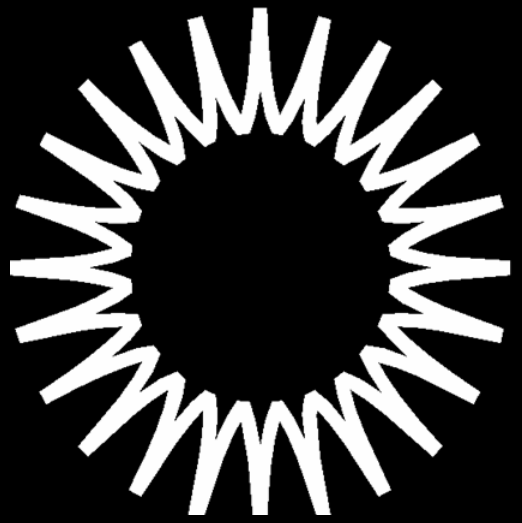
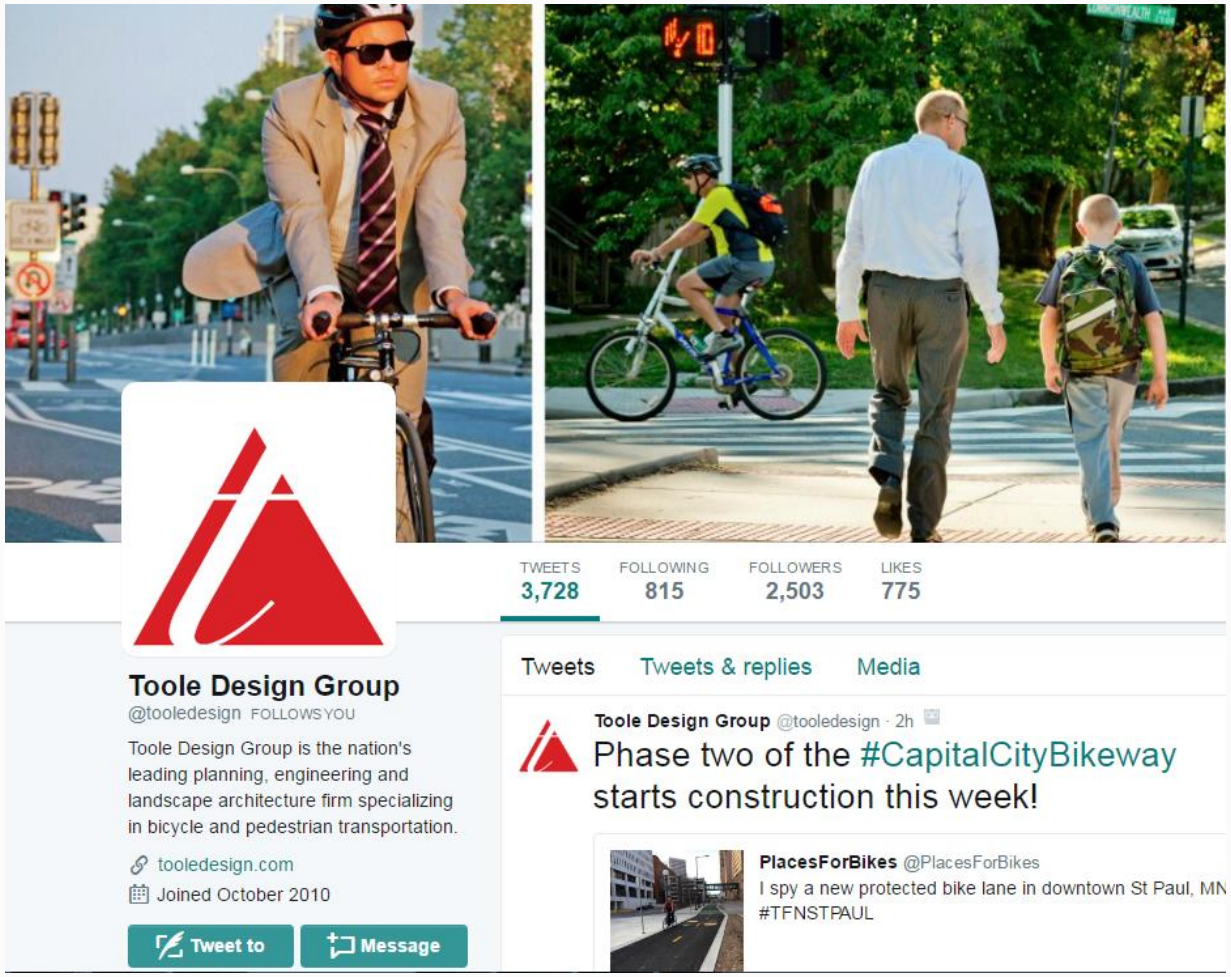


SPUR

Ideas + Action for a Better City

learn more at SPUR.org

tweet about this event:
@SPUR_Urbanist
#BuildingBetterBikeways



@tooledesign

www.tooledesign.com

Bill Schultheiss, P.E.,
Toole Design Group
Vice President

@schlthss

wschultheiss@tooledesign.com
301-927-1900 x106

2018 AASHTO Bike Guide Author

2015 MassDOT Design Guide Author

Designer 300+ miles of streets, trails, & bikeways

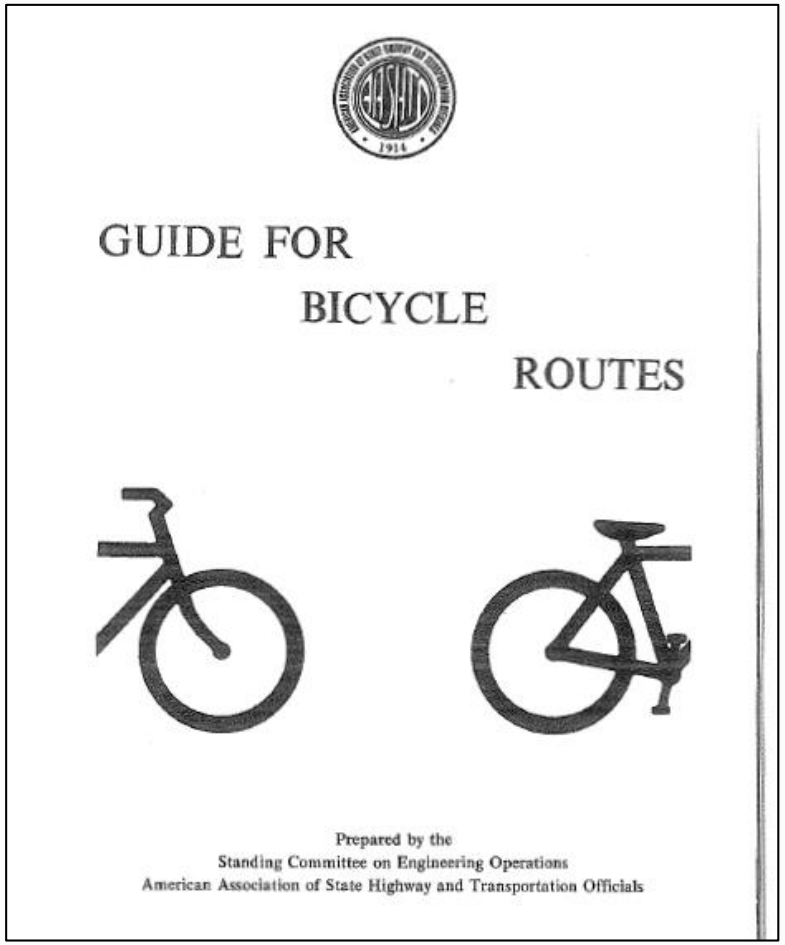
Westlake Protected Bike Lane Design, Seattle

Commonwealth Avenue Protected Bike Lane Design, Boston

Pennsylvania Avenue Bike Lane Design, Washington DC

A long time ago in a galaxy far, far away....

1974 AASHTO Bike Guide



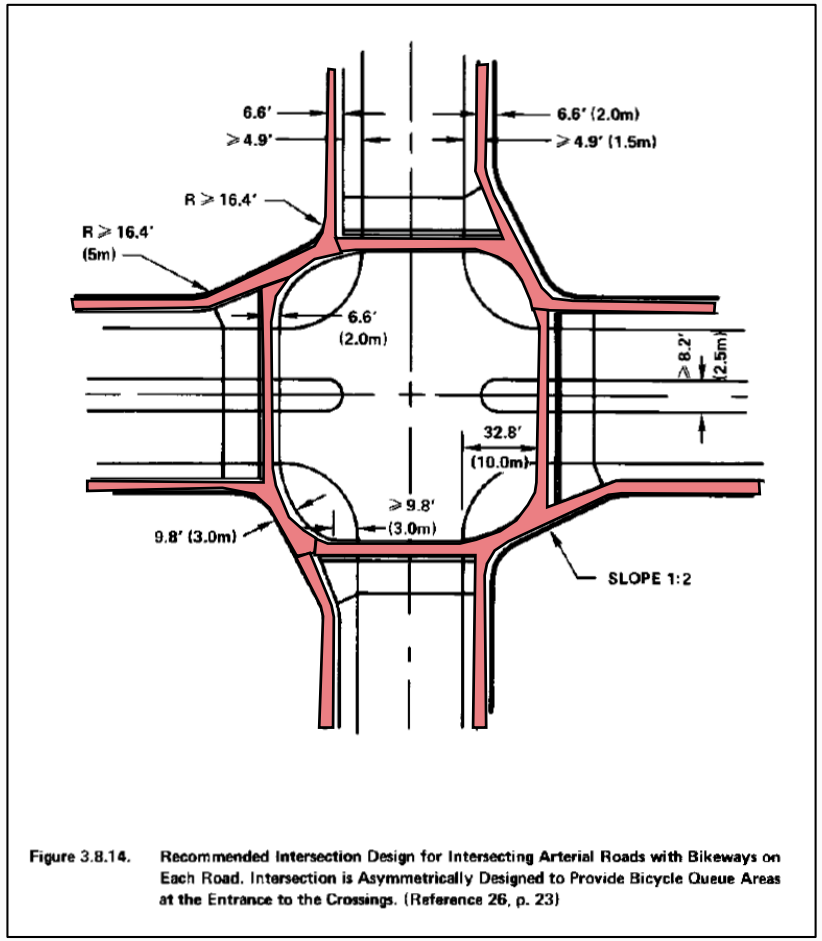


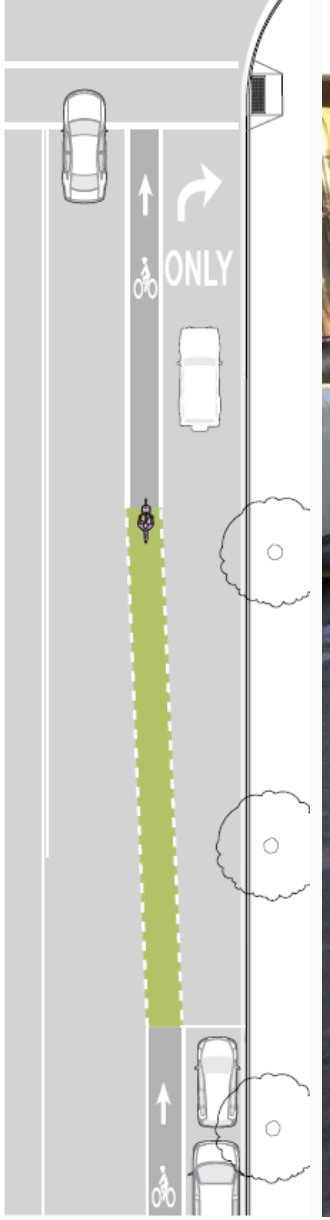
Figure 3.8.14. Recommended Intersection Design for Intersecting Arterial Roads with Bikeways on Each Road. Intersection is Asymmetrically Designed to Provide Bicycle Queue Areas at the Entrance to the Crossings. (Reference 26, p. 23)

Protected Bike Lanes & Intersections

Davis, California 1967

“Vehicular cycling…Is faster and more enjoyable, so that the plain joy of cycling overrides the annoyance of even heavy traffic.” - john forester

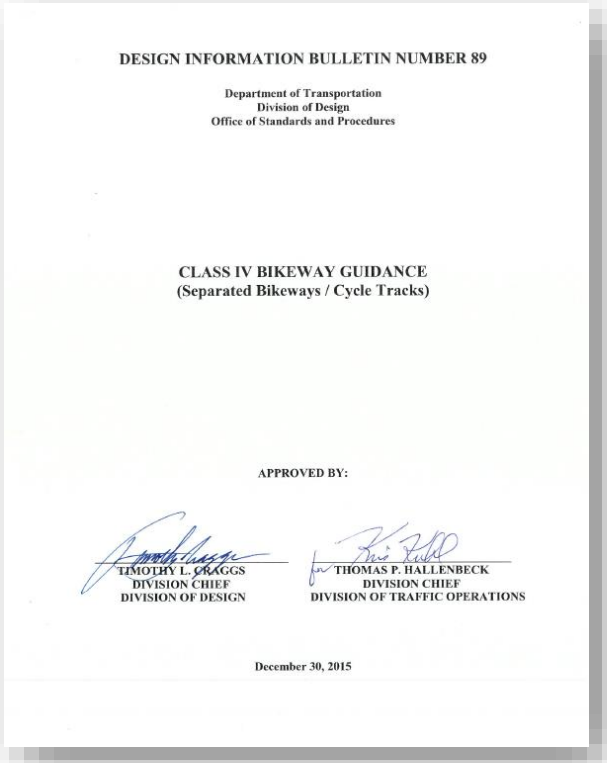
Bike Lanes



Standard Bike Lane Intersections

Washington, DC

State DOT Guidance



DESIGN INFORMATION BULLETIN NUMBER 89

Department of Transportation
Division of Design
Office of Standards and Procedures

CLASS IV BIKEWAY GUIDANCE
(Separated Bikeways / Cycle Tracks)

APPROVED BY:

TIMOTHY L. CRAGGS
DIVISION CHIEF
DIVISION OF DESIGN

for THOMAS P. HALLENBECK
DIVISION CHIEF
DIVISION OF TRAFFIC OPERATIONS

December 30, 2015

Caltrans

MassDOT

MnDOT

Revised AASHTO Chapter Outline

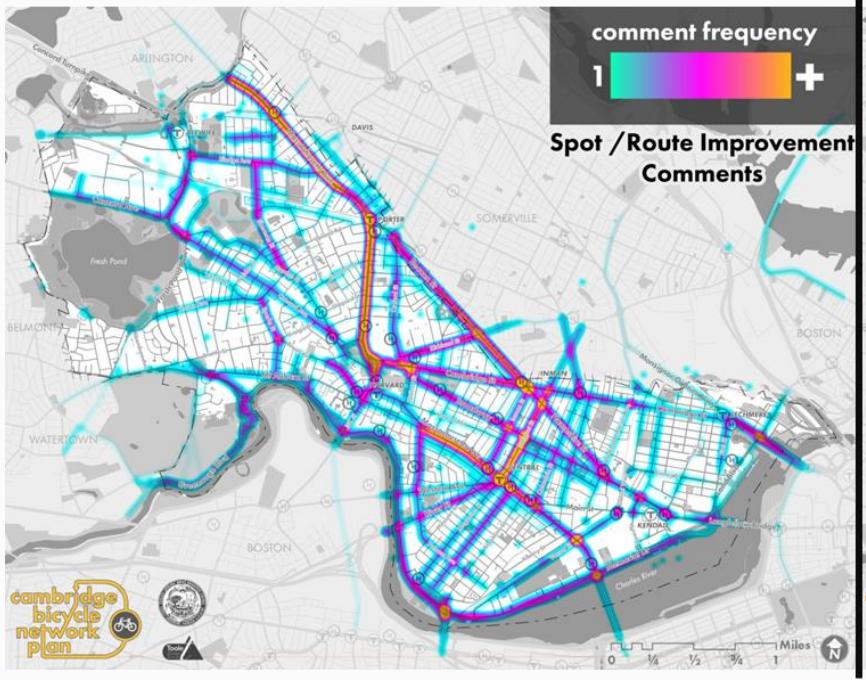
1. Introduction
2. Bicycle Operation & Safety
3. Planning
4. **Facility Selection**
5. **Elements of Design**
6. Shared Use Paths
7. **Separated Bike Lanes**
8. **Bicycle Boulevards**
9. Bike Lanes & Shared Lanes
10. **Traffic Signals and Active Warning Devices**
11. **Roundabouts, Interchanges, and Other Intersections**
12. **Rural Area Bikeways**
13. **Structures**
14. **Wayfinding**
15. Maintenance & Operations
16. Parking & End of Trip Facilities

