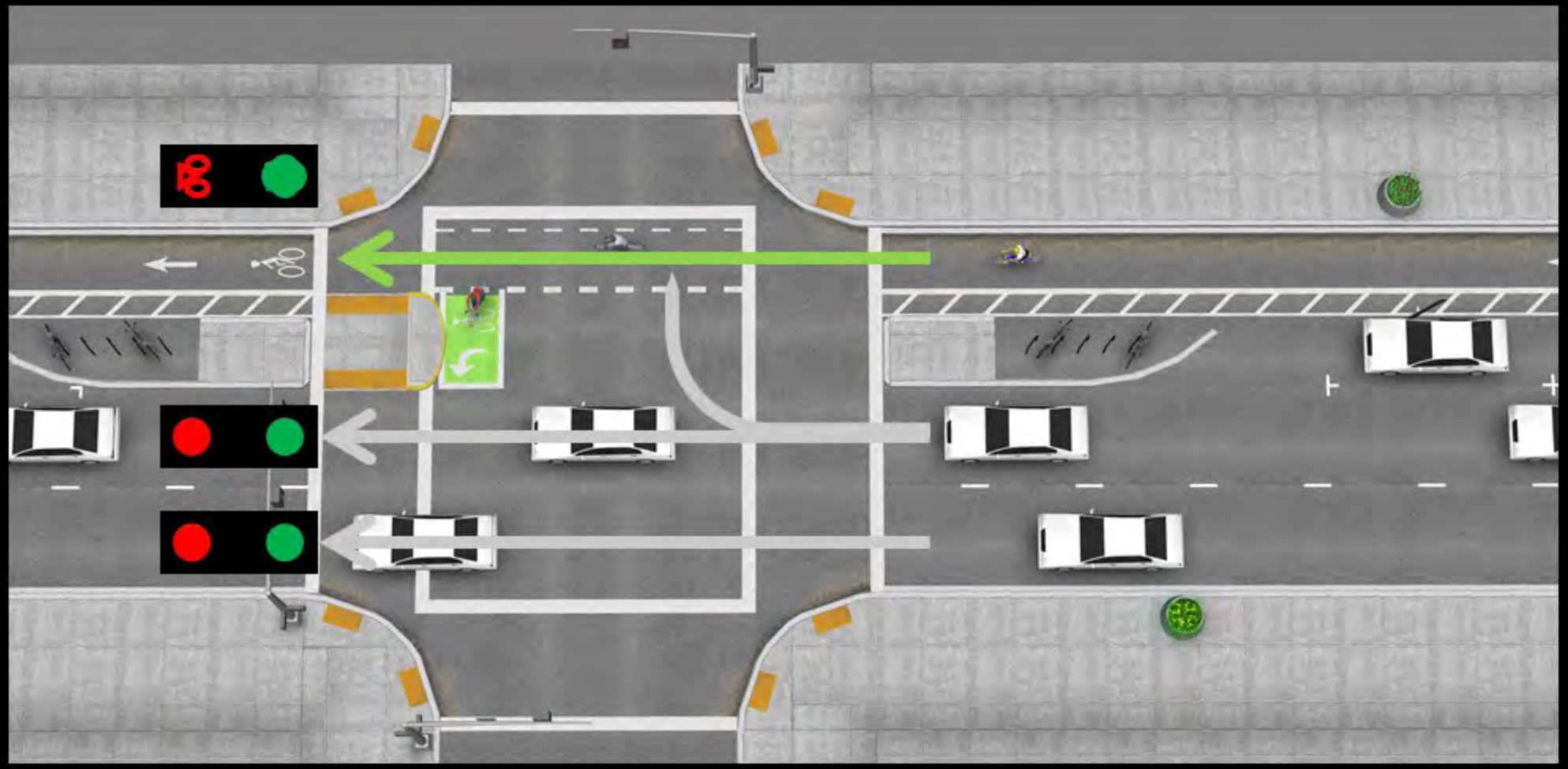


Protected Phase: One-way Bikeway

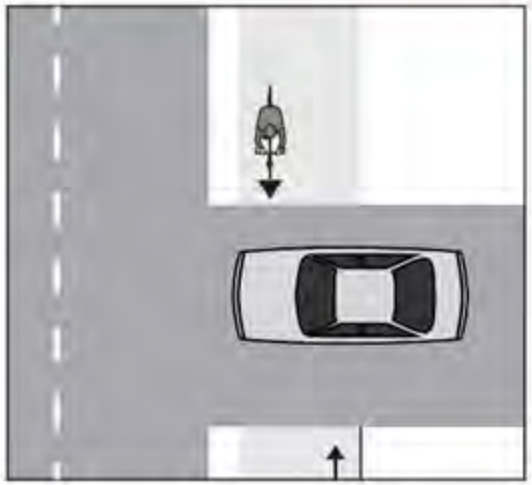


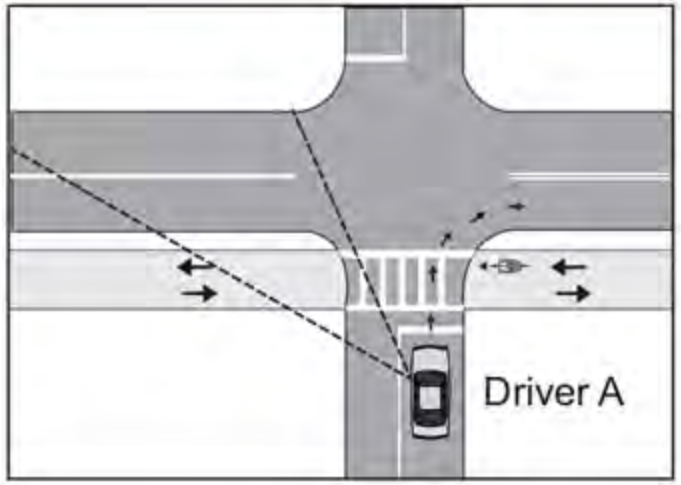

NO
TURN
ON RED
BIKE
SIGNAL

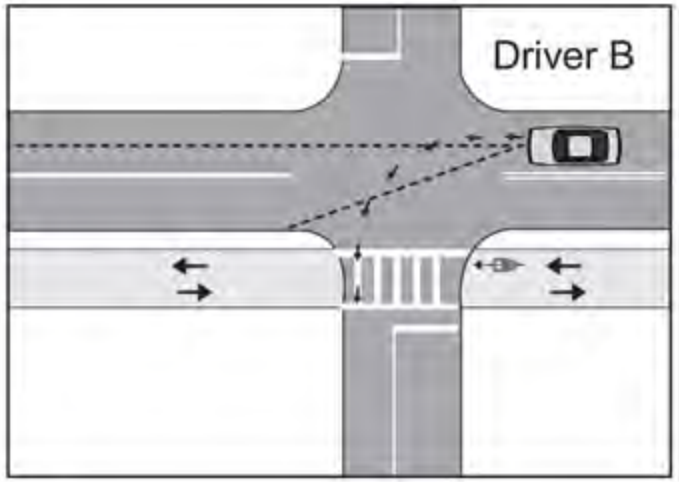
Leading Bike and Pedestrian Interval

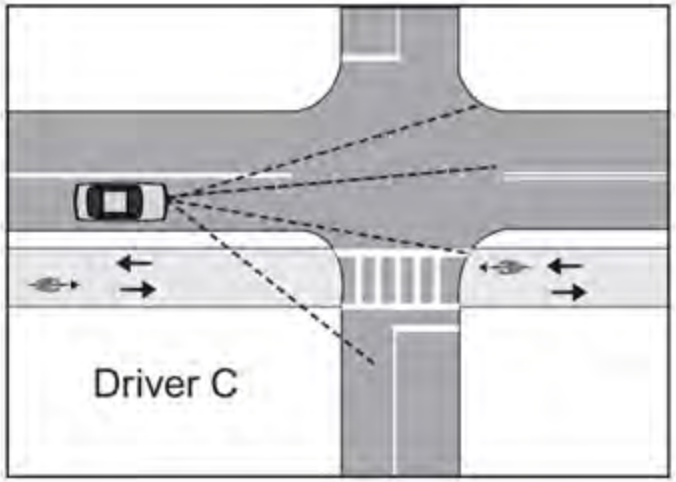


Two-way PBL Concerns



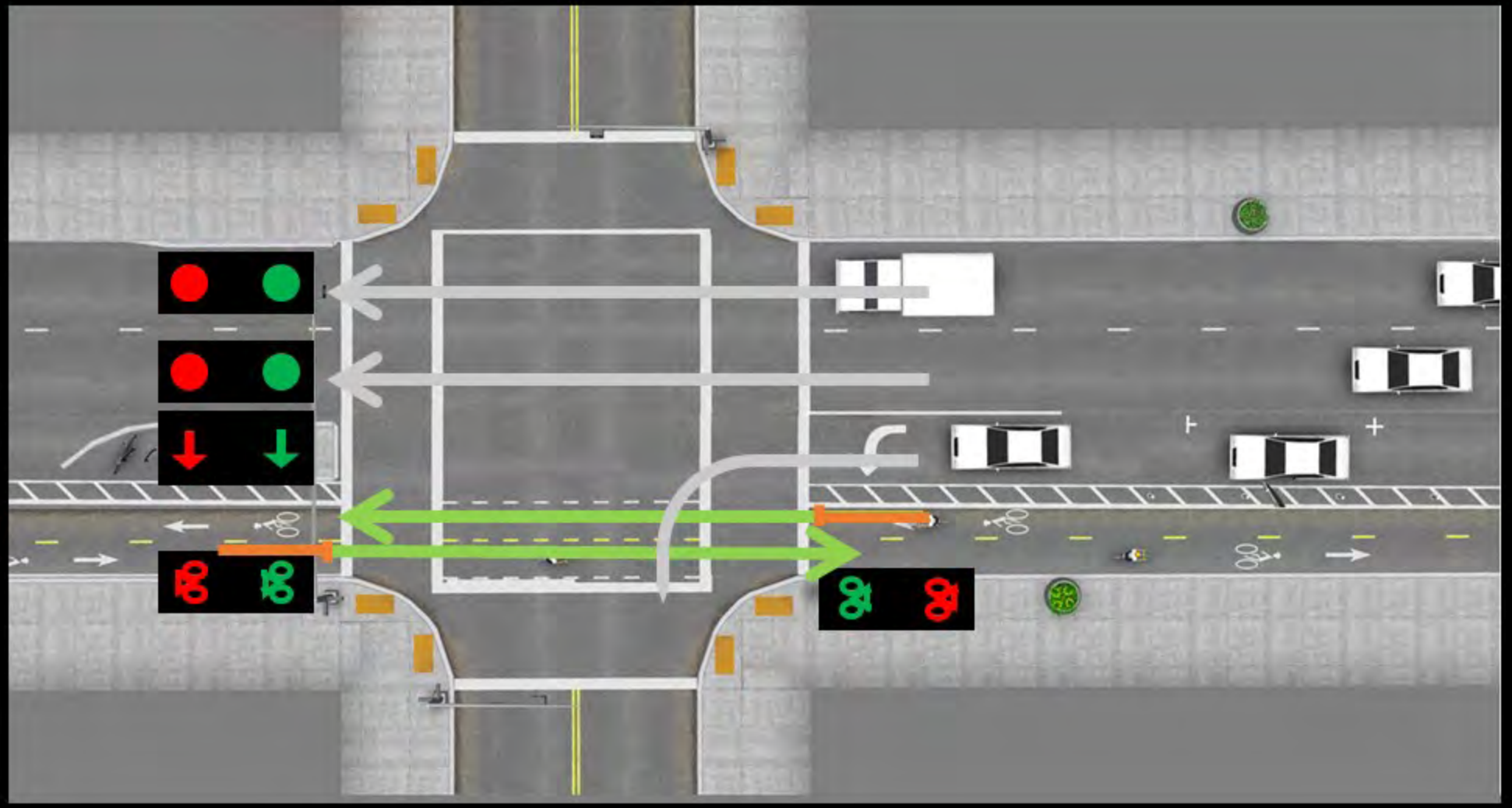






Two-way PBL Concerns

Two-way Protected Bike Lane



Detection: Push Buttons

Pros:

- 100% accurate.
- Cheap to install

Cons:

- Can be hit by vehicles
- require input from bicyclists
- Can't be used for counting

Detection: Loops

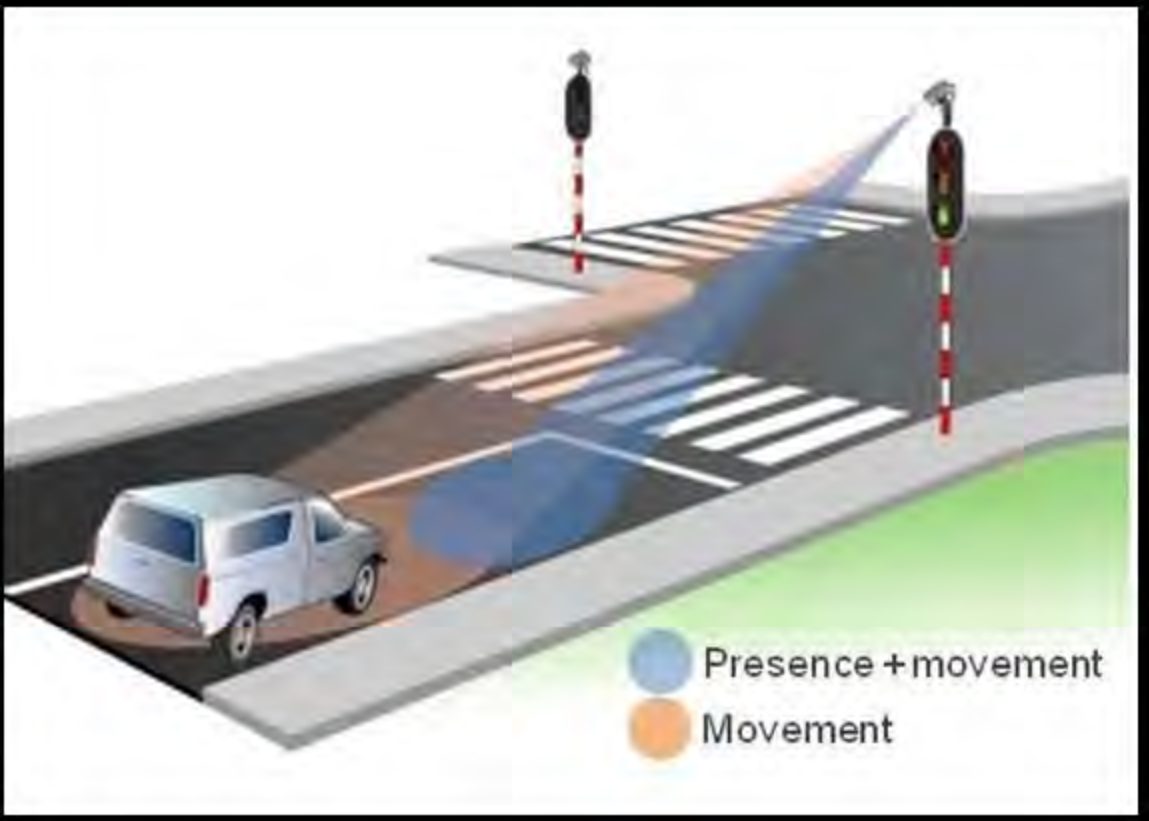
Pros:

- Can be very accurate if calibrated correctly
- Cheapish to install
- Not impacted by weather or visibility
- Can be used for counting

Cons:

- If they go bad the loop needs to be replaced in the pavement
- May not detect all types of bicycles (carbon firber)

Detection: Microwave



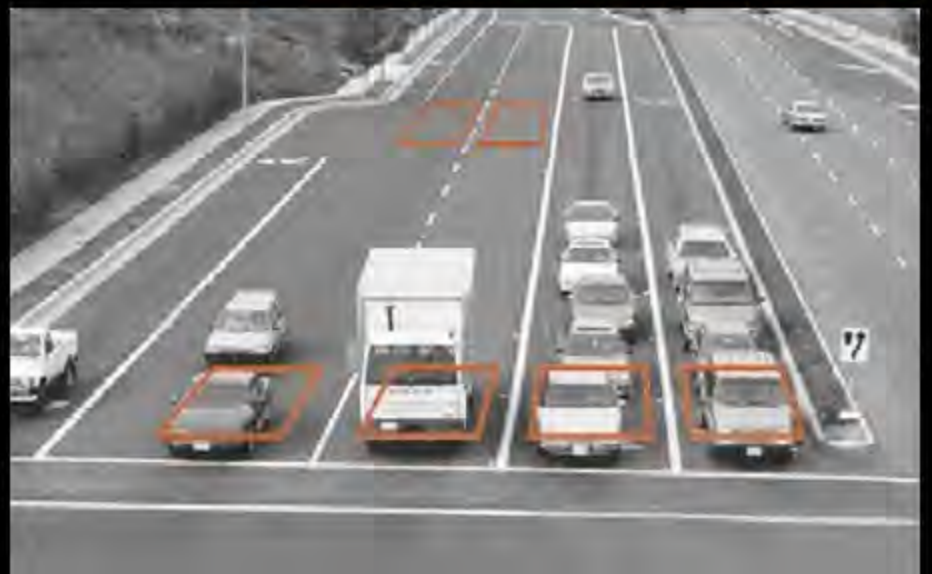
Pros:

- Installs without ground disturbance
- sees through fog and snow
- Can be used for counting

Cons

- Somewhat expensive
- Possible false positives by adjacent cars (not 100% reliable)

Detection: Video



Pros

- Installs without ground disturbance
- Exiting video detectors (if present) can be configured for bikes without any additional equipment.
- Can be used for counting

Cons

- Somewhat expensive
- May have trouble in low visibility, in fog, or in whiteout conditions with low contrast.

Signals

PEDESTRIAN CROSSING CONTEXTUAL GUIDANCE
At unsignalized locations

FACILITY TYPE		Local Streets 15-25 mph		Collector Streets 25-30 mph			Arterial Streets 30-45 mph							
		2 lane	3 lane	2 lane	2 lane with median refuge	3 lane	2 lane	2 lane with median refuge	3 lane	4 lane	4 lane with median refuge	5 lane	6 lane	6 lane with median refuge
1	Crosswalk Only (high visibility)	✓	✓	EJ	EJ	X	EJ	EJ	X	X	X	X	X	X
2	Crosswalk with warning signage and yield lines	EJ	✓	✓	✓	✓	EJ	EJ	EJ	X	X	X	X	X
3	Active Warning Beacon (RRFB)	X	EJ	✓	✓	✓	✓	✓	✓	X	✓	X	X	X
4	Hybrid Beacon	X	X	EJ	EJ	EJ	EJ	✓	✓	✓	✓	✓	✓	✓
5	Full Traffic Signal	X	X	EJ	EJ	EJ	EJ	EJ	EJ	✓	✓	✓	✓	✓
6	Grade separation	X	X	EJ	EJ	EJ	X	EJ	EJ	✓	✓	✓	✓	✓