Chapter 2 - Bicycle Operation & Safety

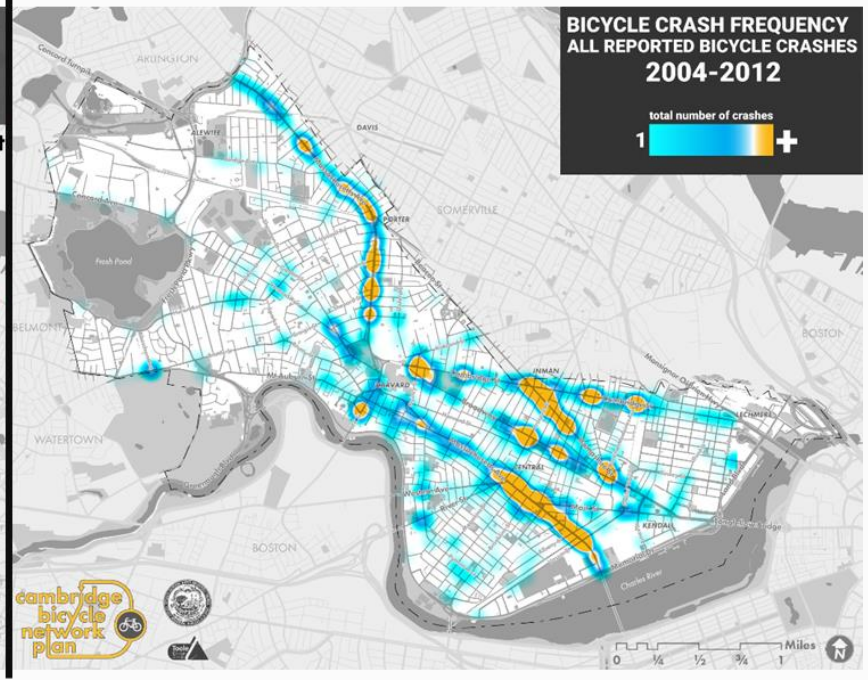
Crashes and Near Crashes

Both crash and near-crash experiences influence perceived bicycling safety and comfort (Lee et al., 2015; Sanders, 2015; Aldred & Crossweller, 2015)

perceptions



reported crashes



Chapter 2 - Bicycle Operation & Safety
Preferred Design User for AASHTO Guide

4 - 7%

Experienced & Confident Cyclist

AASHTO 2012

51 - 56%

Interested but Concerned Cyclist

AASHTO 2018

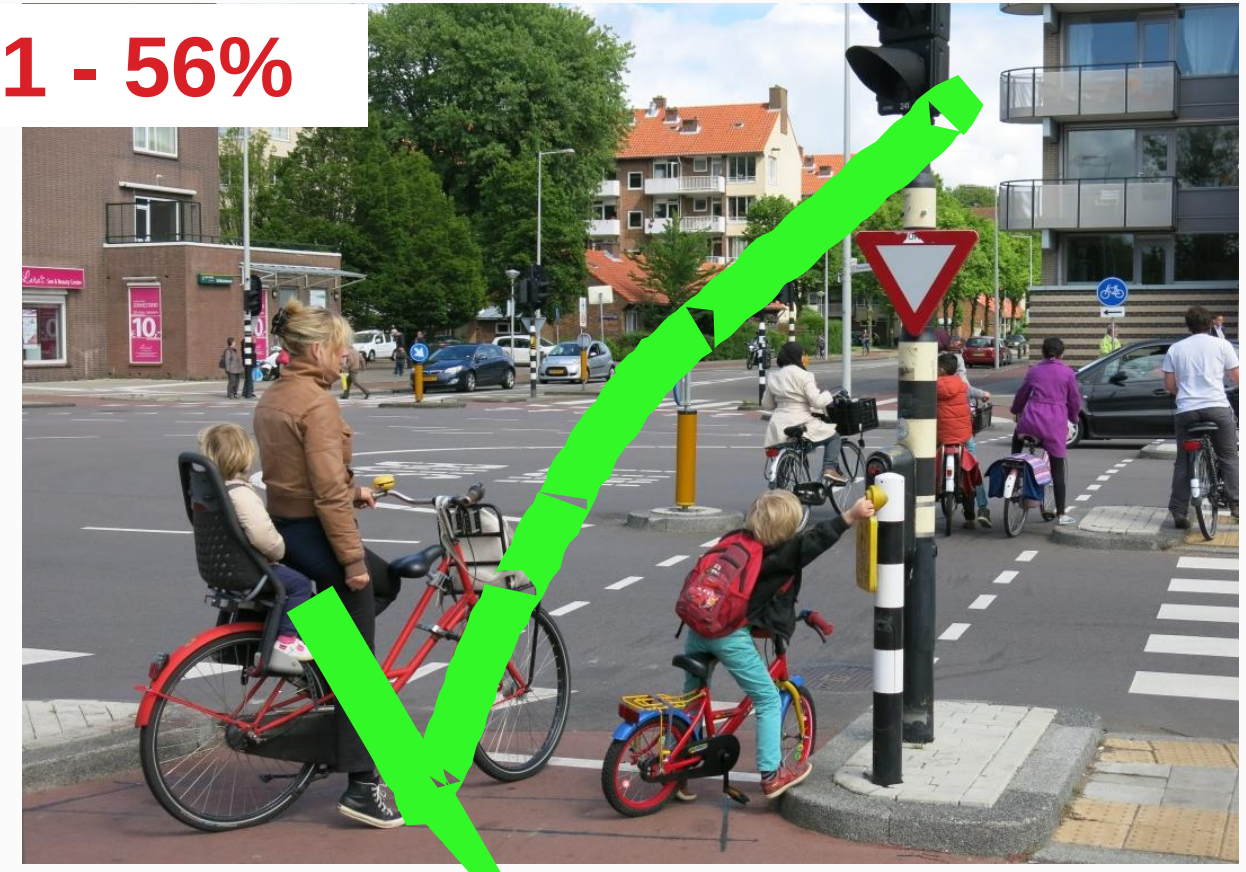
Chapter 2 - Bicycle Operation & Safety
Preferred Design User for AASHTO Guide

4 - 7%

Experienced & Confident Cyclist

AASHTO 2012

51 - 56%



Interested but Concerned Cyclist

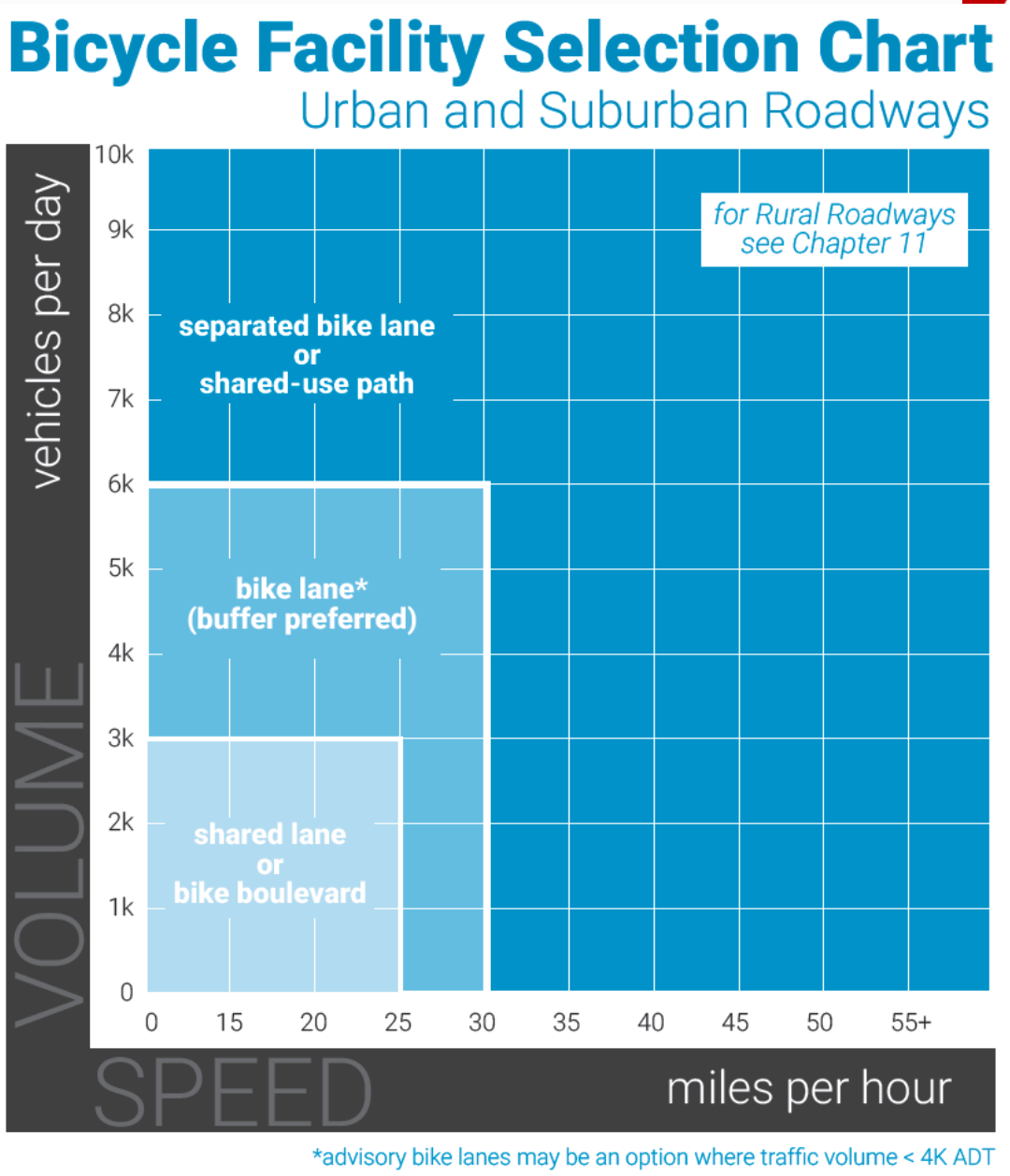
AASHTO 2018

Chapter 4 – Facility Selection
AASHTO 2018

Shared Lanes
- Max volume = 3,000 ADT
- Max speed = 25 mph

Bike Lanes
- Max volume = 6,000 ADT
- Max speed = 30 mph

Separated Bike Lanes
- More than 6,000 ADT
- Speed over 30 mph



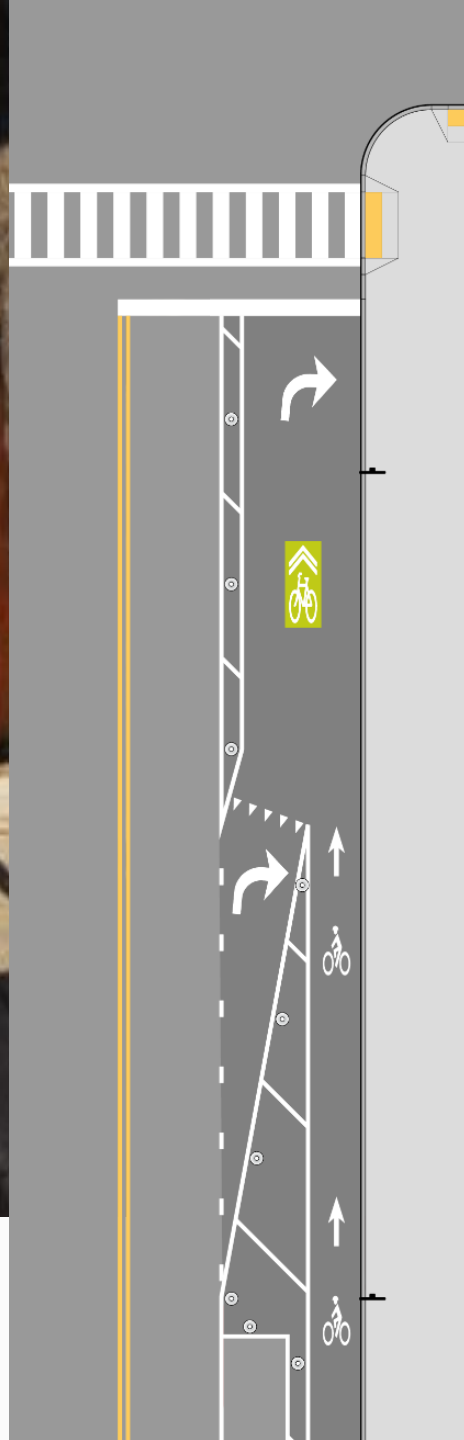
Chapter 2 – Bicycle Operation
SBL Safety Research Summary

Reduced injury risk compared to shared lanes (Lusk et al., 2013; Lusk et al., 2011; NYCDOT, 2014; Winters et al., 2013)

SBL preferred over striped or shared lanes by both cyclists and motorists
(Monsere et al., 2014; Monsere et al., 2012; Sanders, 2014)

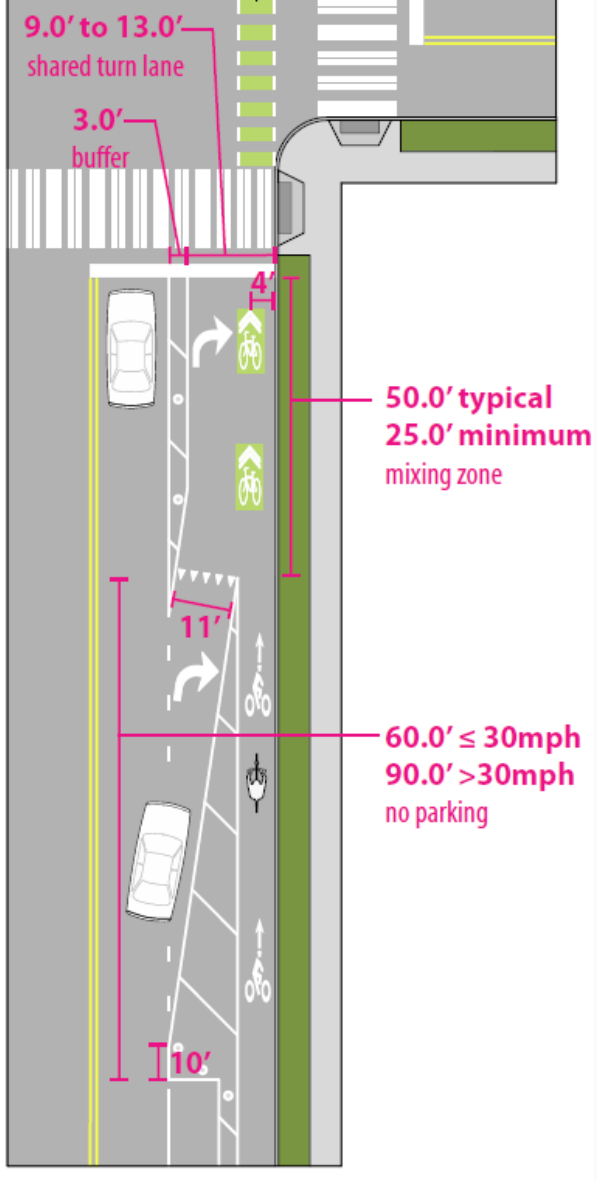
One-way generally safer than two-way
(Schepers et al., 2011; Thomas & DeRobertis, 2013)

Two-way SBLs on one-way roads, preferable on right side
(Schepers et al., 2011; Zangenehpour et al., 2015)



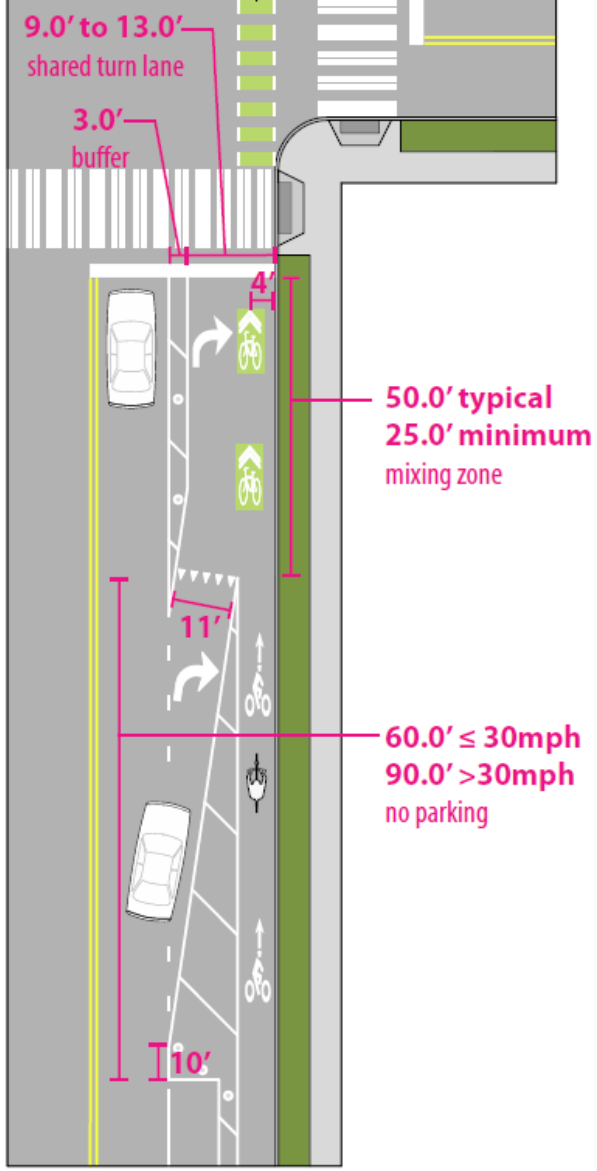
Mixing Zones – Shared Right Turn Lanes

New York City – Photo NACTO



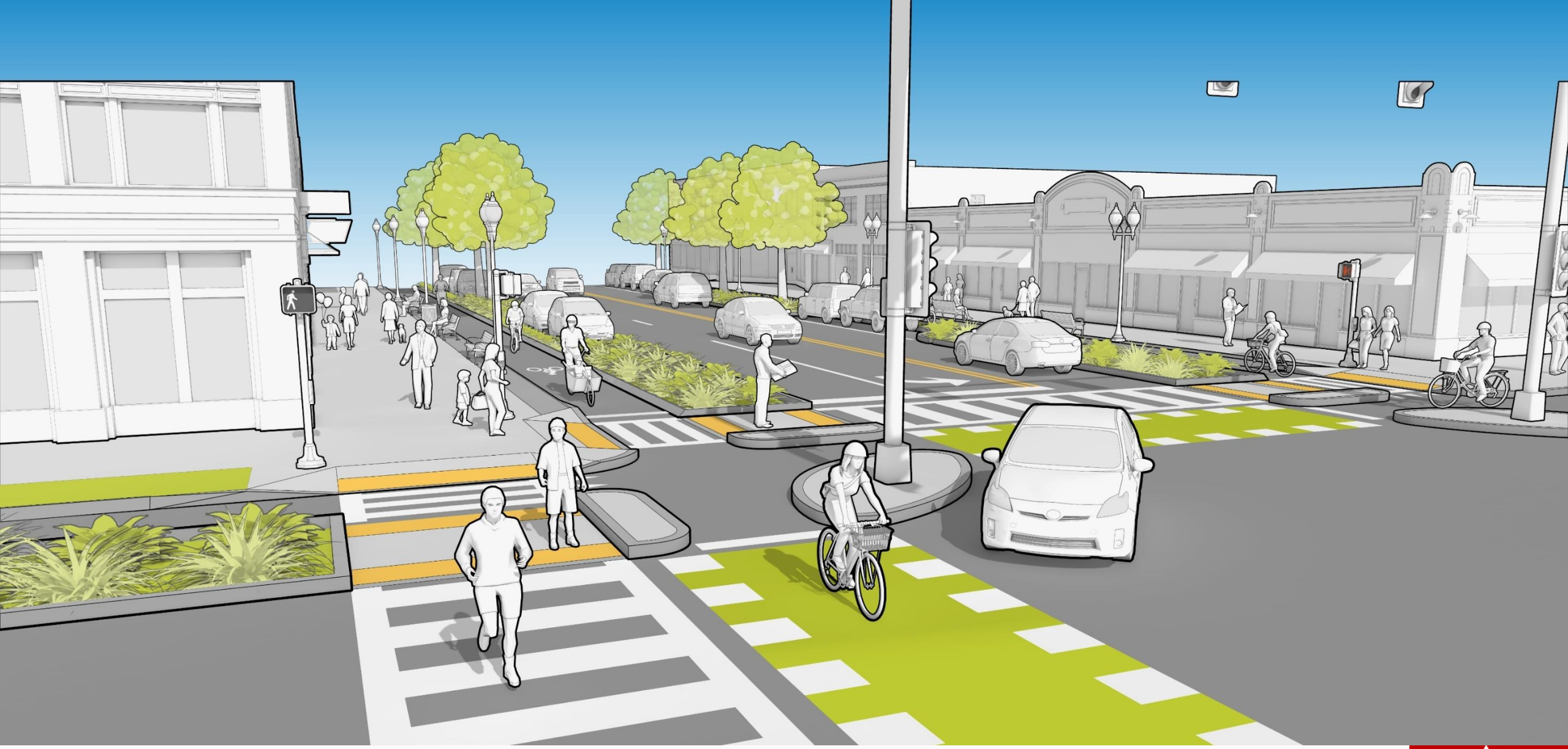
Mixing Zone Intersection Shared Space Option