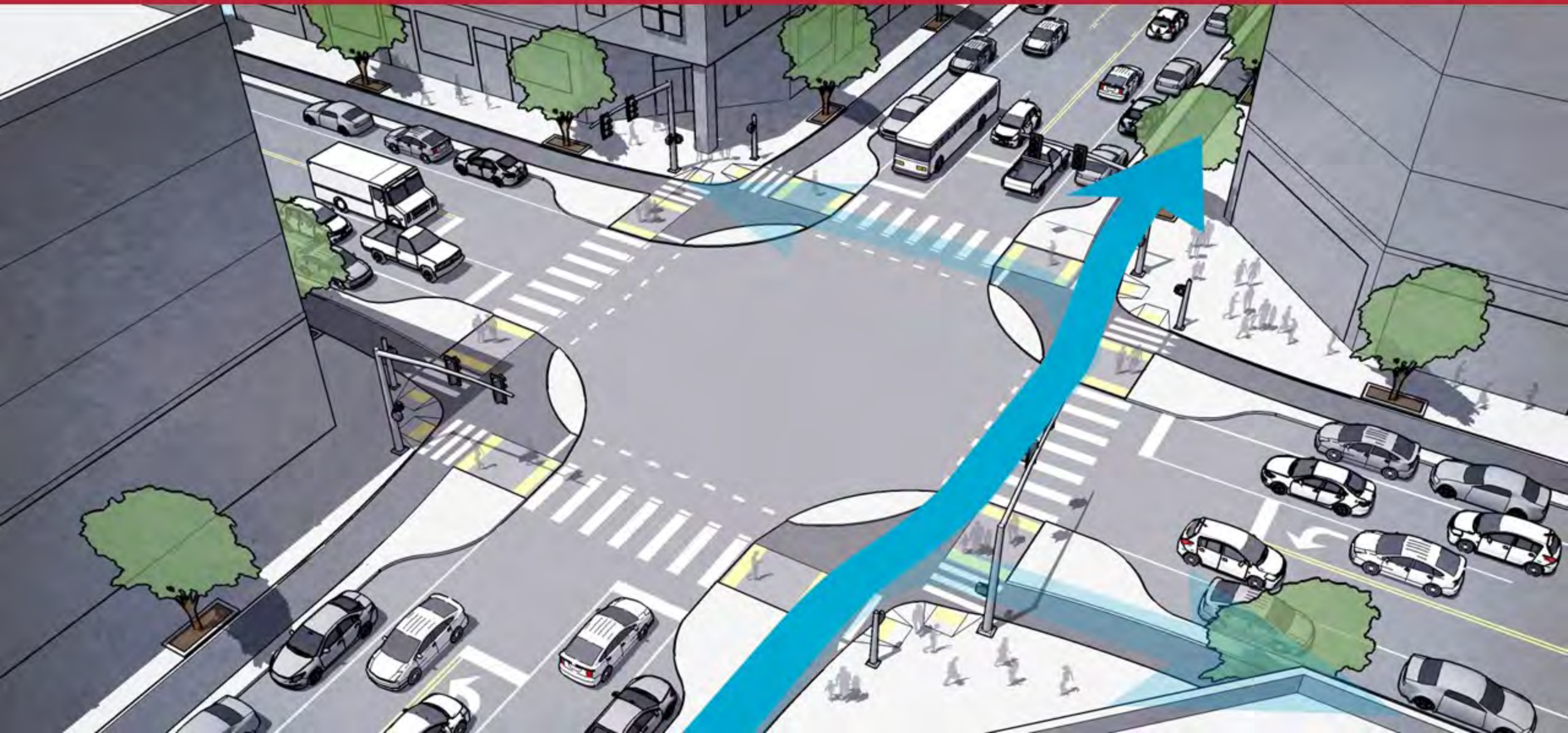
LEGEND

Most Desirable	✓
Engineering Judgement	EJ
Not Recommended	X

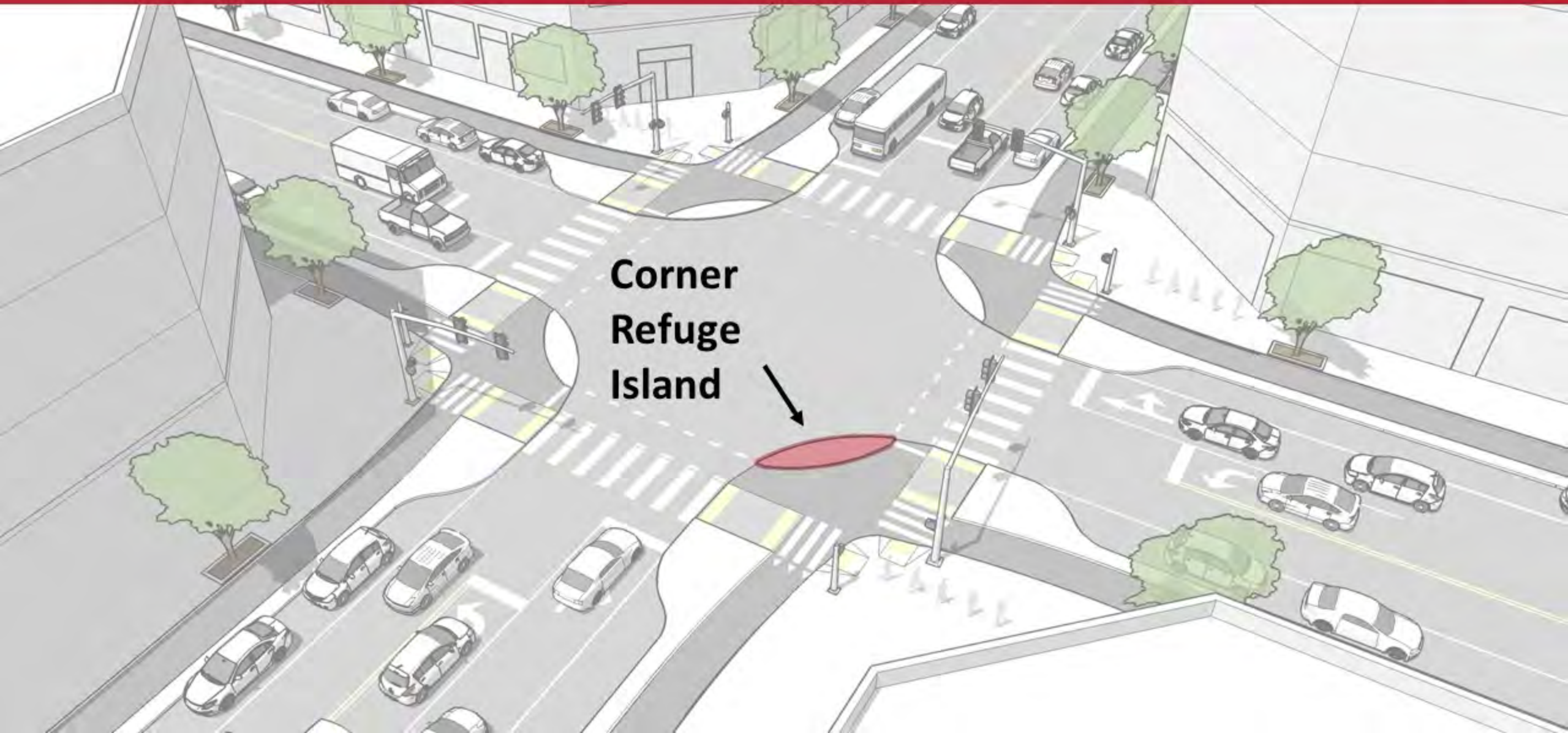
Major Goals for Intersections

- Increase Awareness
- Increase Conspicuity
- Isolate Conflicts
- Clearly Assigning Priority
- **Maintaining Bikeway Comfort**

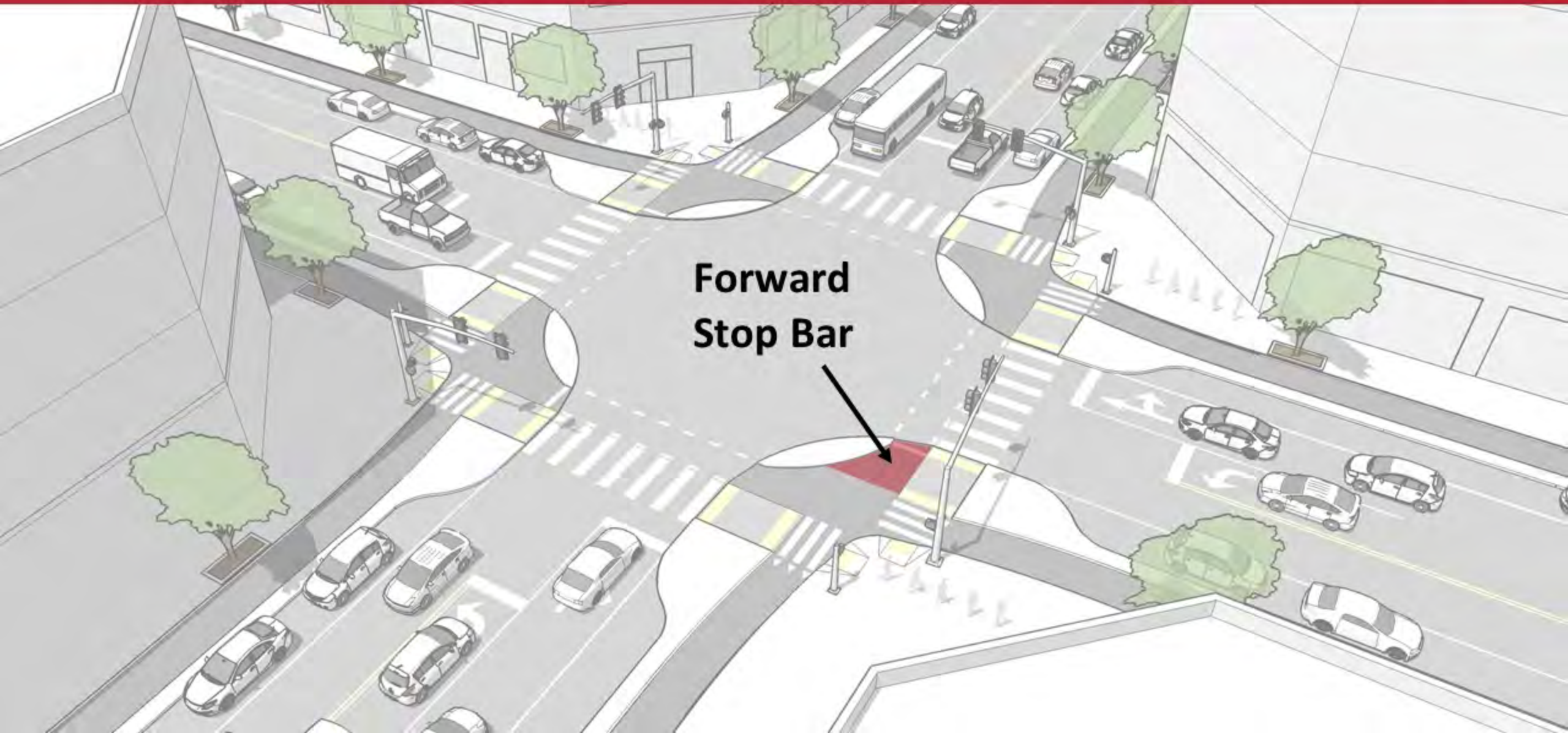
Protected Intersection



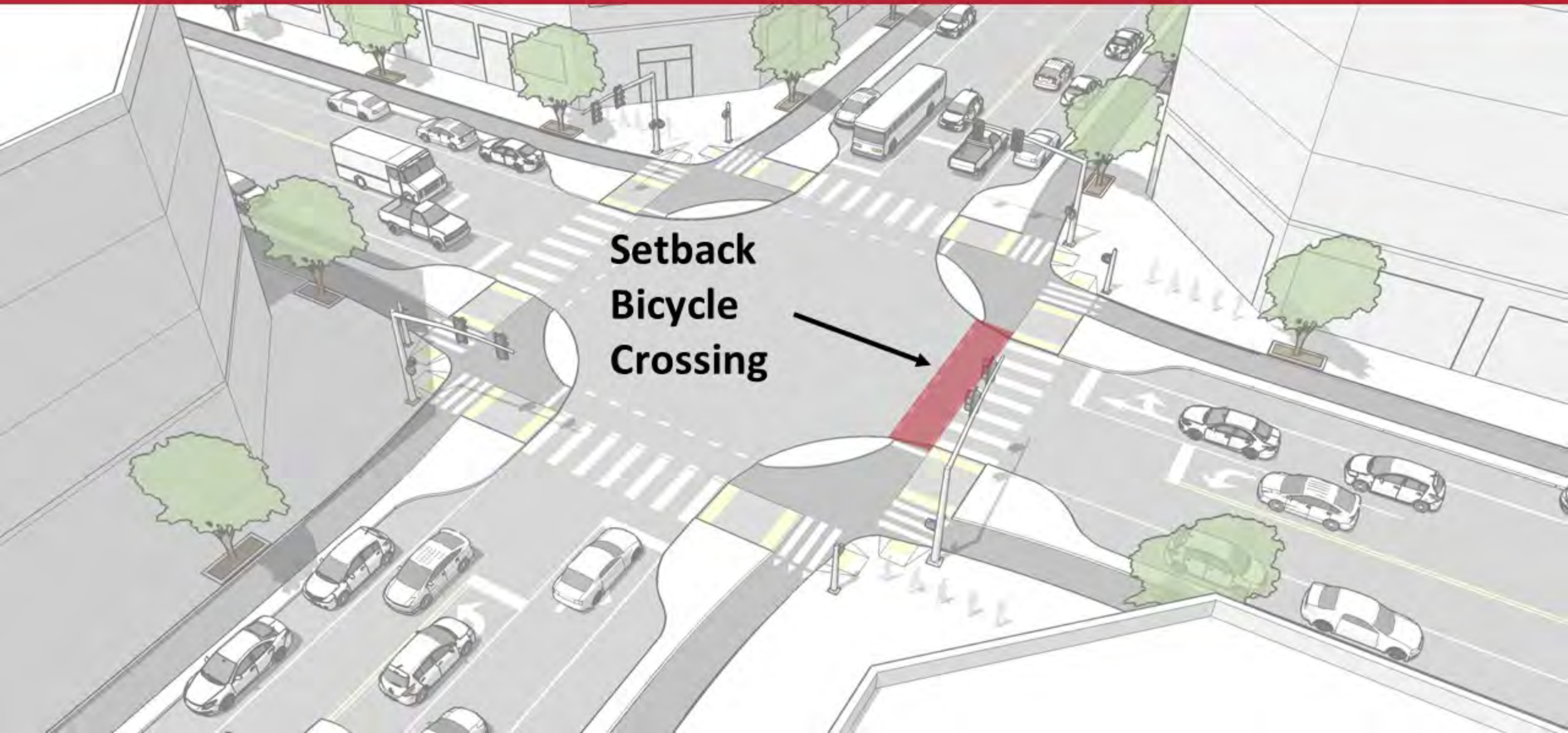
Protected Intersection



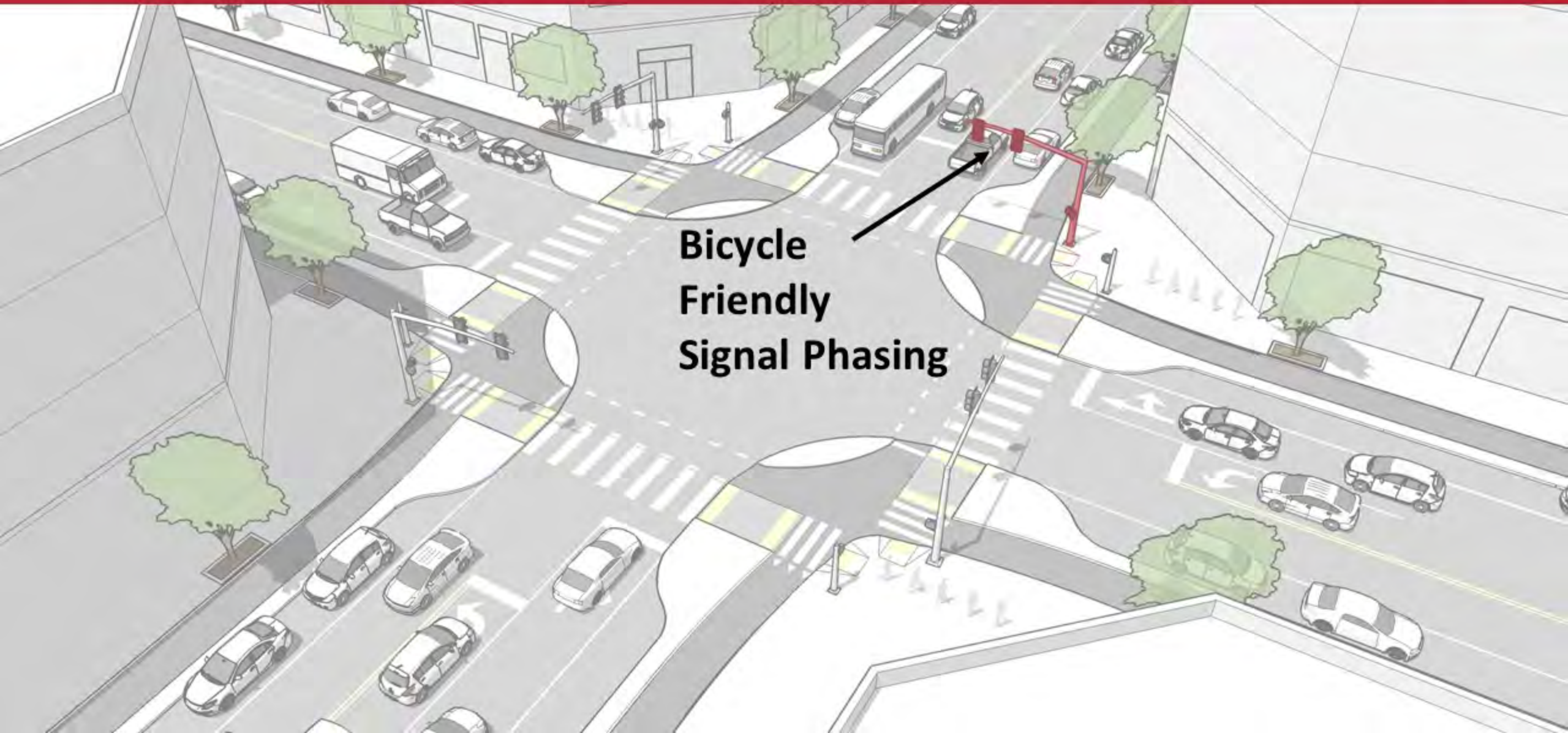
Protected Intersection



Protected Intersection



Protected Intersection

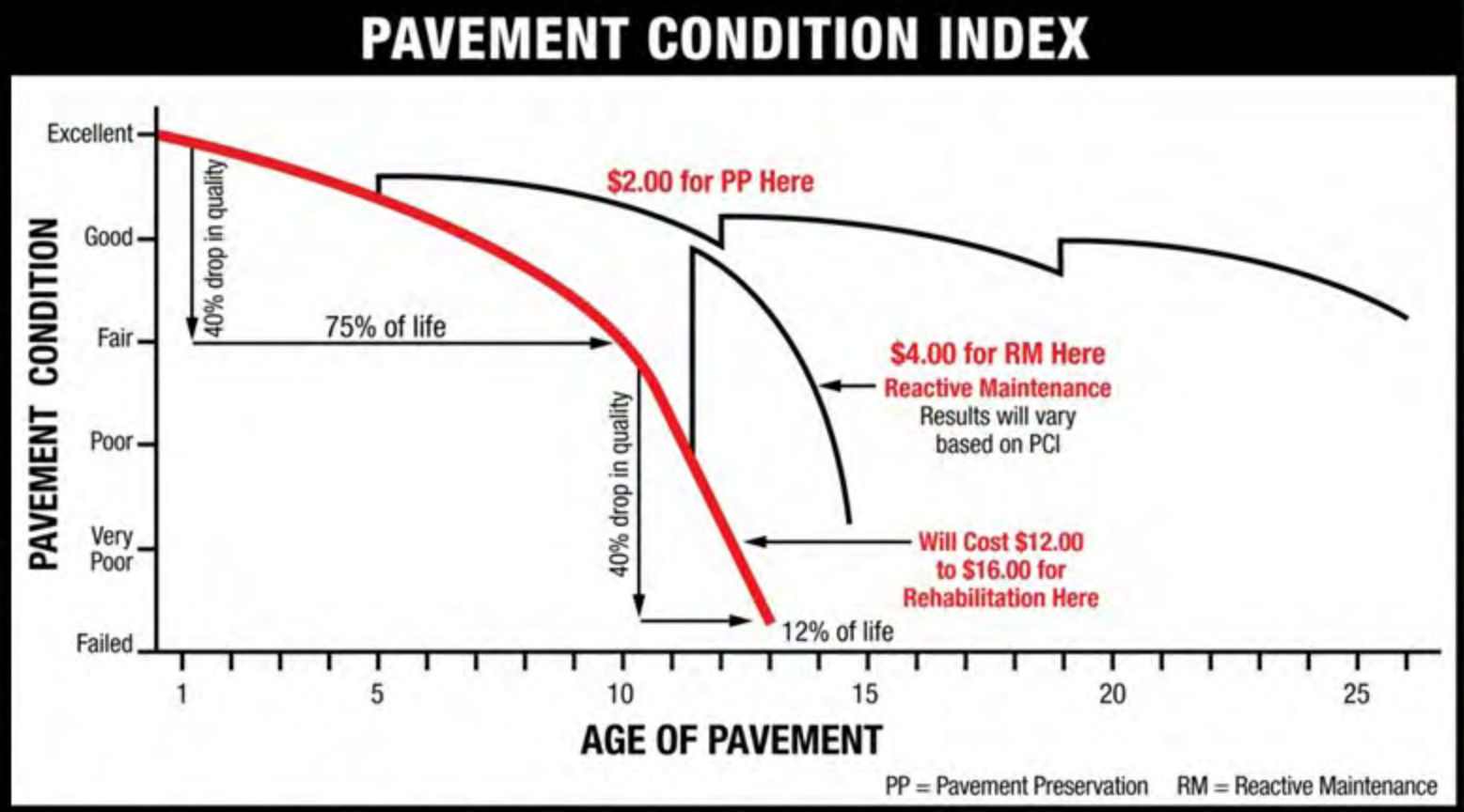


Protected Intersection

Protected Intersection

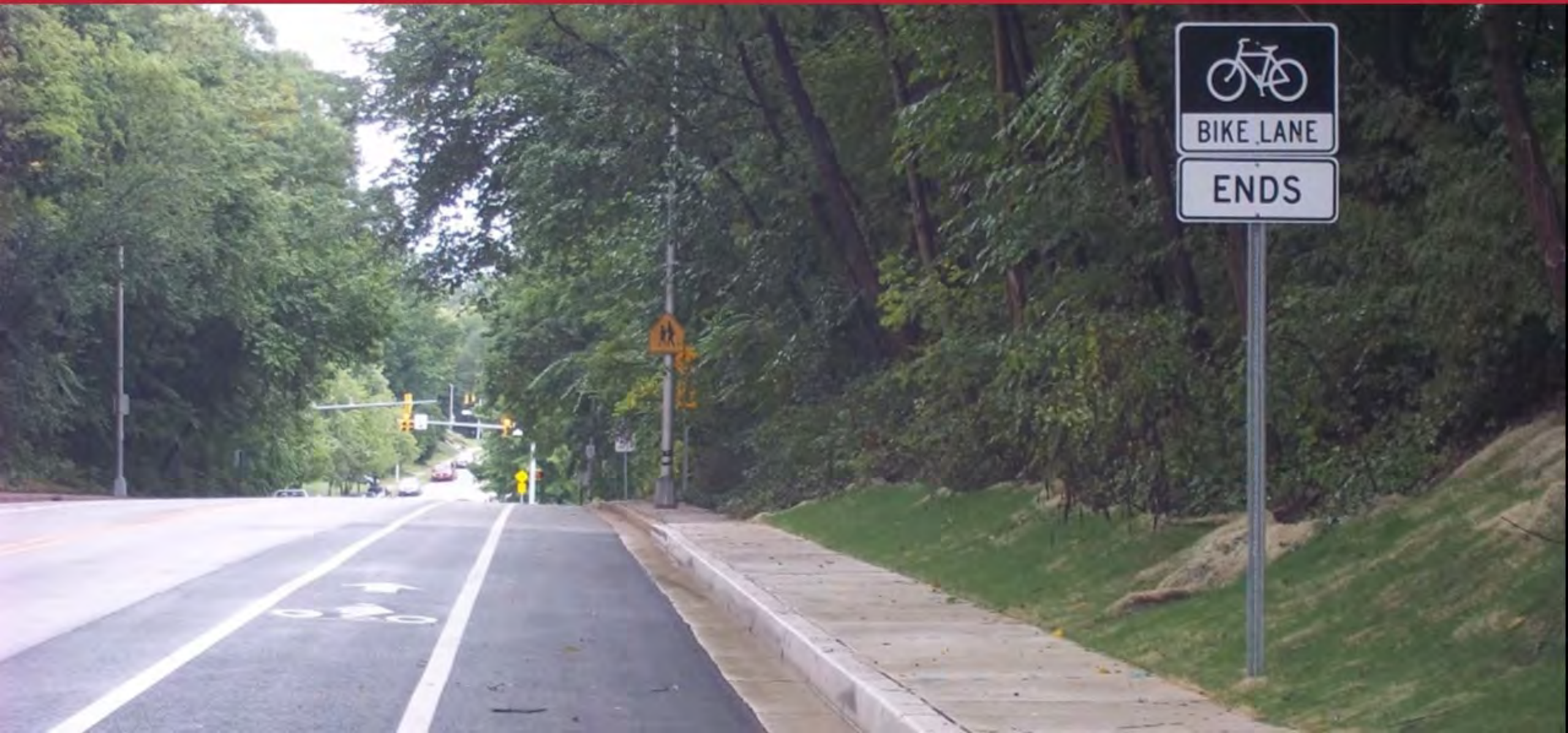
IMPLEMENTATION

Resurface and Repurpose

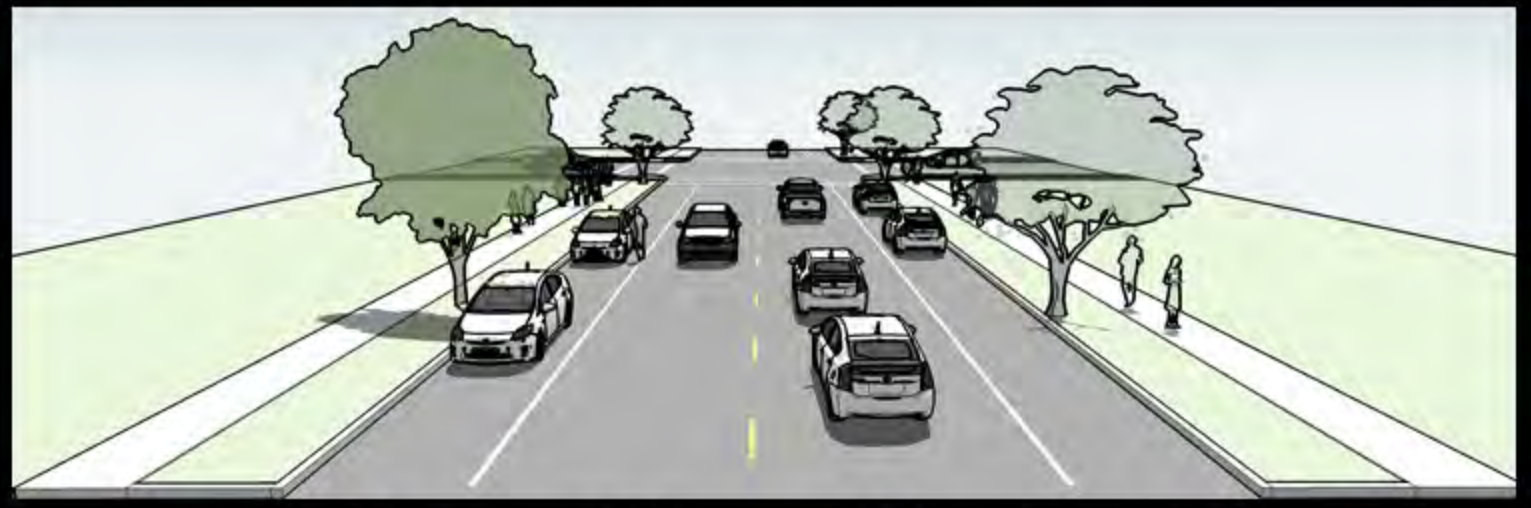


http://slurry.org/education/disciplinesguidelinesfaq/

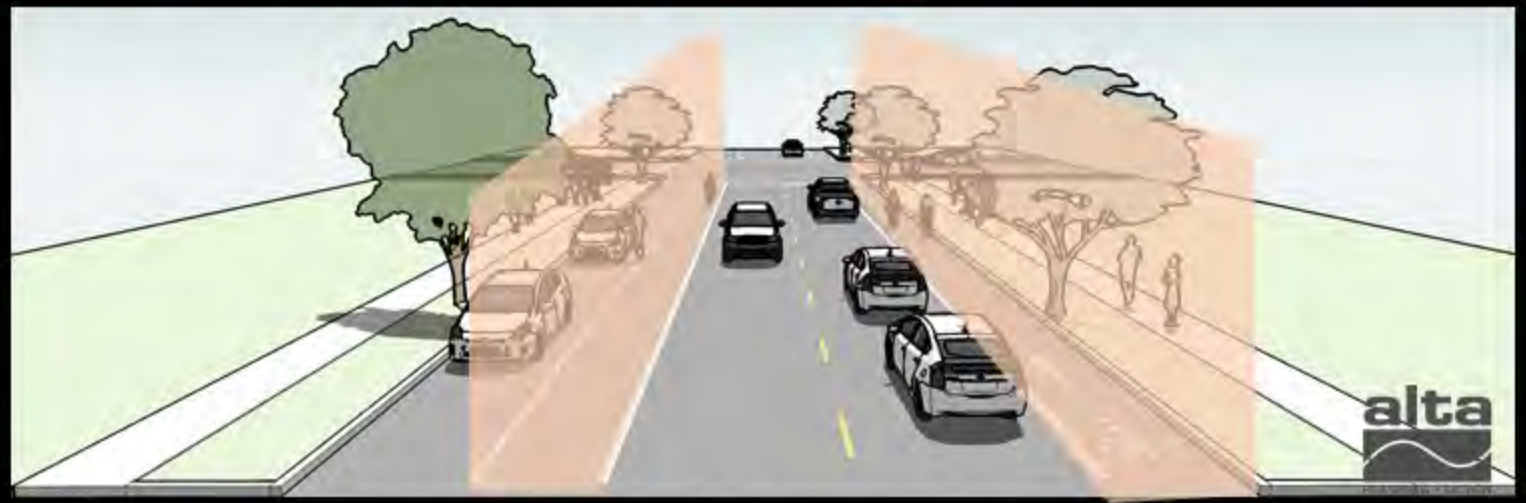
Resurface and Repurpose



Parking Removal