New York City Video Courtesy of Jonathon Fertig - @rightlegpegged



Mixing Zone Intersection Shared Space Option

New York City



Protected Intersections

MassDOT Separated Bike Lane Guide

Visibility at Conflict Points

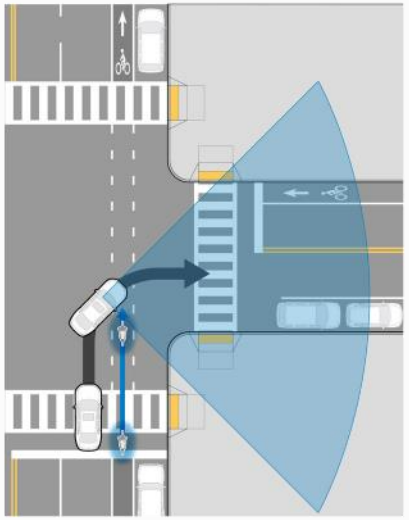
protected intersection

photo source: Jonathan Maus

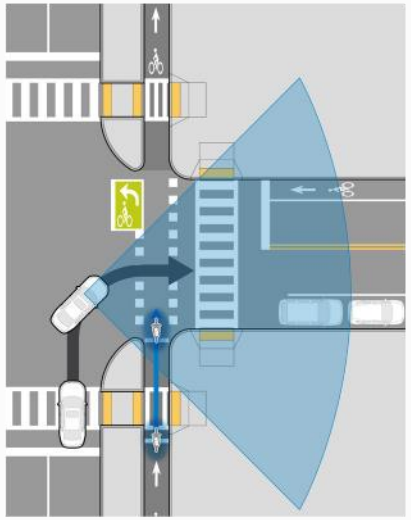
conventional bike lane

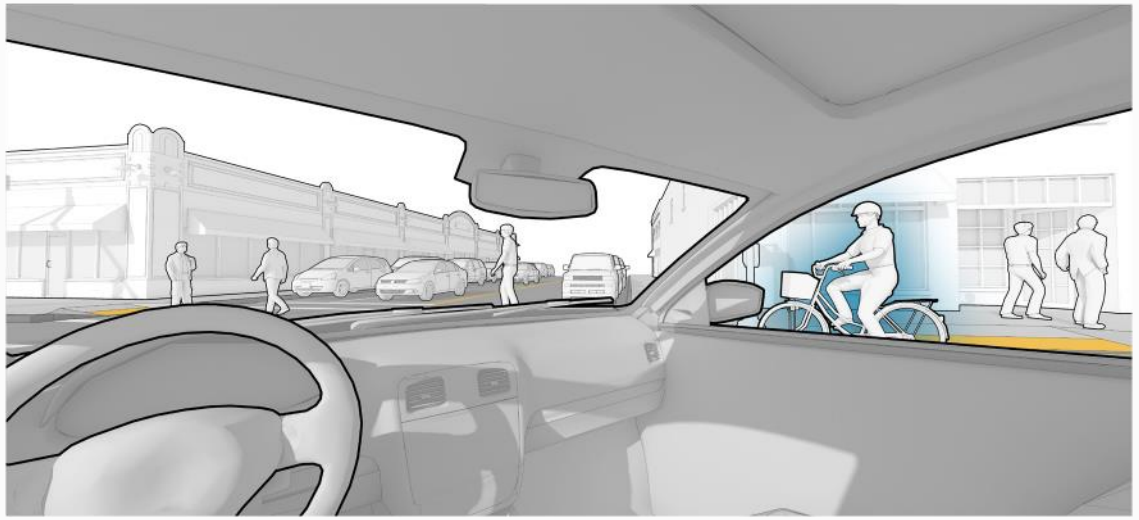
Visibility at Conflict Points

motorist's view at **conventional bike lane**

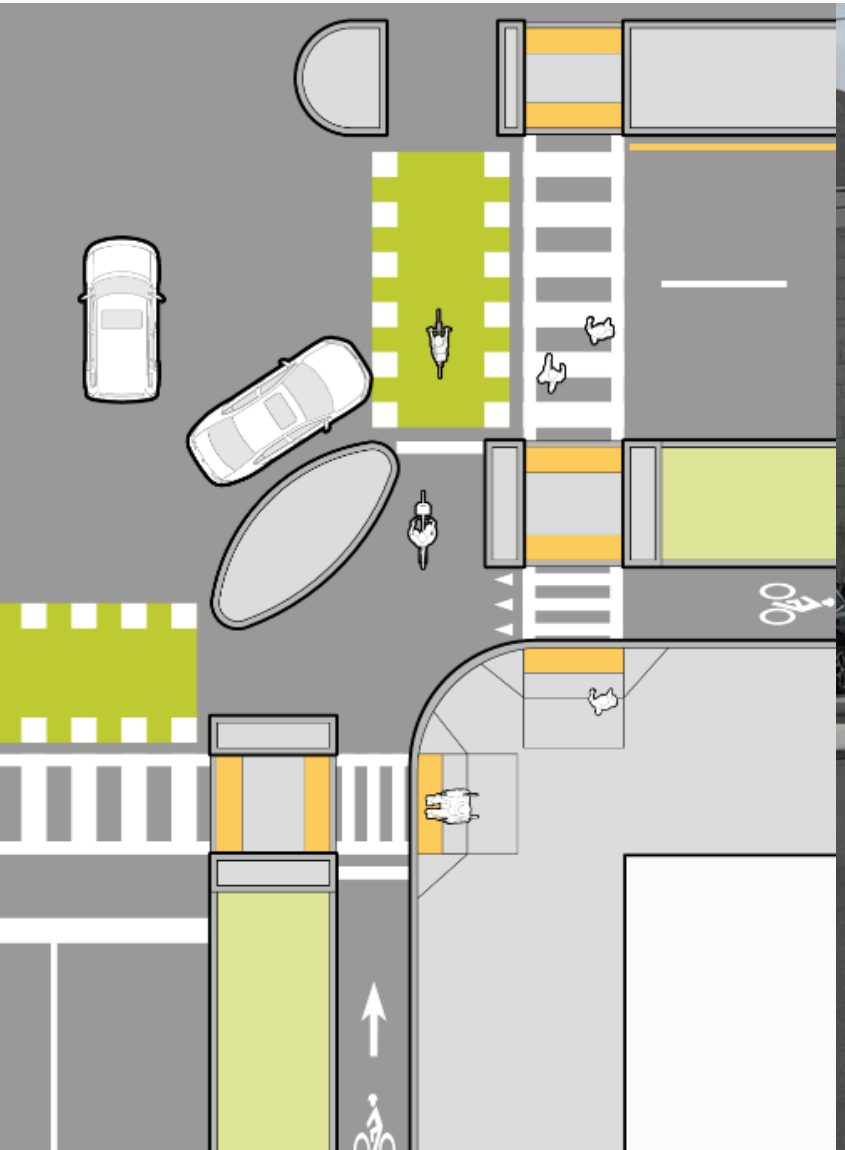


motorist's view at **separated bike lane**





Protected Intersection




TURNING
VEHICLES
TO
300 S
Sheraton
DOWNTOWNSLC.ORG

Protected Intersections in the US

Salt Lake City, UT

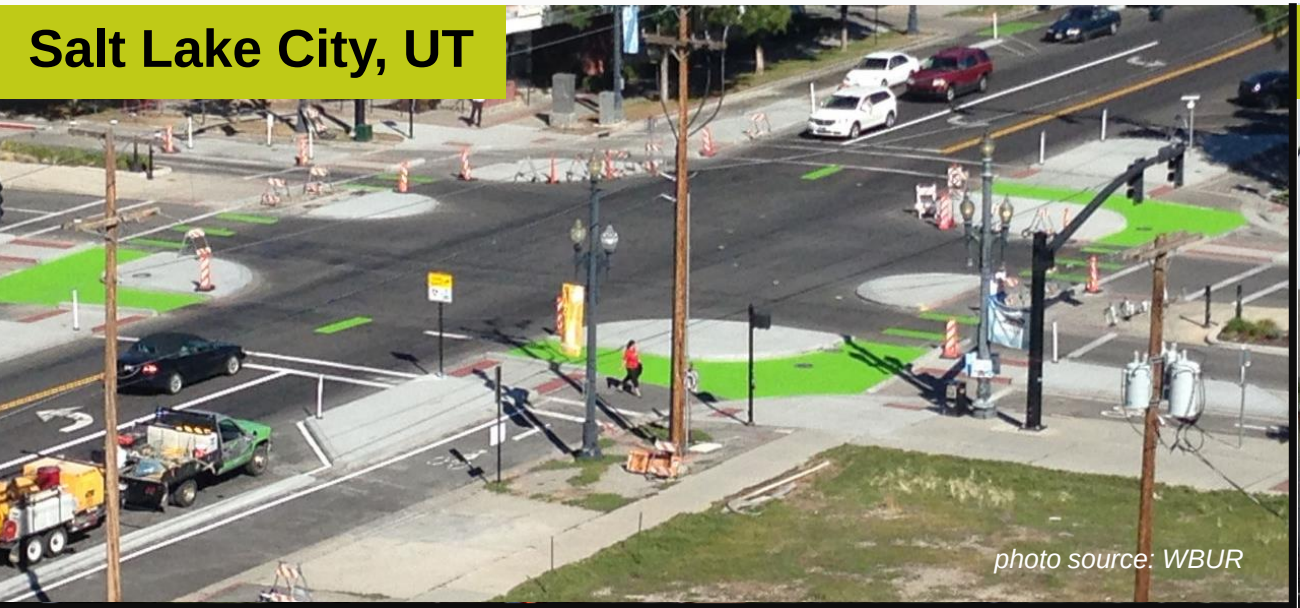


photo source: WBUR

Davis, CA

photo source: People for Bikes

Austin, TX

Accessibility Needs

Access

Warning

Guidance

Aids and techniques for obstacle and curb detection – White Cane

Support Cane

- Heavy
- Not for exploring surfaces

Probing Cane

- Lightweight
- Explores walking surface
- Identification

Only 2 - 8% of vision impaired people use white canes

Accessible Signals

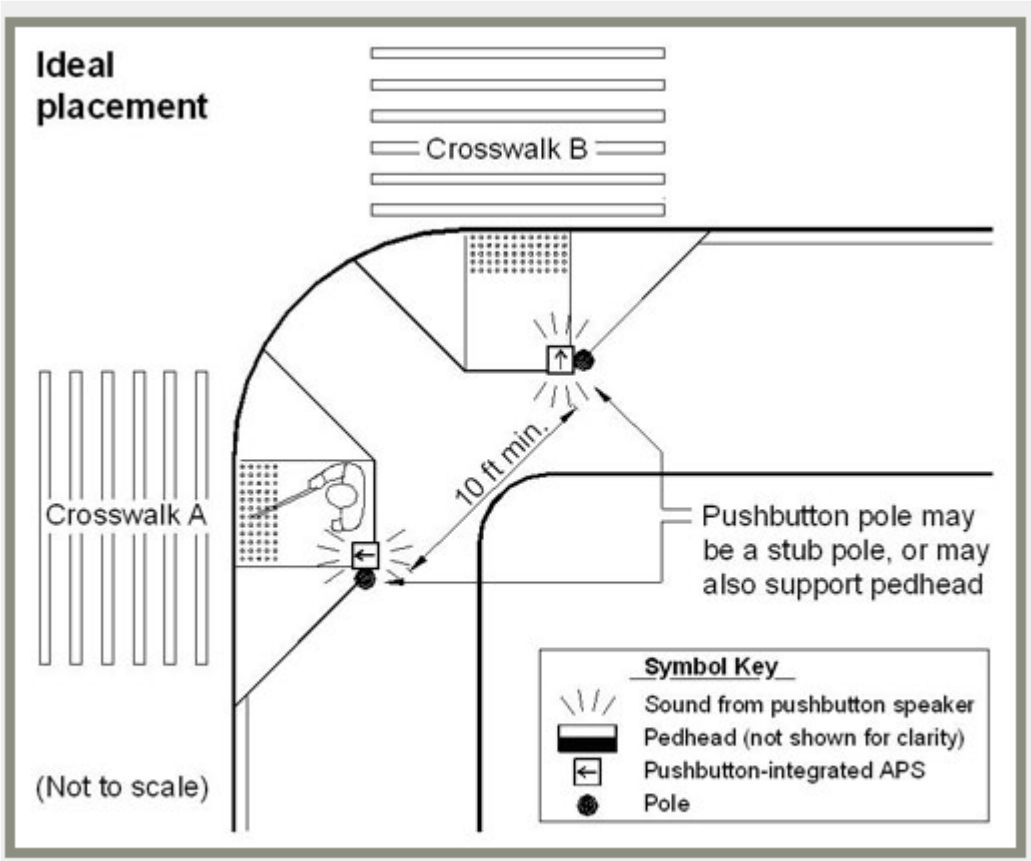
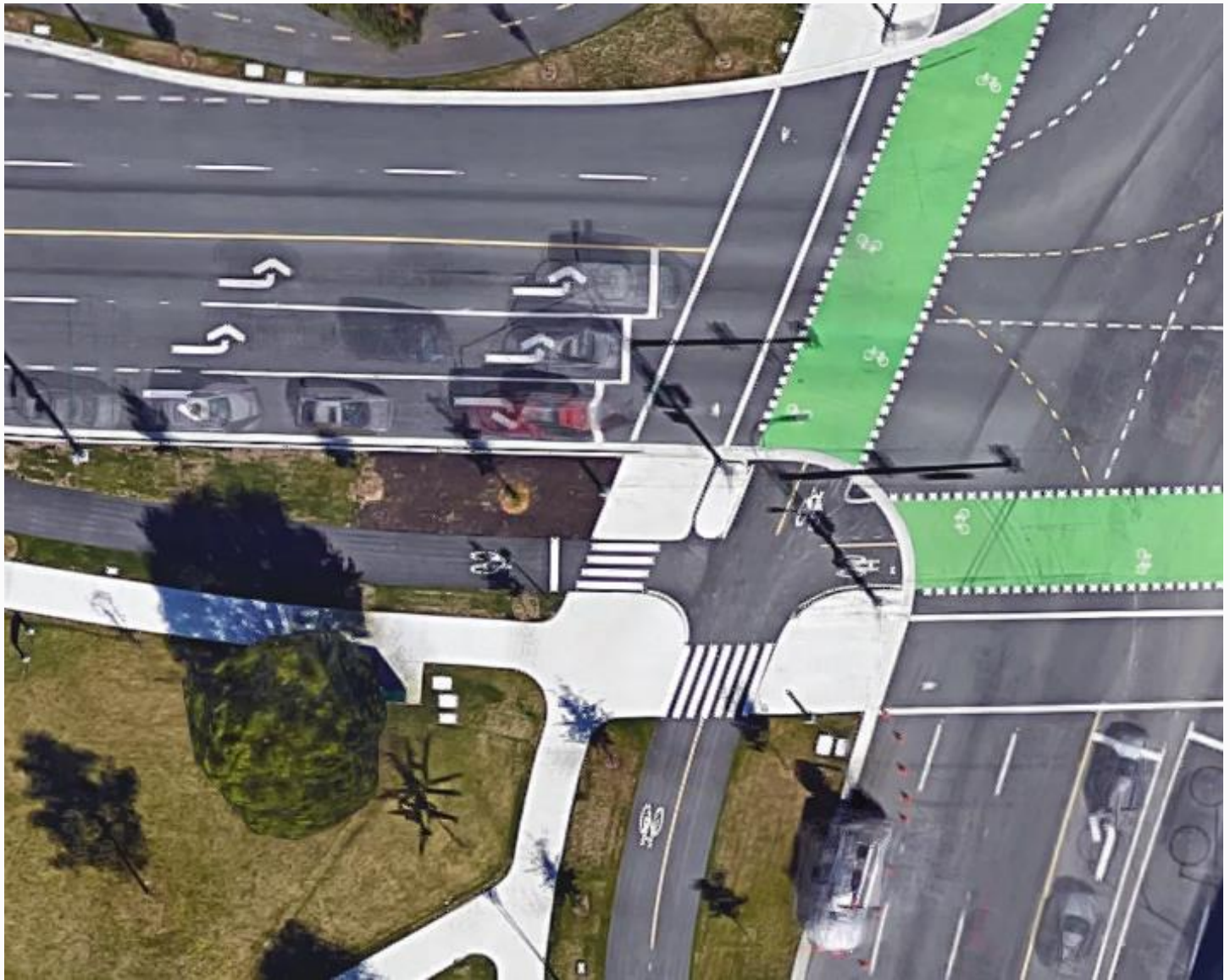


Figure 6-1. Optimal location of pushbutton-integrated APS (two pushbuttons on one corner, mounted on two separated poles " rapid tick WALK indication)

Protected Intersections
Accessible Signals



Directionality Guidance and Warning

European Standard

Detectable Warnings and Green Surface

Moody Street – Portland, OR

Detectable Warnings, Guide Strip and Crosswalks

Westlake – Seattle, WA

Detectable Warnings, Guide Strip and Crosswalks

Westlake – Seattle, WA

Sidewalk-level Bike Lane with Domed Vertical Element (Cambridge, MA)

Detectable Vertical Elements

Western Avenue – Cambridge, MA

Intermediate Level, Curb Separated

Mercer Street - Seattle, WA

Sloped Curb Design

- Can’t cause wheelchair user to fall out of chair
- Needs to serve as detectable edge
- Can’t be trip hazard to people walking

Thank You

Bill Schultheiss, PE
Vice President

wschultheiss@tooledesign.com

@tooledesign

@schlthss

Brooke Dubose, PE
Regional Office Director, Berkeley

bdubose@tooledesign.com

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Implementing Better Bikeways

SPUR * Oakland * 09.19.17

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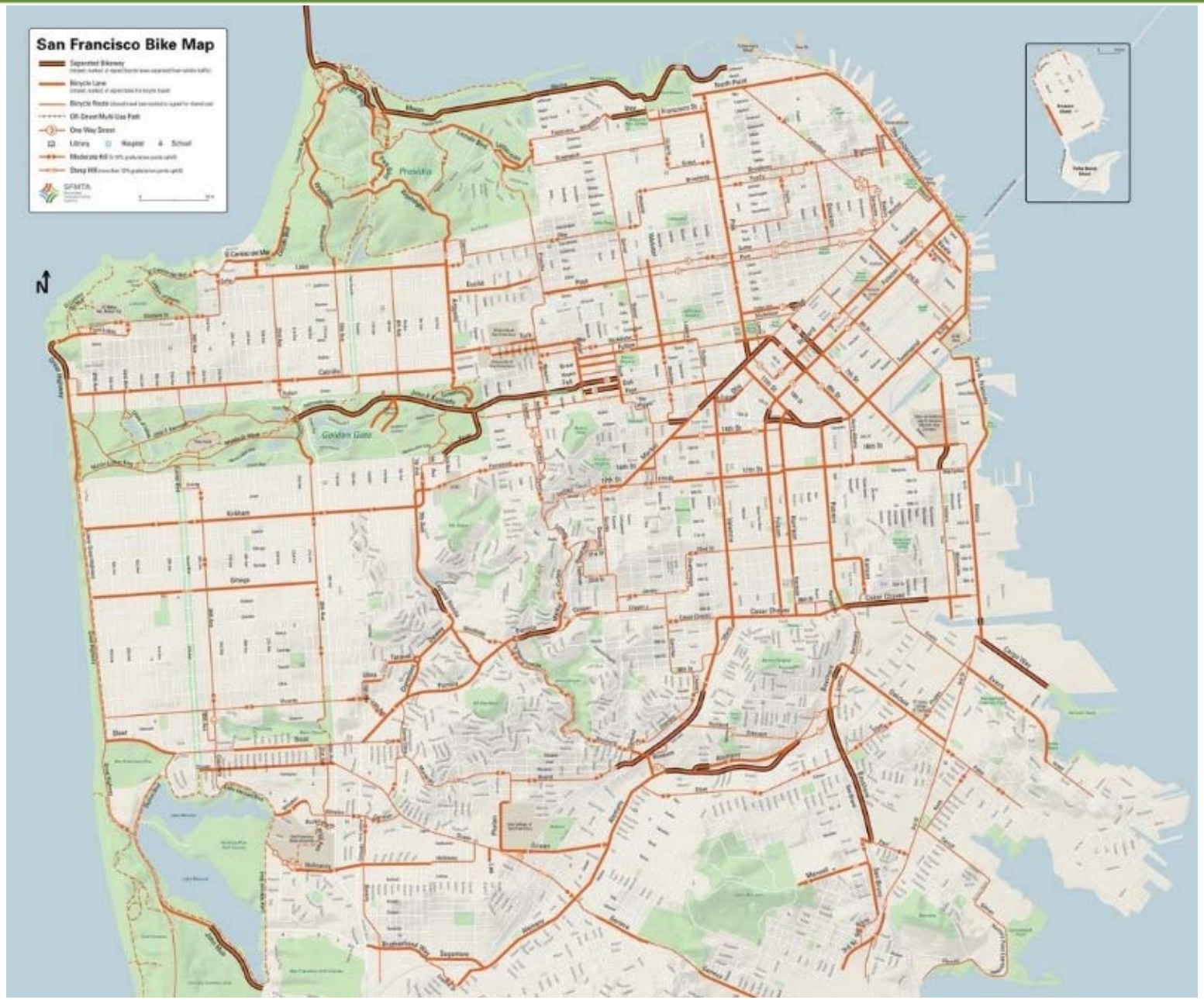
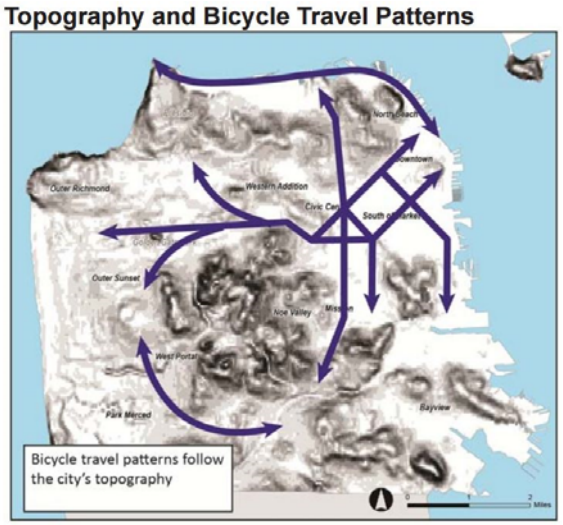
SF Bike Route Network - 2017