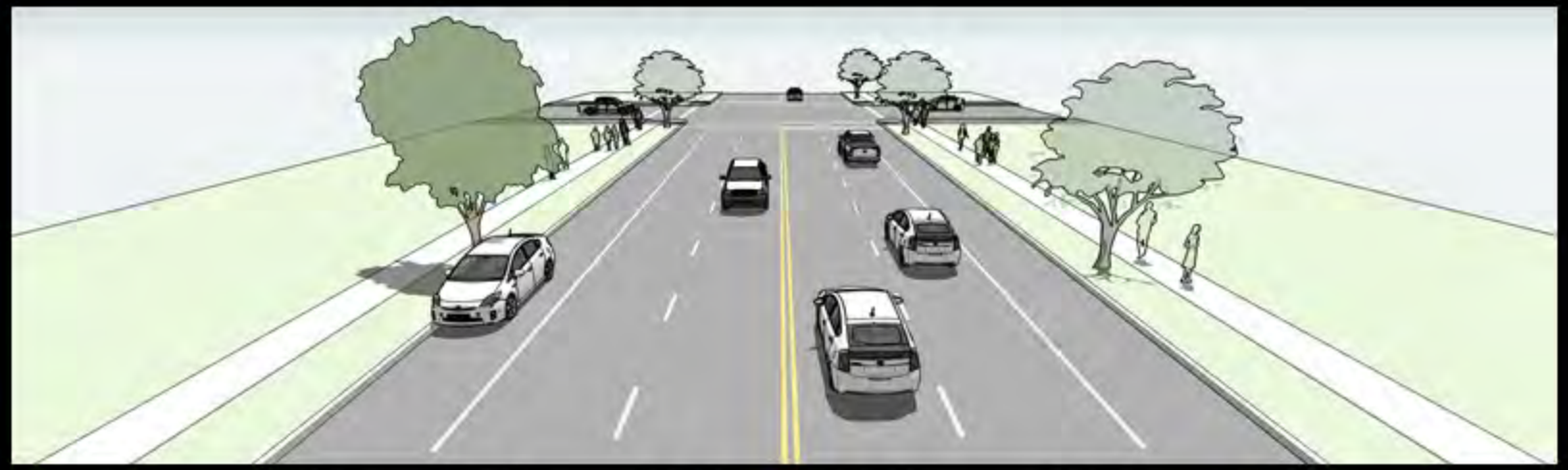


8 ft 12 ft 12 ft 8 ft



8 ft 6 ft 10 ft 10 ft 6 ft

Lane Reconfiguration



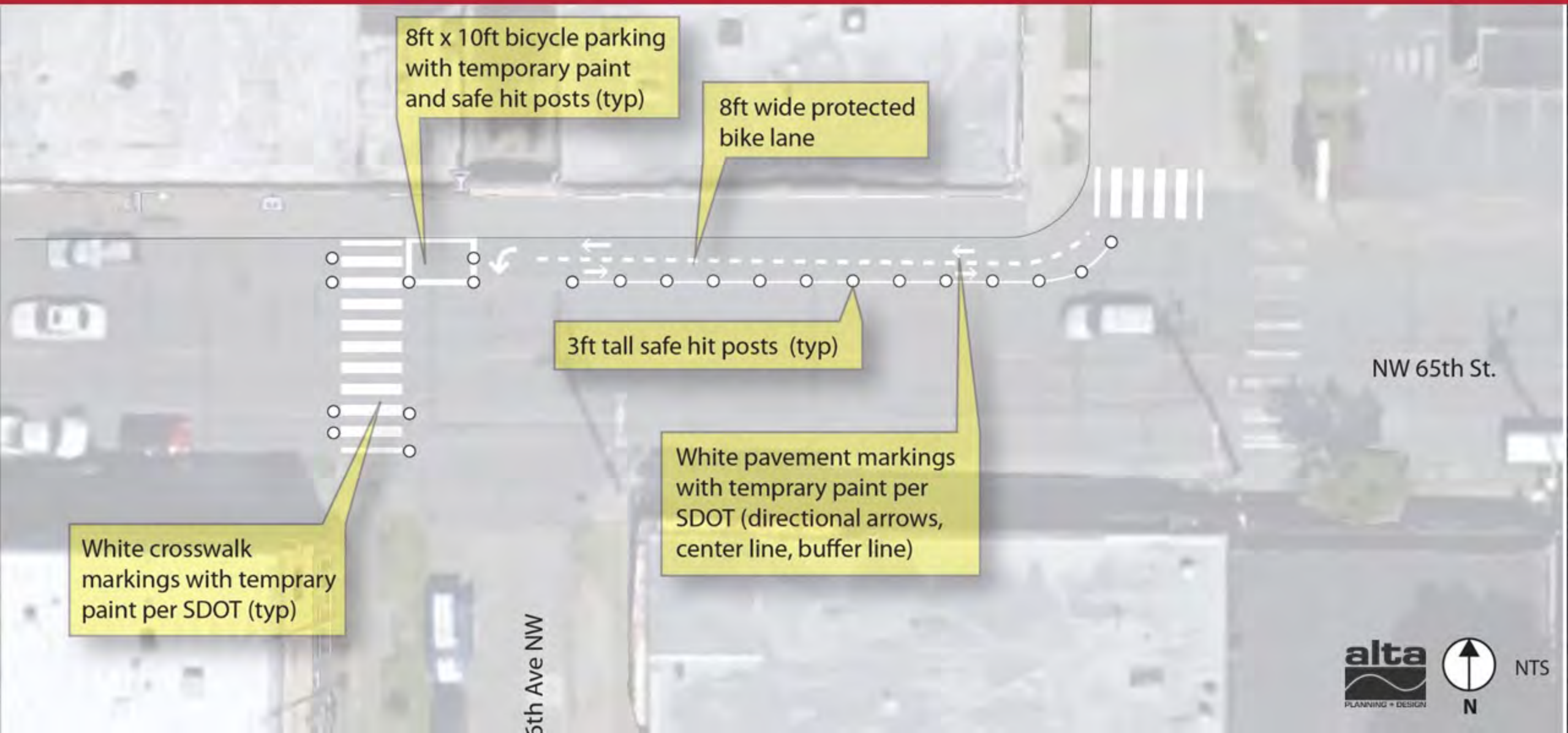
8 ft 10 ft 10 ft 10 ft 10 ft 8 ft

8 ft **5 ft** 10 ft 10 ft 10 ft **5 ft** 8 ft

Open Streets Events

Minneapolis, MN

PARK(ing) Day


8ft x 10ft bicycle parking with temporary paint and safe hit posts (typ)
8ft wide protected bike lane
3ft tall safe hit posts (typ)
White pavement markings with temprary paint per SDOT (directional arrows, center line, buffer line)
White crosswalk markings with temprary paint per SDOT (typ)
NW 65th St.
6th Ave NW
N
NTS