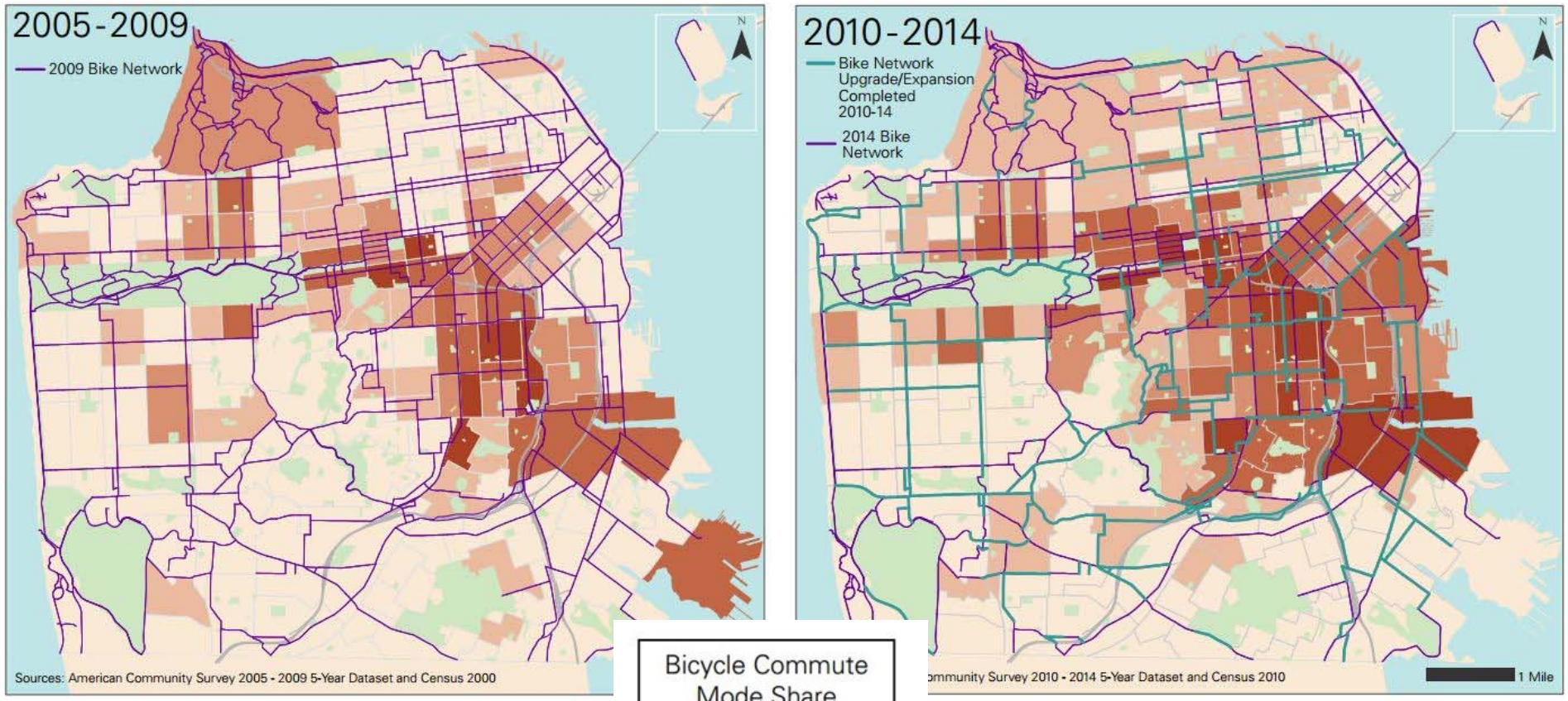
Flat Routes through a Hilly City

Streets shown in black are 5% or less



Rates of Cycling to Work by Census Tract

Bike Commute Mode Share 2005 – 2014

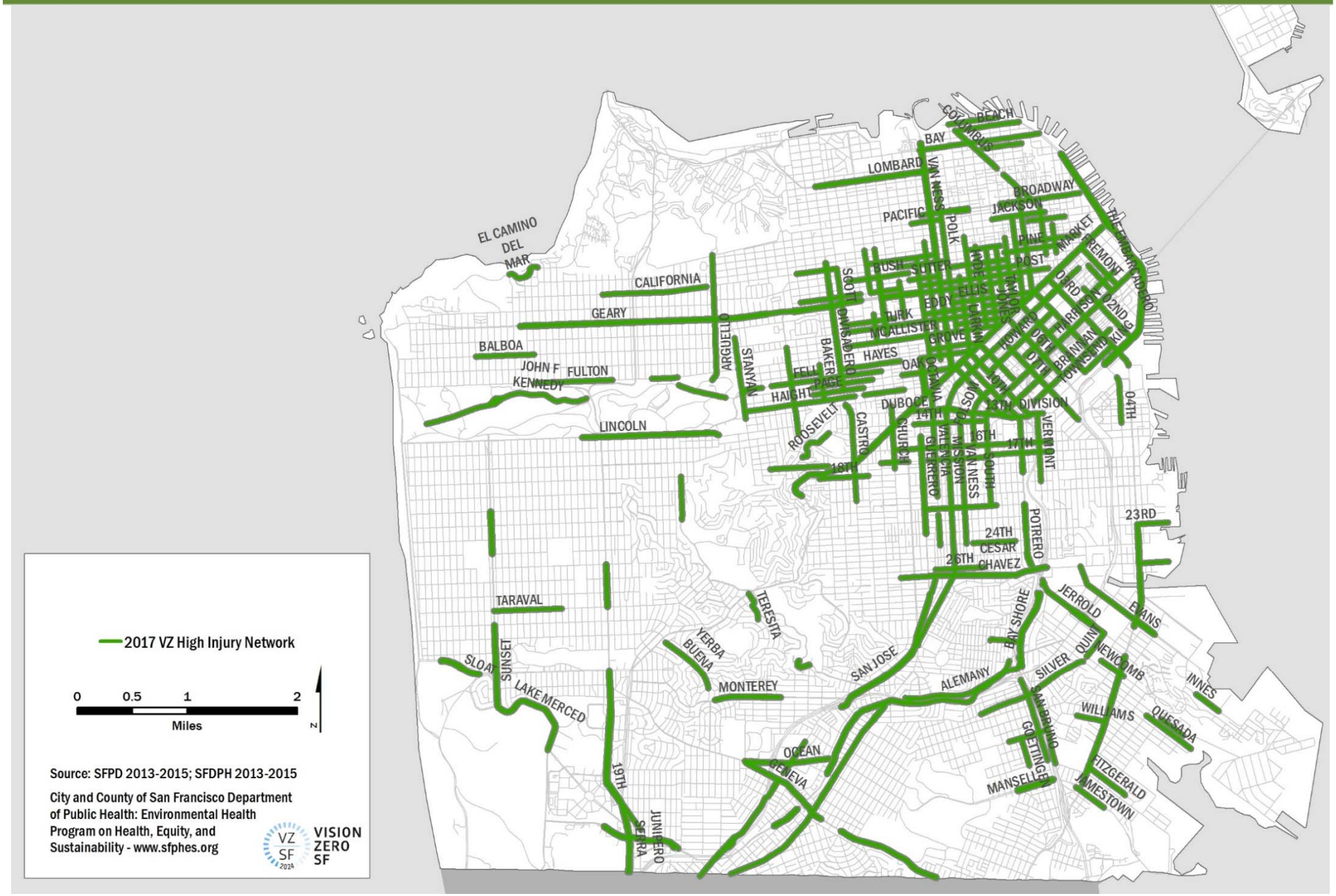


Annual Bicycle Count Report 2015

3.9% of trips to work by bike (2016)

Biking has surged across the city, with many neighborhoods exceeding a 10% bike commute mode share.

Concentration of Crashes



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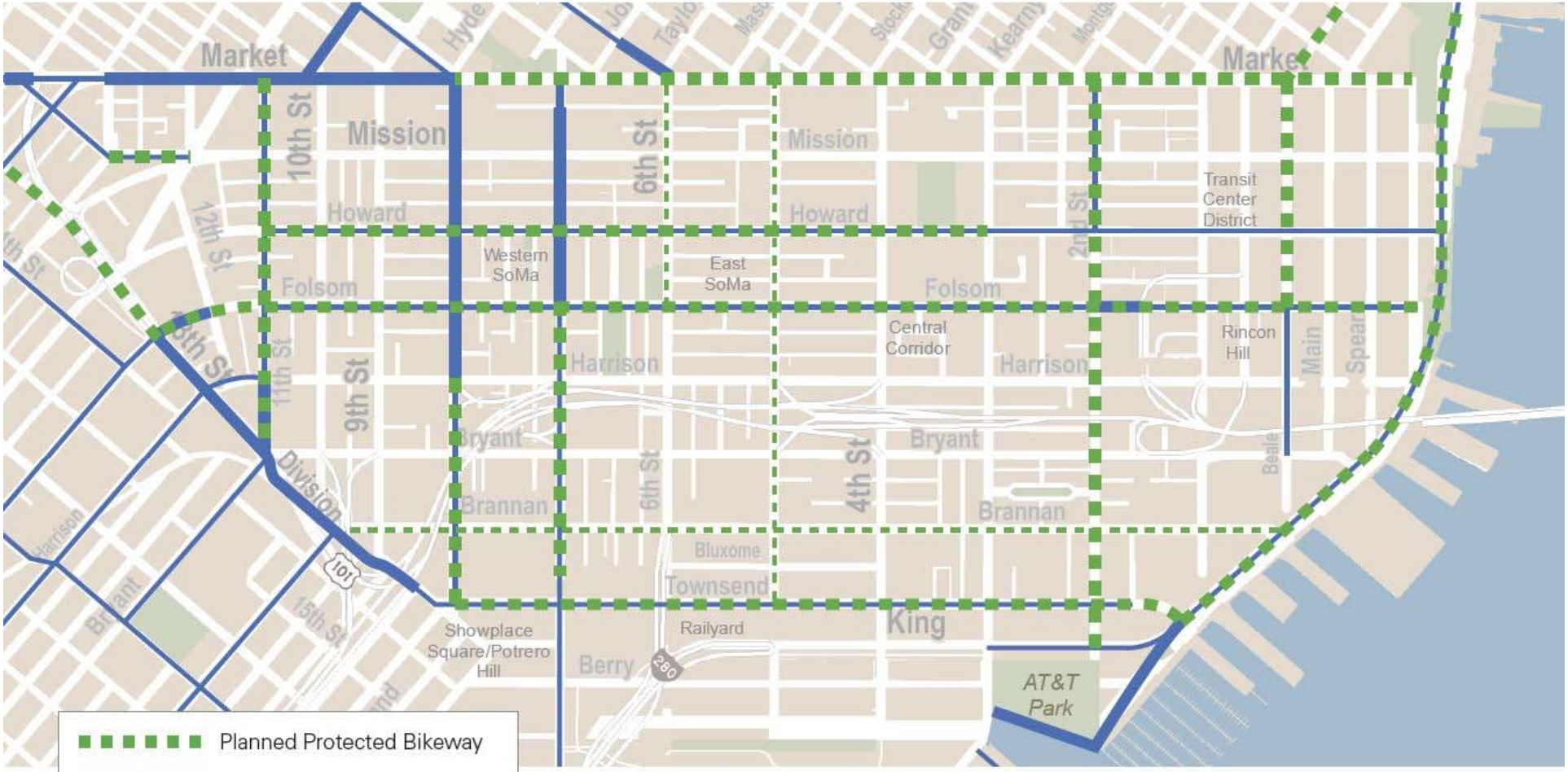
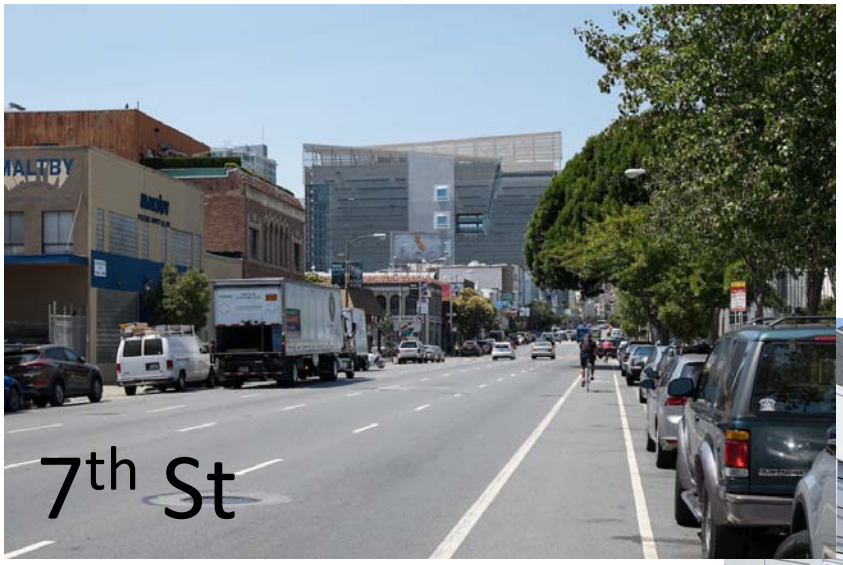
South of Market Bikeways



7th and 8th St: Before



Typical of streets in South of Market

8th St

~250 cyclists/ peak hour

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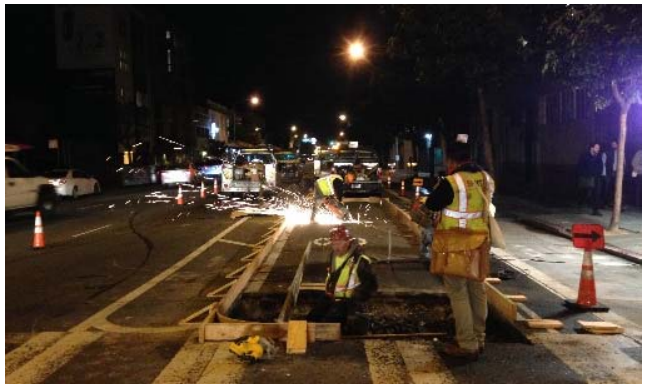
7th Street - After

Completion in Months Rather than Years

- Identify Processes that can be Overlapped
- Strong Foundation to Start Work
- Supporting Policies and Directives
- Intermediate Design Elements
- Regular Check-Ins and Meetings
- Smart Public Outreach
- Impermanence of Design
- Effective Use of In-House Resources for Construction



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Impermanence of Design

Lower Cost and
Easy to Adjust
if Needed

Transit Stop Challenges on Bike Routes

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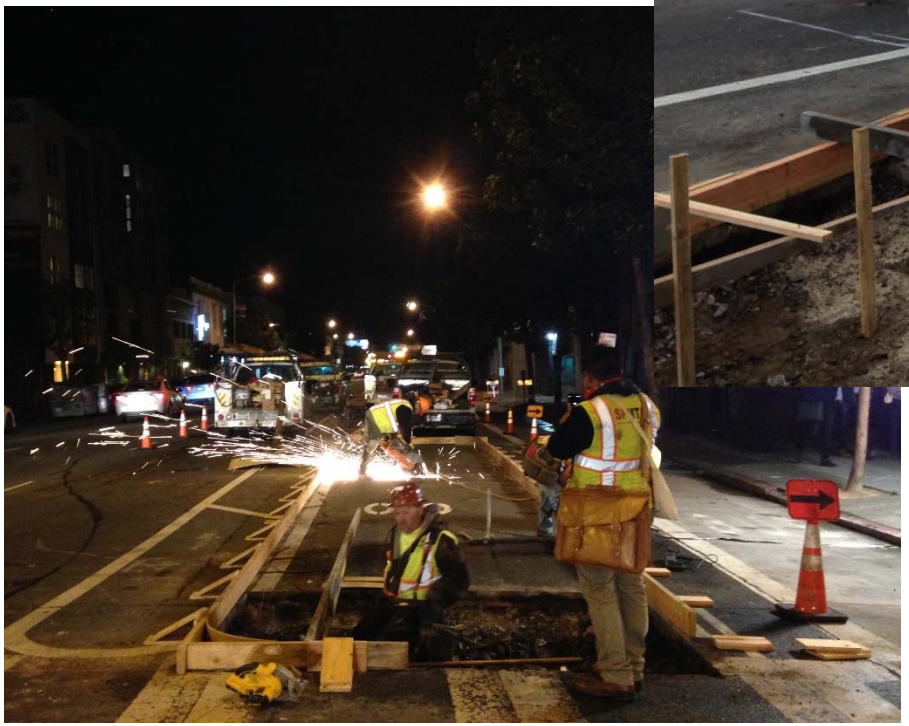
Bus-Bike Conflict Removed