PARK(ing) Day

PARK(ing) Day

Seattle, WA

Pop-up Demonstration Projects

Portland, OR

Demonstration Projects

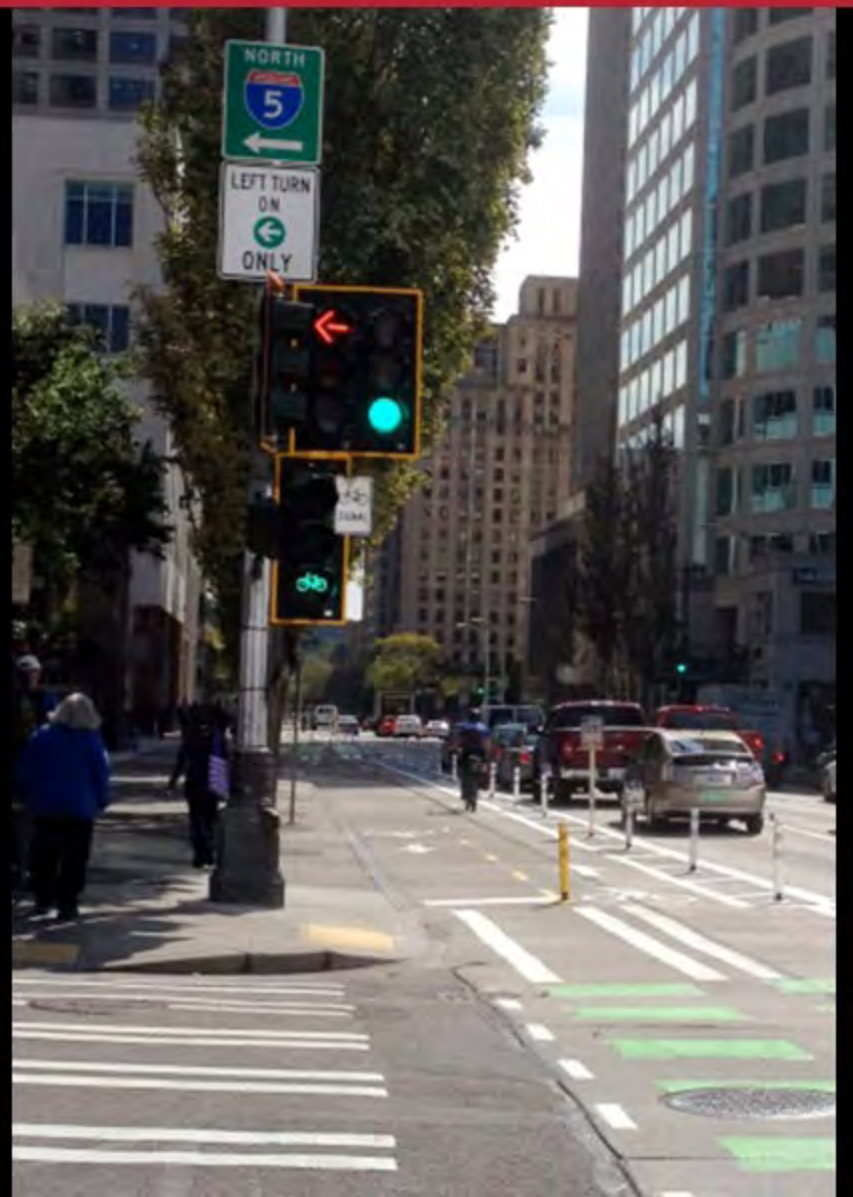
Demonstration Projects

Denver, CO

Interim Treatments

- Signs
- Signals
- Roadway Markings
- Planters & Trees
- Tables, Benches & Chairs
- Colored Lanes (bike/bus)
- Surface Treatments (epoxied gravel; paint)
- Stones/Boulders
- Superficial Construction (islands, etc)
- Programming & Events
- Part-Time Closures
- Flexible Parking Lane

Phased Implementation

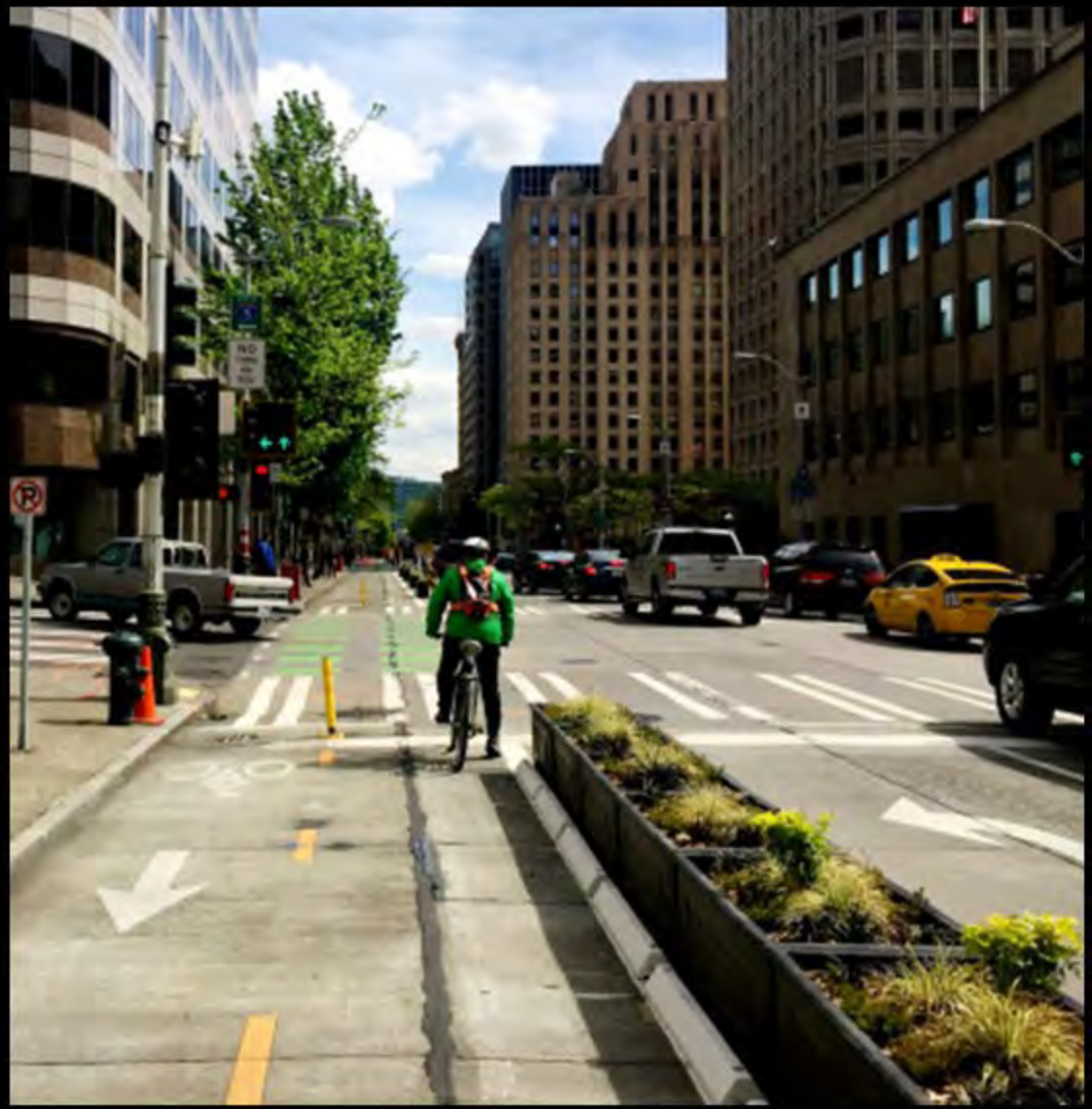


Phased Implementation

Phased Implementation

alta
PLANNING + DESIGN

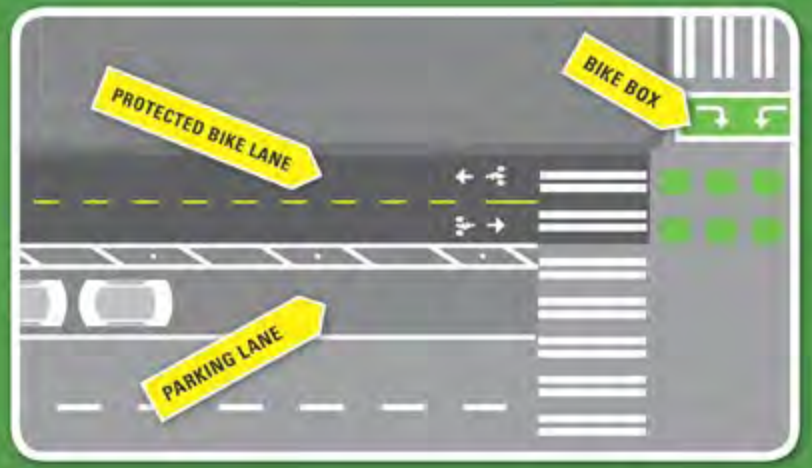
Phased Implementation



Education

NEW! SECOND AVENUE *PROTECTED BIKE LANE*

DEMONSTRATION PROJECT



WHAT YOU NEED TO KNOW

The new two-way protected bike lane between Pike Street and Yesler Way will change the way you ride on Second Avenue—learn how to use it safely. >

USING THE PROTECTED BIKE LANE

Protected bike lanes add safety and predictability. Using curbs, planters, posts, etc., they physically separate people riding bikes from people driving, and they are distinct from the sidewalk.

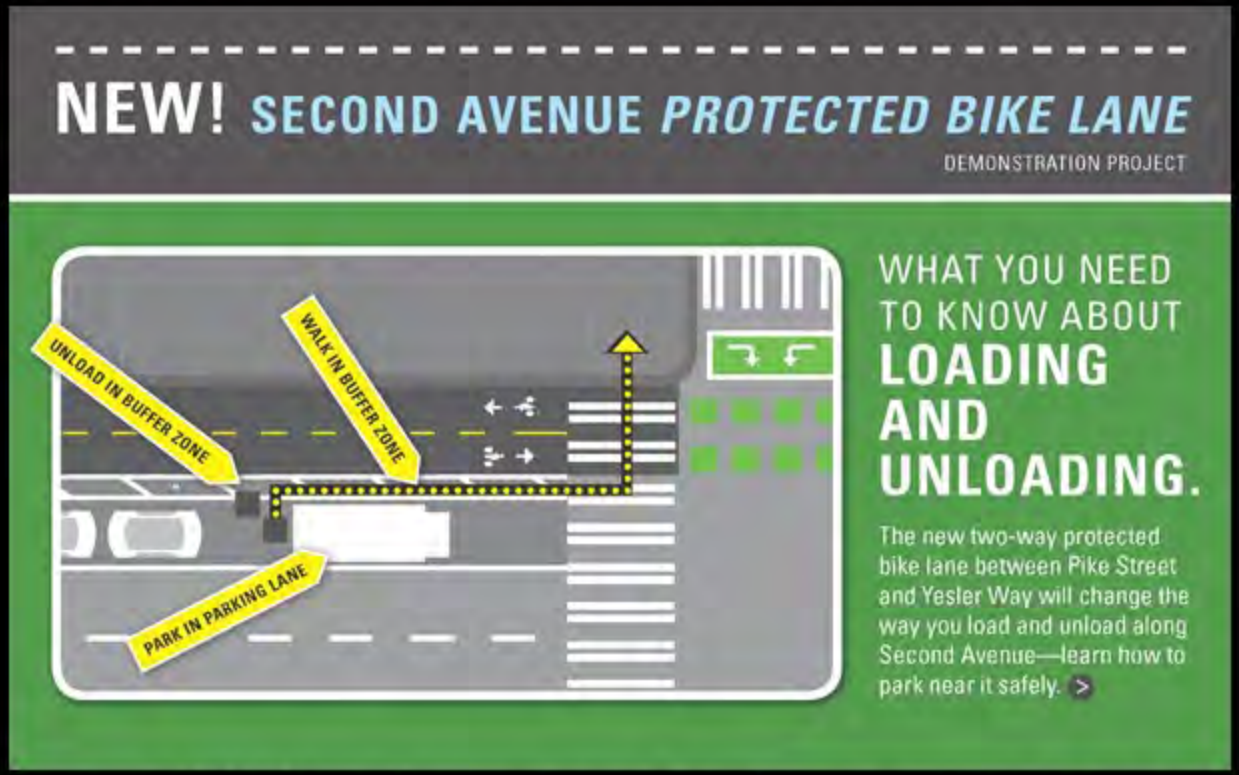
- **Be aware of people crossing** the protected bike lane.
- Always follow **bicycle signals** at intersections.
- **Don't block crosswalks.**
- **Ride on the right-side of the protected bike lane.** If you pass another person, use caution, pass on the left, and yield to oncoming people biking.
- When **turning off the protected bike lane** to go west toward the waterfront, move into the adjacent bike box on the cross street. When the traffic light turns green, move through the intersection.