Low Cost, Quick, Effective Construction

Transit Boarding Islands



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Transit Boarding Island

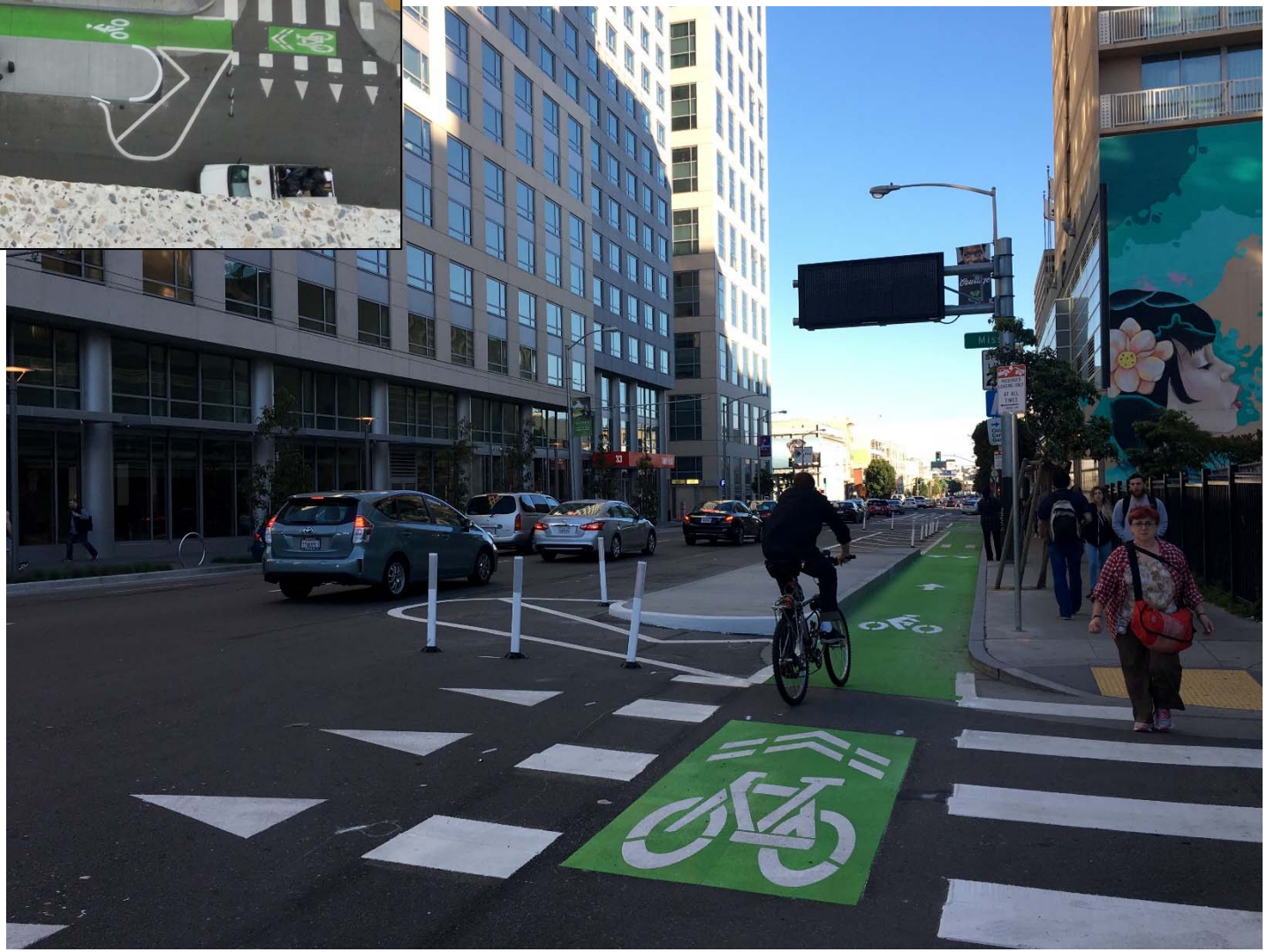
One weekend to construct
~$60,000/island

Navigation Bars for Sight Impaired

Bikeways at Bus Boarding Islands

Approx a dozen built or under construction with more to come

Markings and Signs at Alleys



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Typical Bikeway Intersection Designs

Dashed Bike Lane

Right turning vehicles enter bike lane prior to turn

Typical bike lane treatment, especially where turn volumes are lower

Confusion among drivers and cyclists about correct use

Through Bike Lane

Right turning vehicles have own lane and must merge across bike lane

Typical treatment where RT volumes are higher

Parking removal needed, truck/bus turns from curb lane can be problematic

Combined Turn Lane

Right turns and through bikes share same lane

Cyclists positioned to left or middle of lane to discourage "right hook" collisions

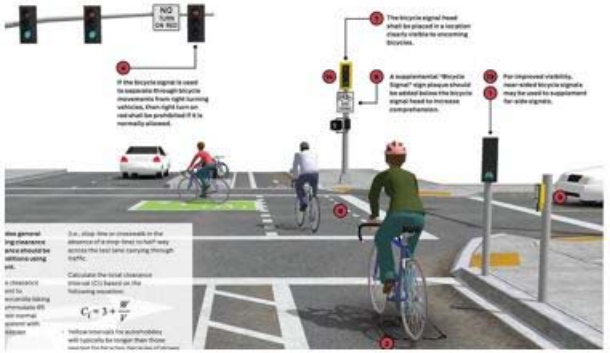
Bikes/vehicles generally expected to be single file

Mixing Zone

Similar to combined turn lane but entry for motorists into lane delineated more specifically and with yield triangles/teeth

Motorists and cyclists expected to be single file, but can be challenging to achieve given angles of entry

Many markings in a small space



Signal Separation

Through bikes have separate phase from turning vehicles

Higher level of protection but results in additional delay/less green time for people on bikes

Requires signal modification which can be costly

Design works best with a right turn lane for motorists

"Dutch-style" Intersection

Consists of "crossbikes" alongside crosswalks, requires turning motorists to yield at crossbike/walk

Island in intersection adds protection for cyclists but must be designed for truck turns

Promising design for cycletracks that have wide separation or parking protection to get proper 16' setback of bike+ped crossing in intersection

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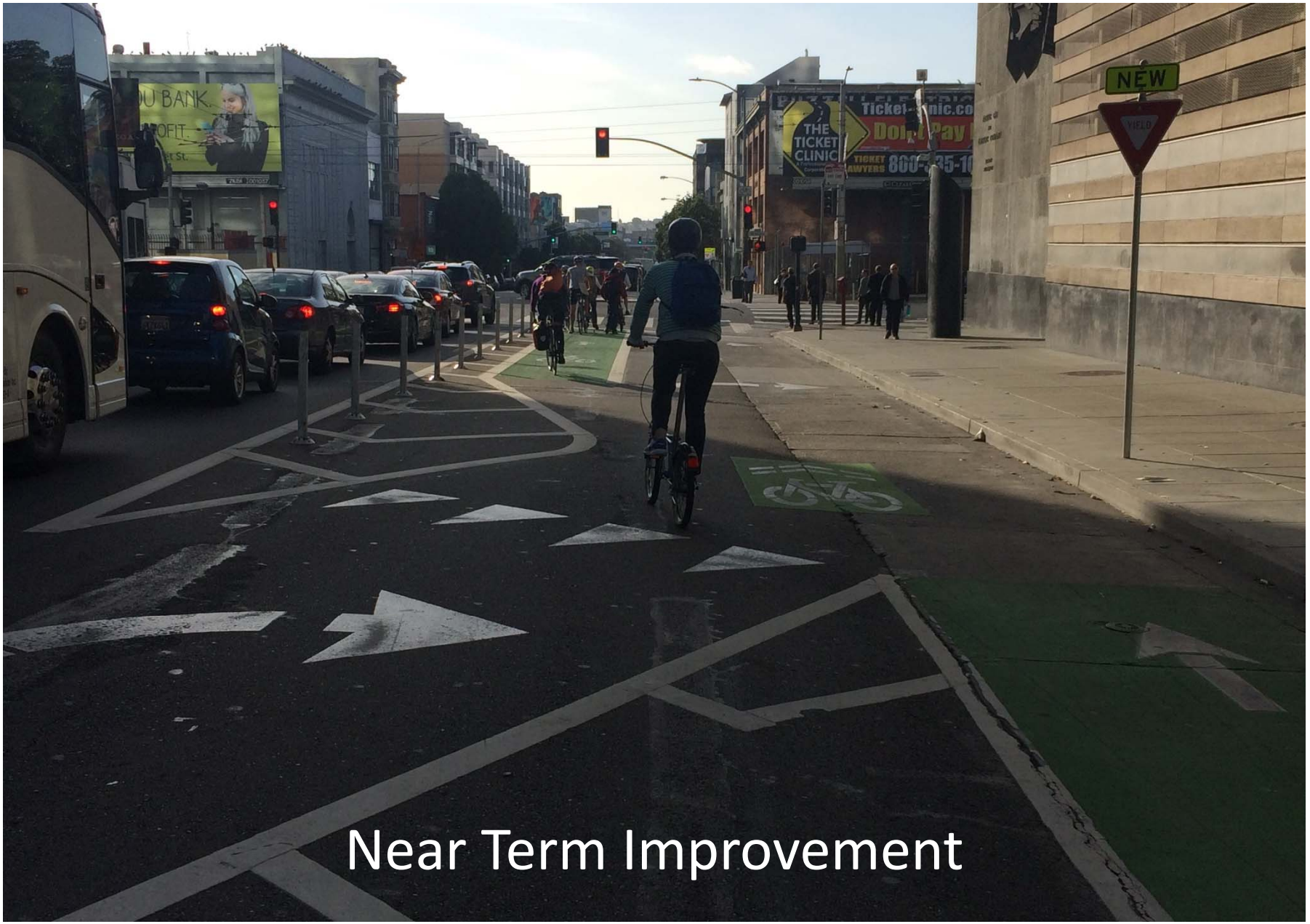
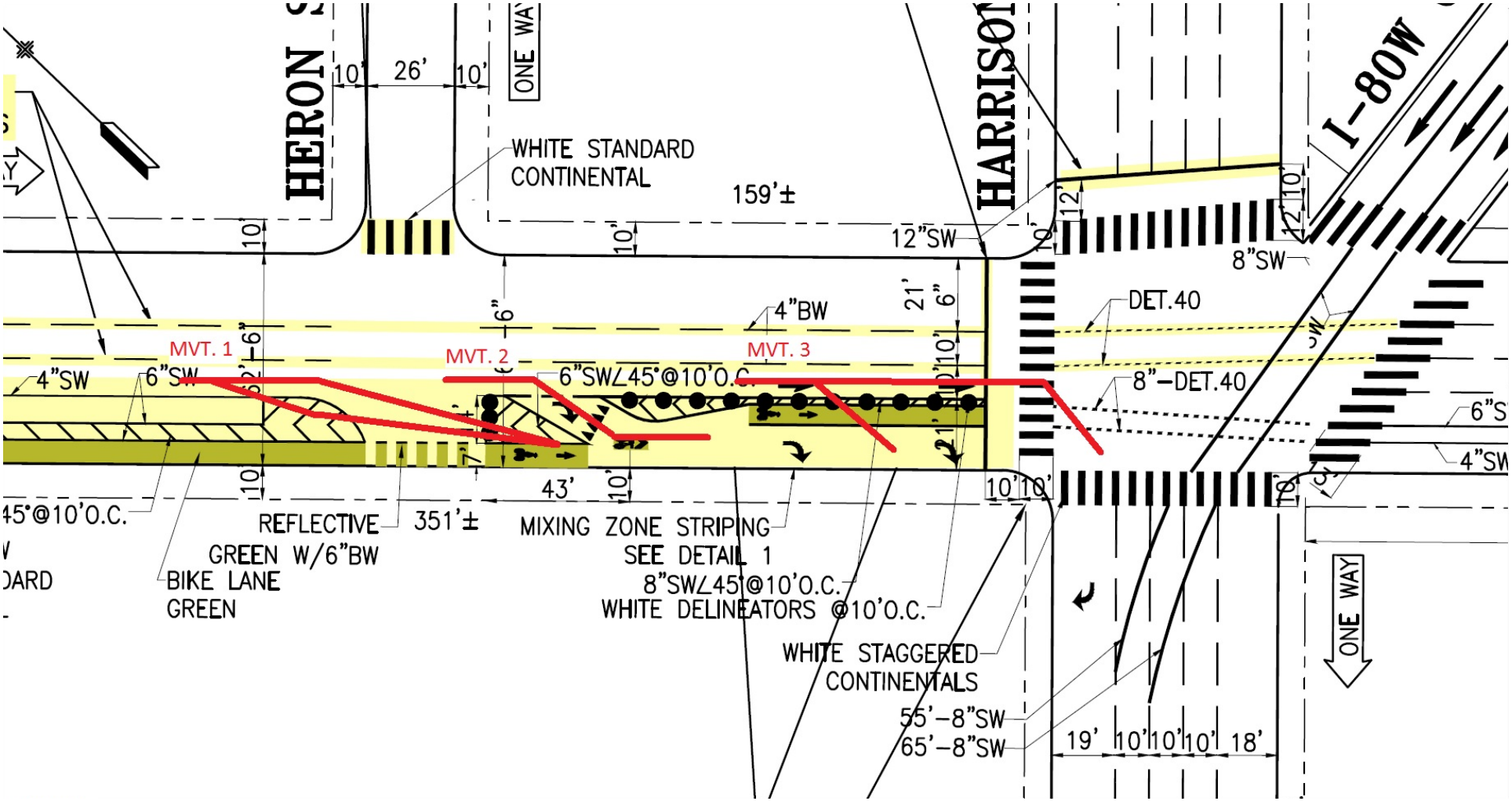
Mixing Zones