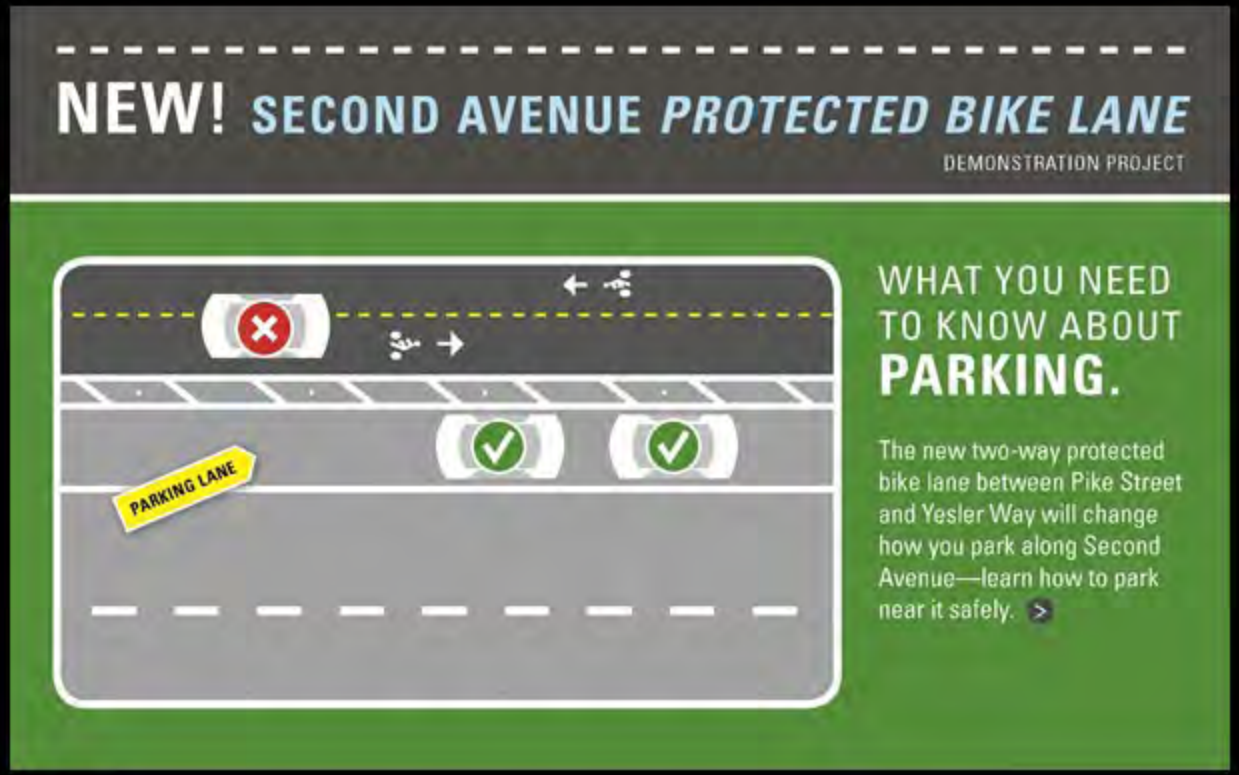
SDOT
Seattle Department of Transportation

seattle.gov/transportation/2ndAvepbl.htm

Seattle DOT: http://www.seattle.gov/transportation/2ndavepbl.htm

Education





Seattle DOT: http://www.seattle.gov/transportation/2ndavepbl.htm

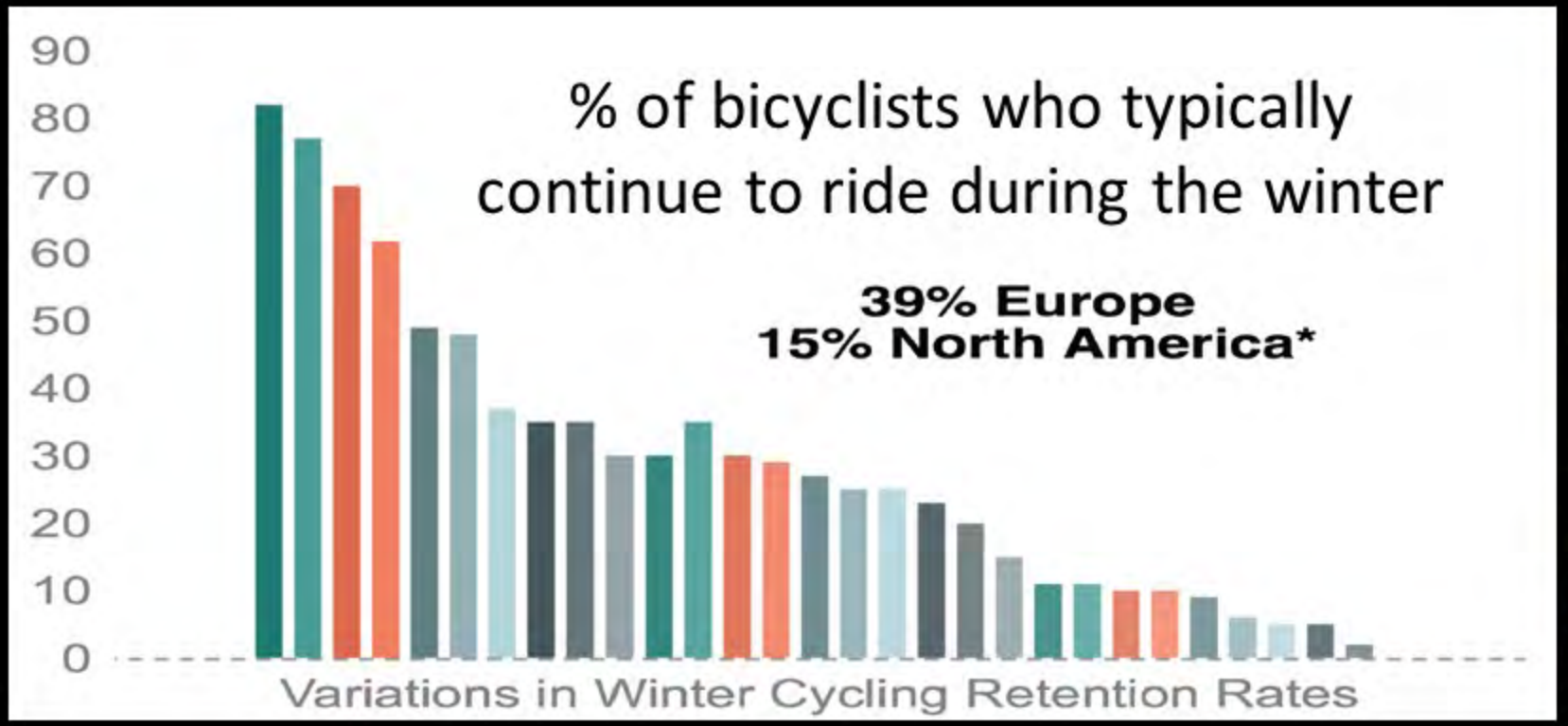
Rapid Network Implementation

Calgary, AB

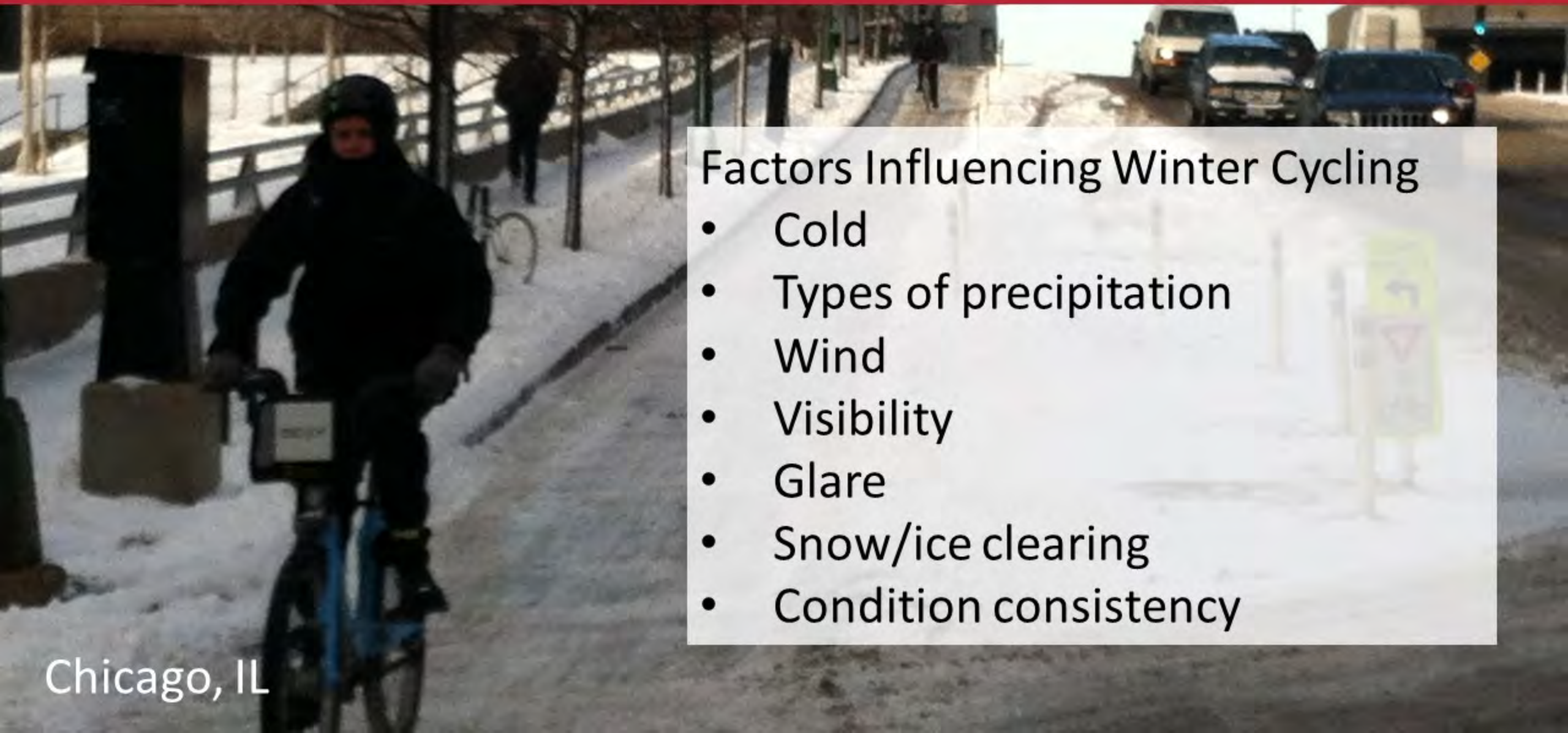
WINTER CITIES

CITY	ANNUAL SNOWFALL (inches)	DAYS BELOW FREEZING	EXISTING PROTECTED BIKE LANES (miles)	PLANNED PROTECTED BIKE LANES (miles)
Lincoln, NE	26	127	1.5	2.2
Chicago	37	122	21	7
Pittsburgh	42	112	2.5	4.5
Boston / Cambridge	43	92	6	6.5
Winnipeg	45	193	2.5	?
Toronto	48	101	8+	?
Calgary	51	194	5	?
Denver	53	157	3	8.5
Minneapolis	54	148	5	3.5
Salt Lake City	56	113	2	?
Fairbanks	64	224	1	?
Anchorage	75	188	0	?
Montreal	82	148	30+	?