Near Term Improvement

Mixing Zone Evaluation



Signal Separation - Longer Term

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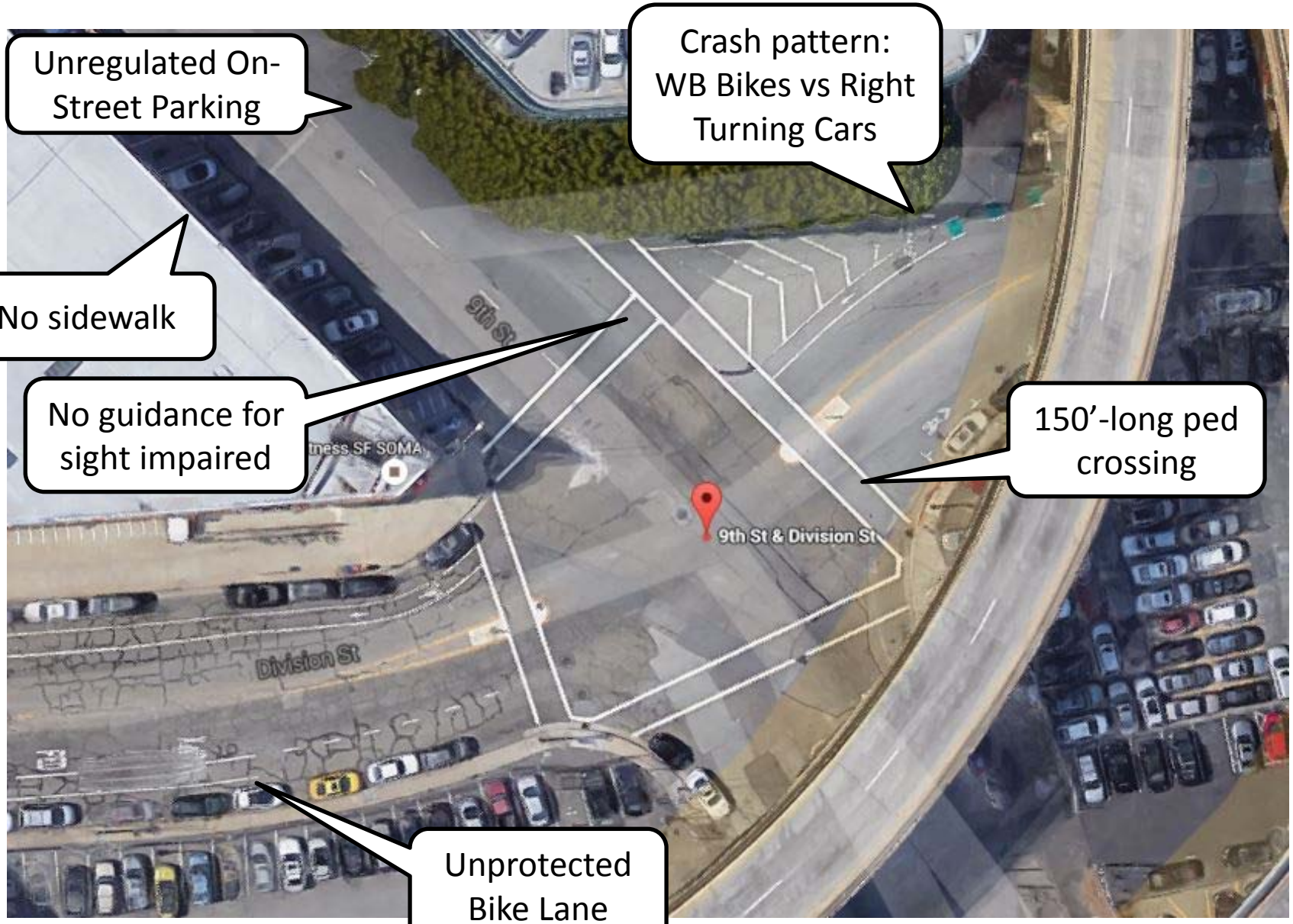
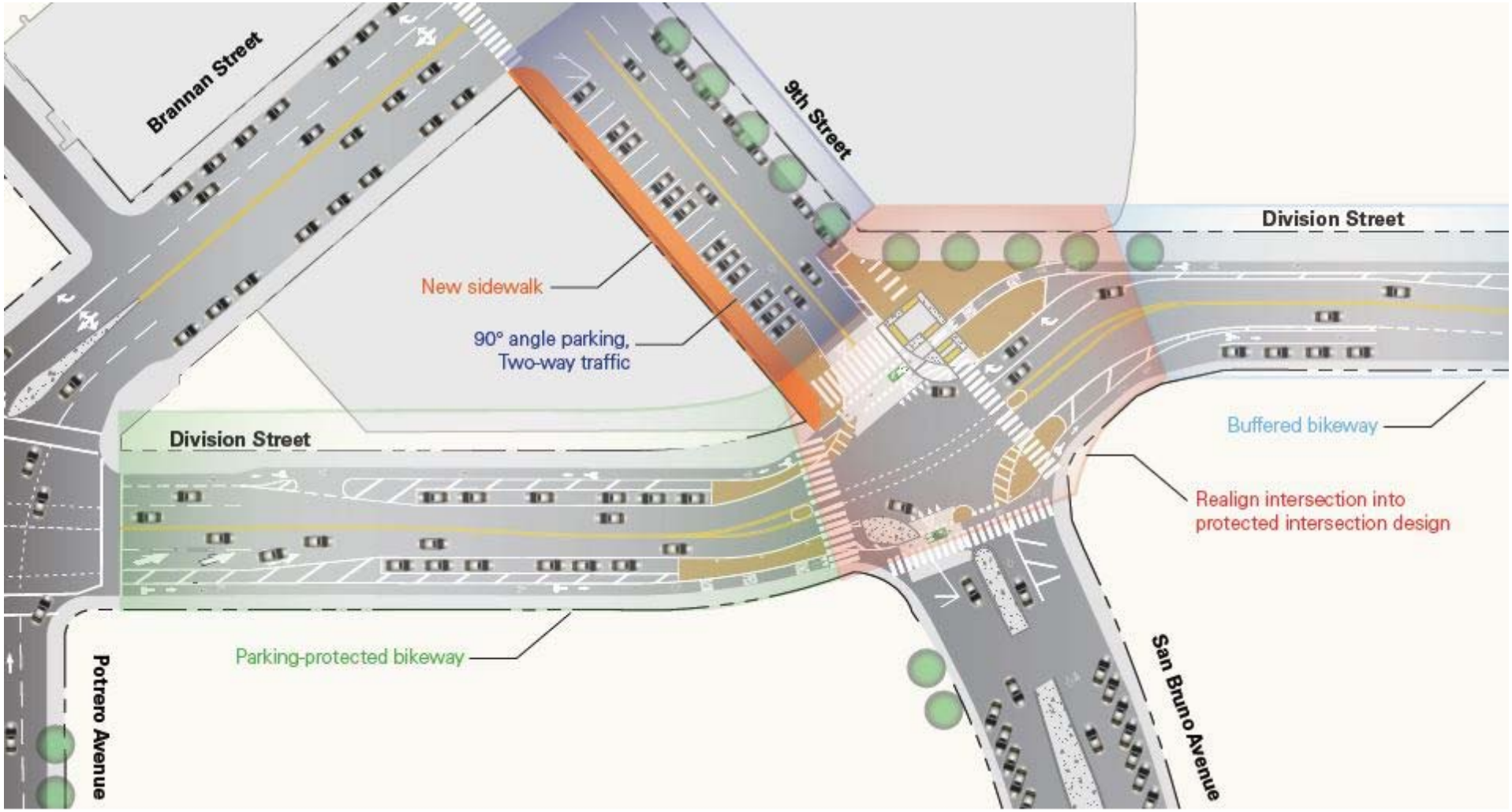
Signal Separation: Market/Valencia

Unprotected Intersection: 9th/Division - Before



9th/Division Protected Intersection



Protected Intersection, Parking Protected Bikeway, Raised Crosswalks, and New Sidewalk via Construction Coordination

9th/Division - Before

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9th/Division - After

9th/Division Protected Intersection

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9th/Division Parking Protected Bikeway

13th Street - before

125 cyclists/peak hour…here??

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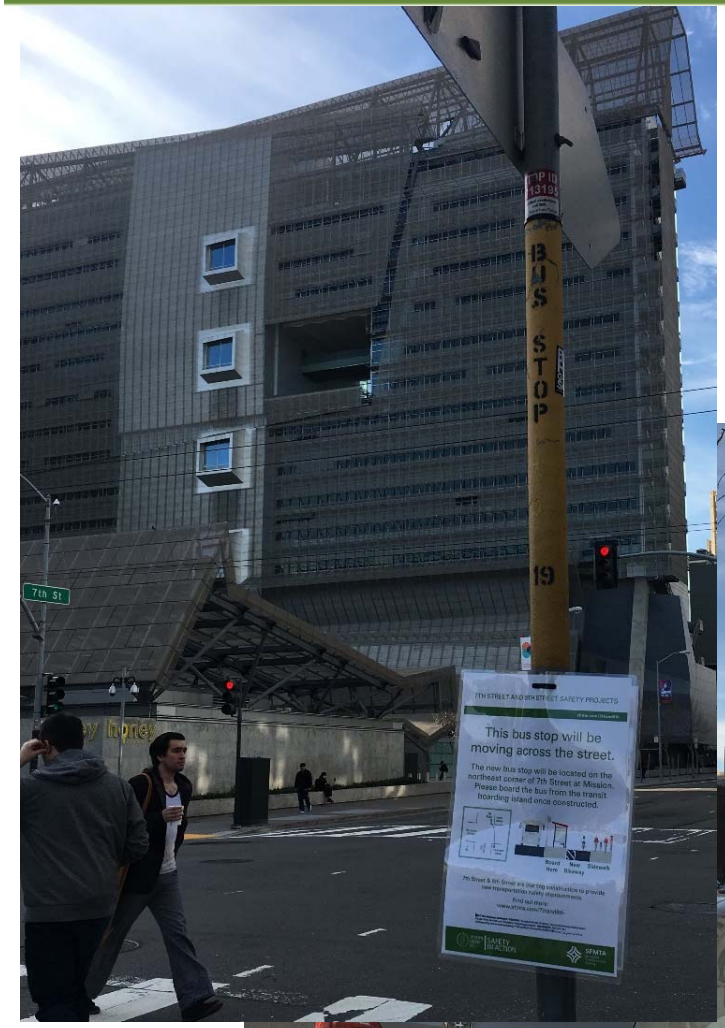
13th Street - after

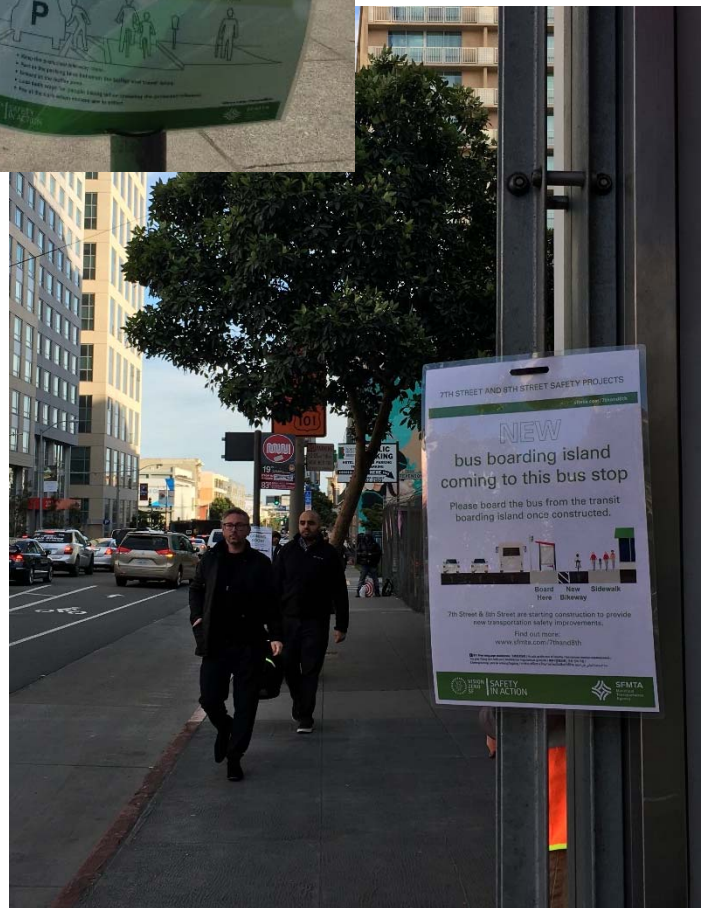
Early Design on Division with Separation

Division – Paving and New Concrete Buffer

Outreach – Inform with some Consult

Regular Communication Along the Way





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City Crews and Quality Work

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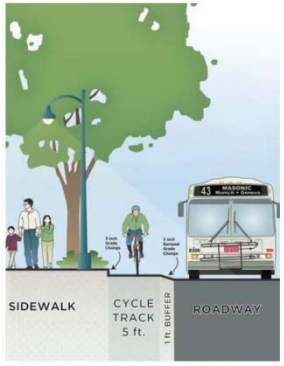
Promote and Celebrate Teamwork

Recent/Upcoming Construction Projects

Masonic Avenue



Section showing typical cycle track layout


Proposed "Bus Bulb Plaza" seeks to reduce conflict between bikes and buses at bus stops

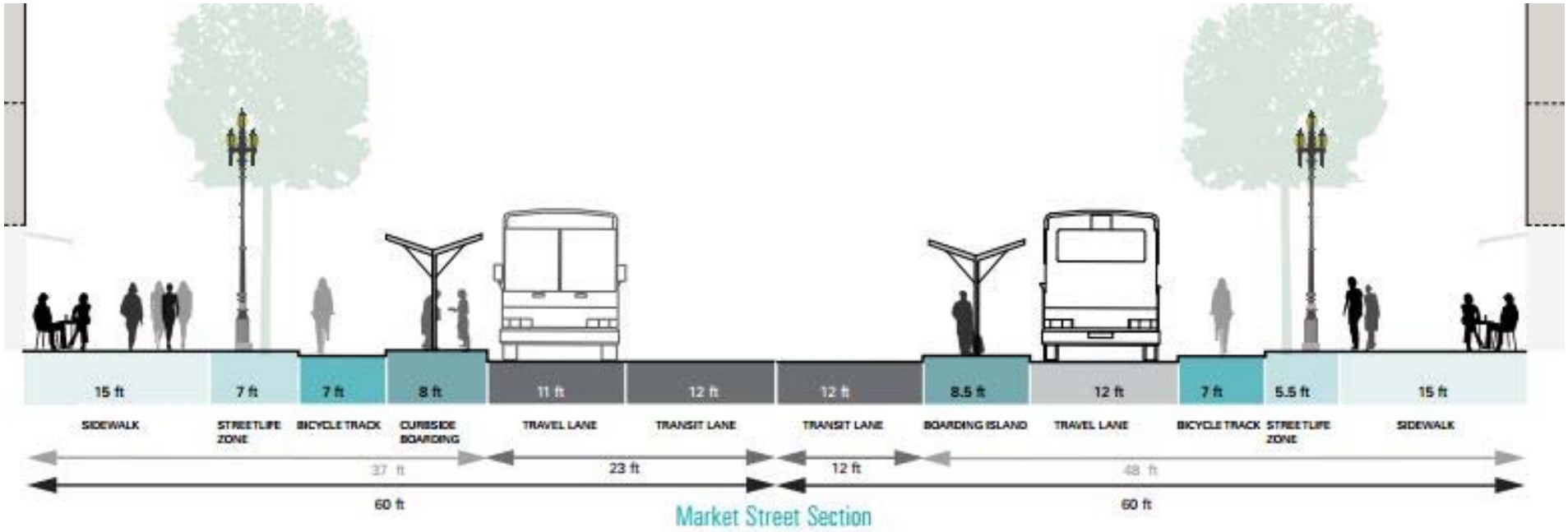
2nd Street

Mansell Street

Polk Street

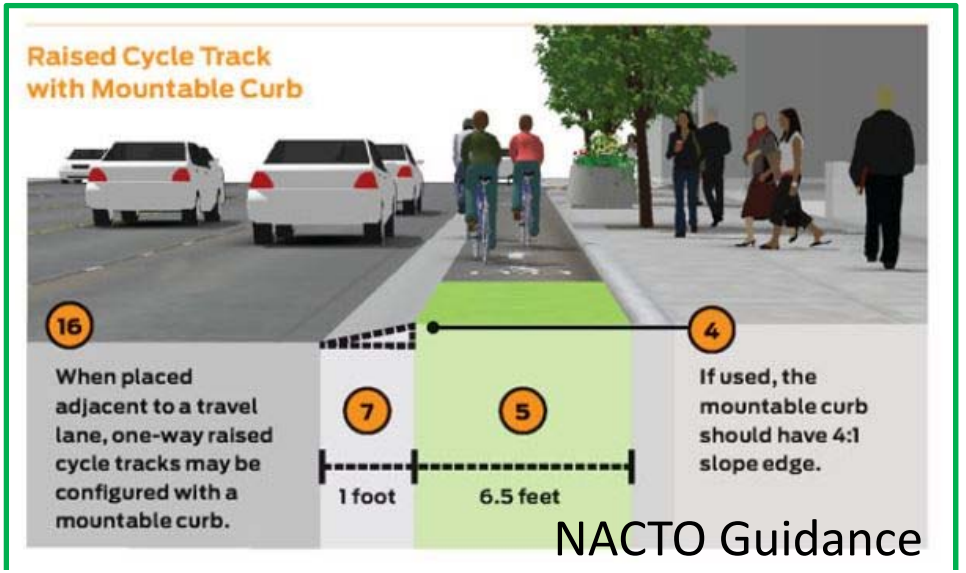
Folsom Street

Better Market Street Project



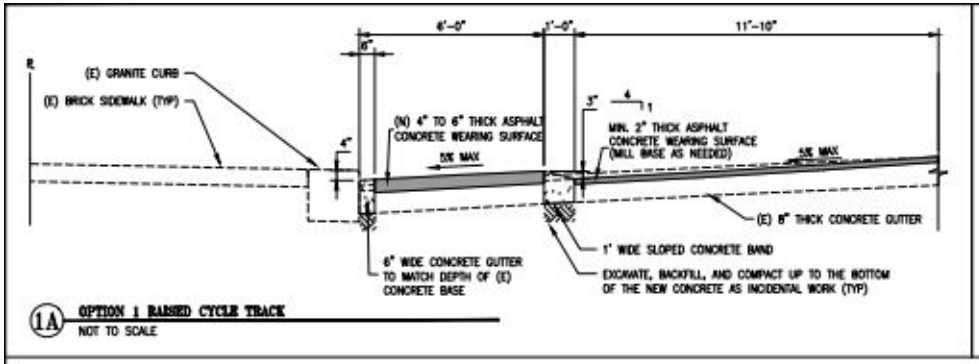
Market Street Section

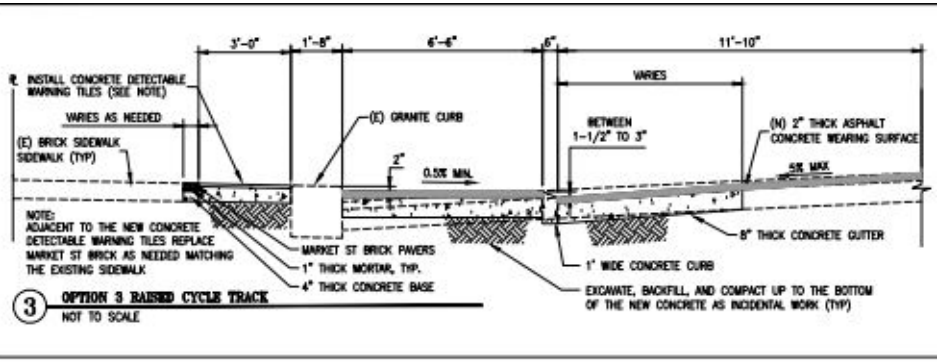
Original Option with Bikeway had 7’ wide raised bike lane immediately adjacent the road