Winter Cycling



Winter Cycling



Factors Influencing Winter Cycling

- Cold
- Types of precipitation
- Wind
- Visibility
- Glare
- Snow/ice clearing
- Condition consistency

Chicago, IL

Snow Removal

Montreal, QC

Number of kilometres of bike paths cleared of snow

Period	Number of kilometres
2012-2013	63
2013-2014	70
2014-2015	351
2015-2016	395

Table and photo source: City of Montreal

Snow Removal Equipment

Snow Removal Equipment

Missoula, MT

Snow Removal Equipment

source: City of Montreal

Snow Removal Equipment

source: City of Montreal

Snow Storage

source: City of Montreal

Snow Storage

Chicago, IL

Snow Storage

Boston, MA

Snow Removal Policy

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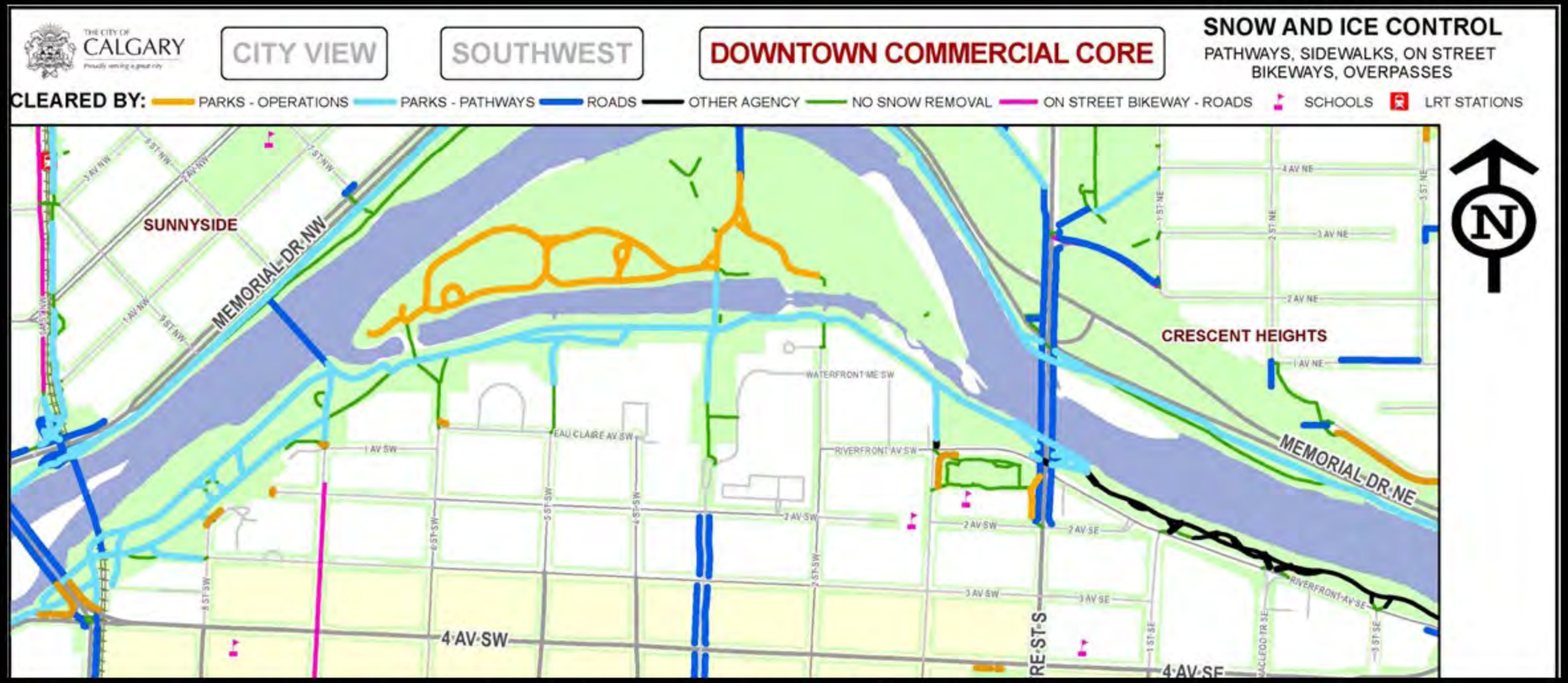
PLANNING + DESIGN

The Washington Post

The Fix

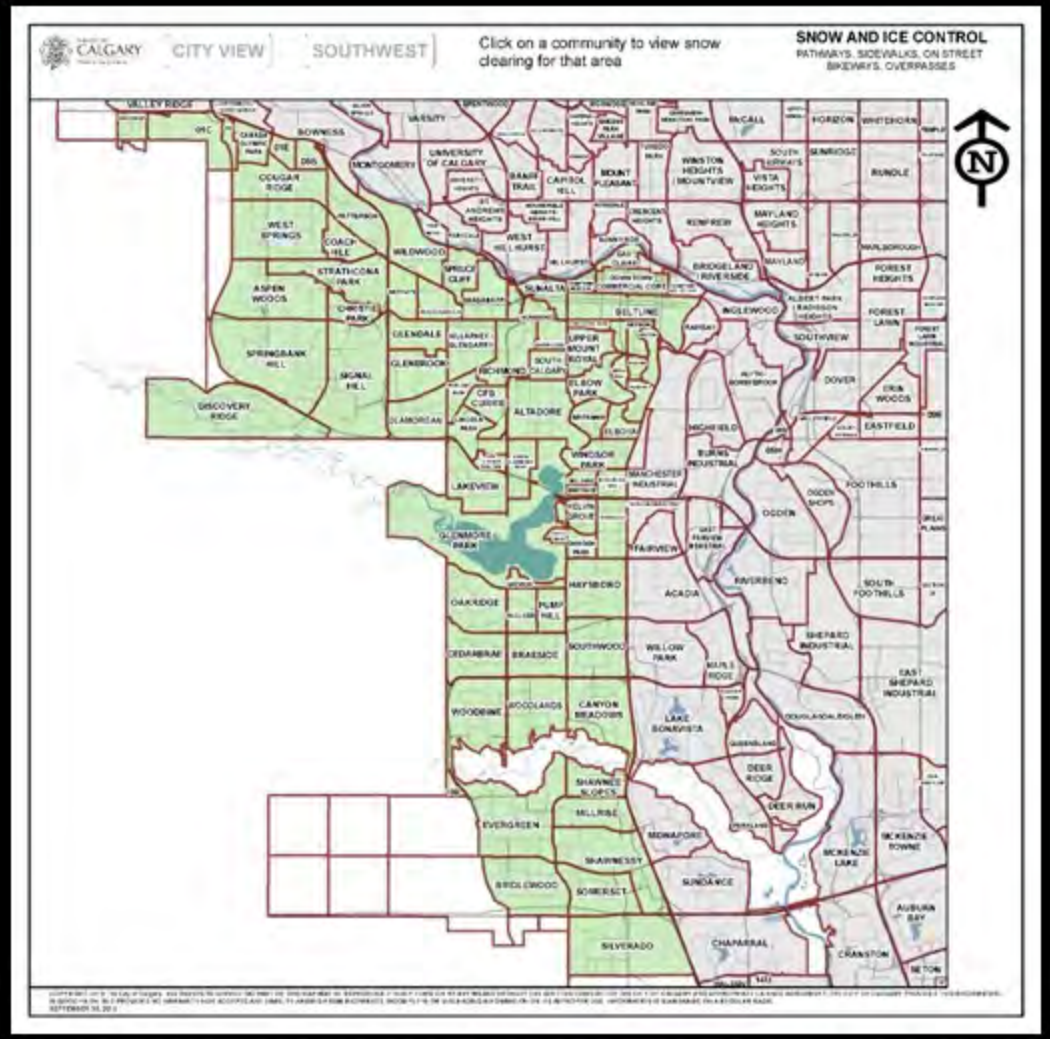
On thin ice — the politics of snow removal

Snow Removal Policy



http://www.calgary.ca/Transportation/Roads/Pages/Road-Maintenance/Snow-and-ice-control/Snow-and-ice-control-program.aspx

Snow Removal Policy

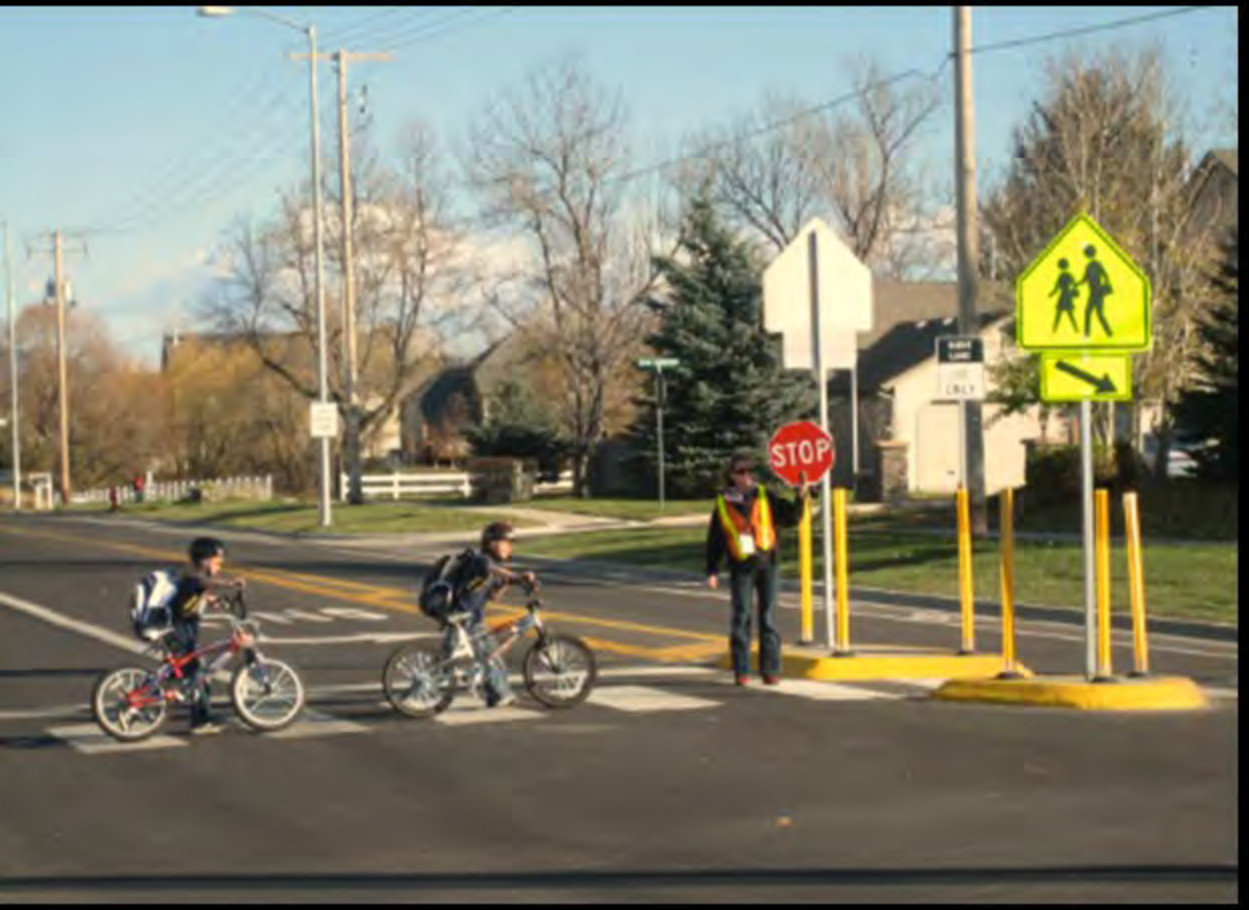


http://www.calgary.ca/Transportation/Roads/Pages/Road-Maintenance/Snow-and-ice-control/Snow-and-ice-control-program.aspx

Snow Removal Policy

- Identify primary routes
- Begin snow clearing after 2” of accumulation
- Schedule operations so that ideal conditions for bicyclists and pedestrians occur between 7am to 7pm with added emphasis on 7-8am and 4-5pm when peak travel times exist

Design Considerations



Questions?

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