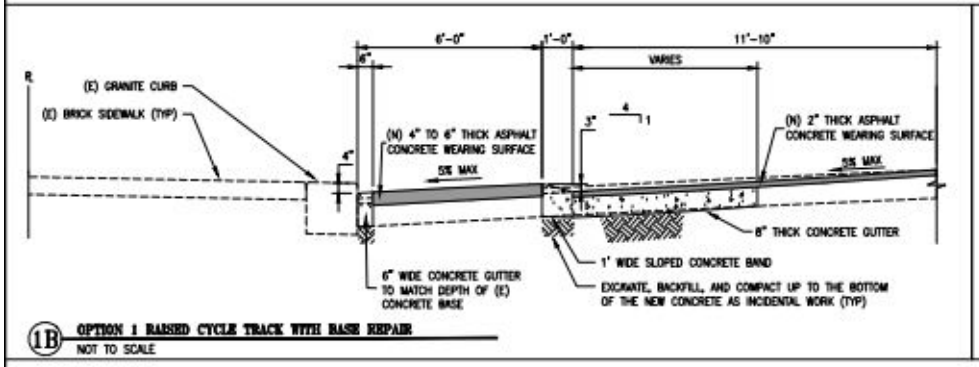


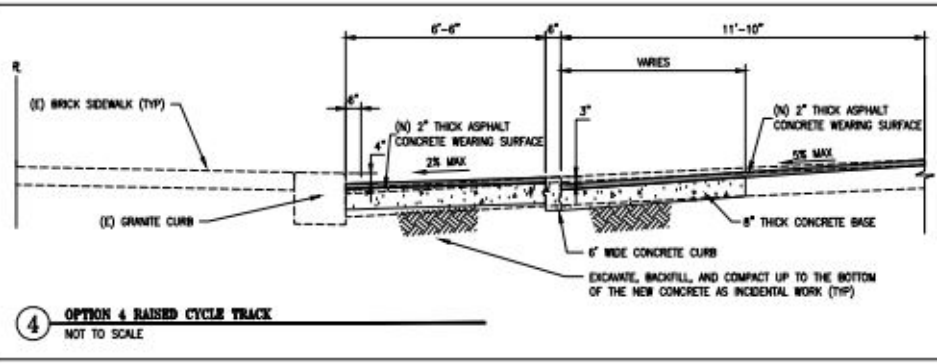
NACTO Guidance

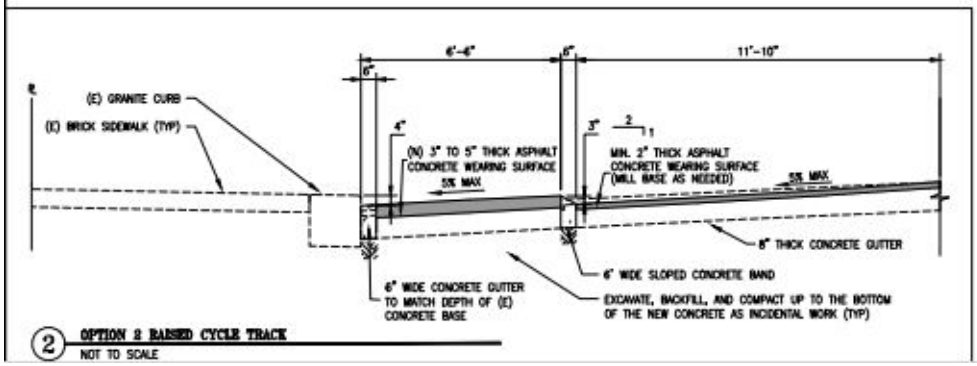
Demonstration Project on Market, Gough to 12th







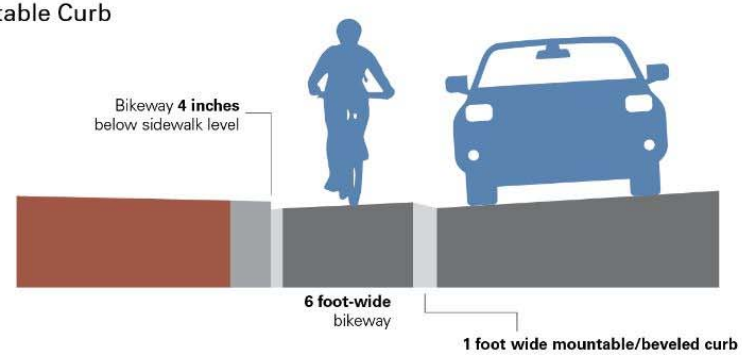




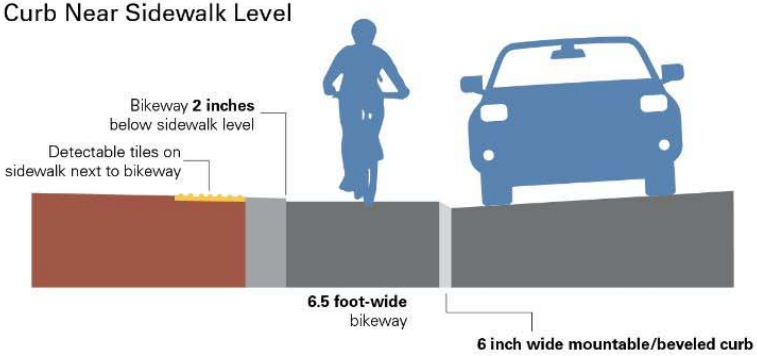
Test different variations prior to major investment

Market St Demonstration Project

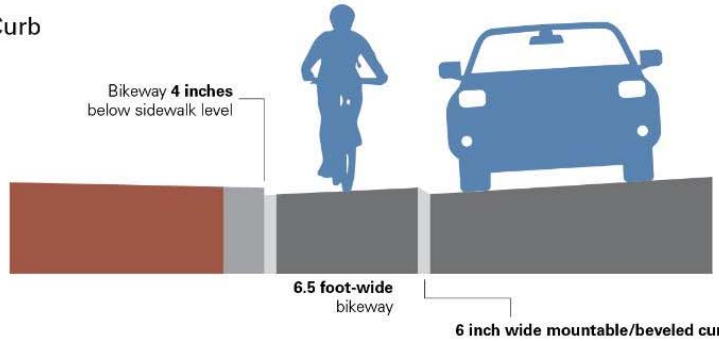
Option A
Wide Mountable Curb



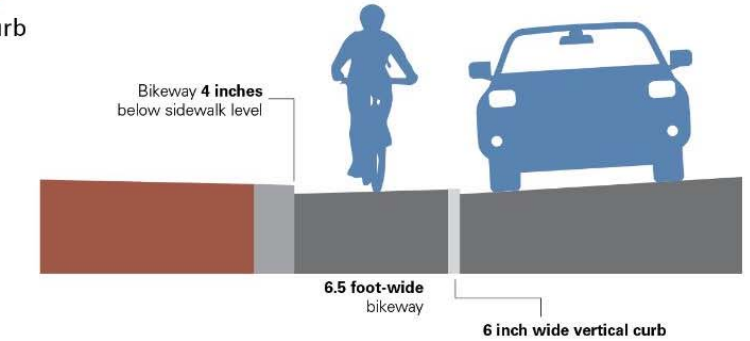
Option C
Mountable Curb Near Sidewalk Level



Option B
Mountable Curb



Option D
Vertical Curb

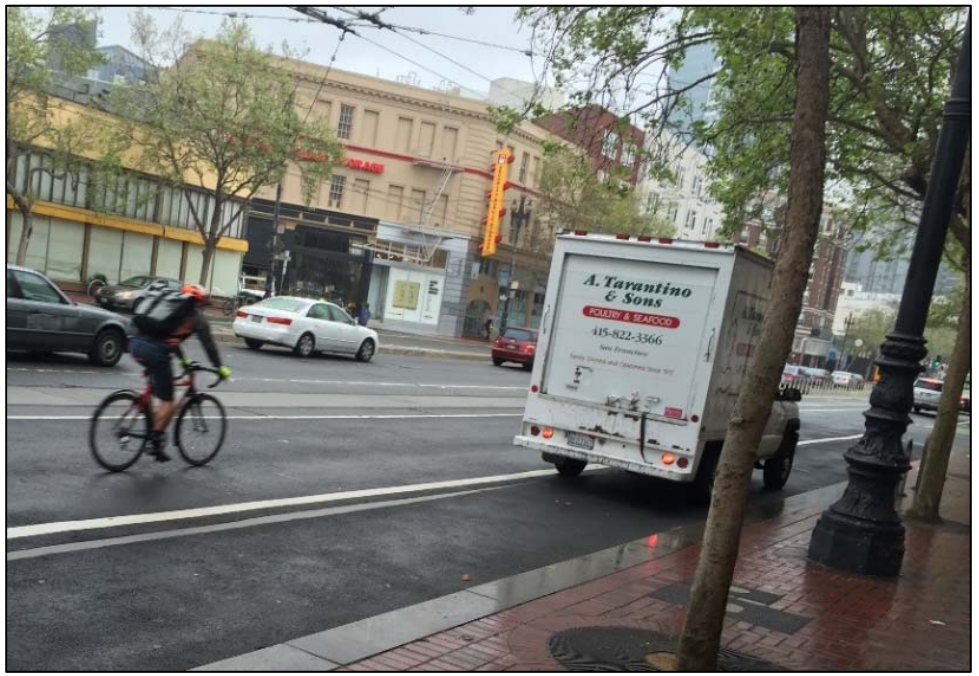


Evaluation

Cyclists, People with Disabilities, Sweepers, Paratransit Vehicles, Design and Construction Process, Drainage, Cost

Issues and Challenges

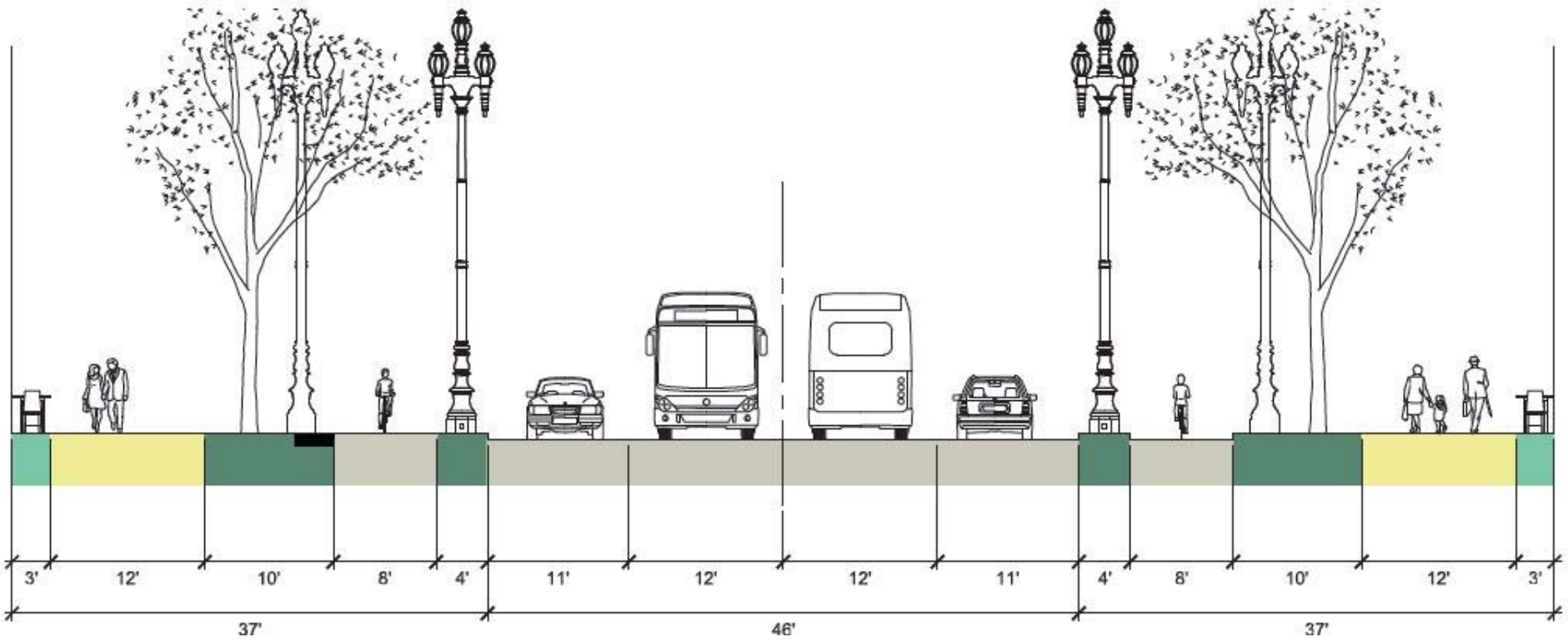
Vehicles are blocking the bikeway!



Too narrow at 7’ wide

Opinions divided between a vertical curb to deter vehicles versus mountable curbs that allow bicyclists to easily get into and out of the bikeway

Revised Design for Market Street



Wider bikeway, sidewalk level, and separated from roadway

Revised Design for Market Street

Benefits: Comfortable Continuous Bikeway, Ample Space for Pedestrians, Transit Improvements, Landscaping, Modifiable Design

Challenges: Intersections, Loading/Paratransit, Bottlenecks, Utilities, Overall Cost

Revised Design for Market Street

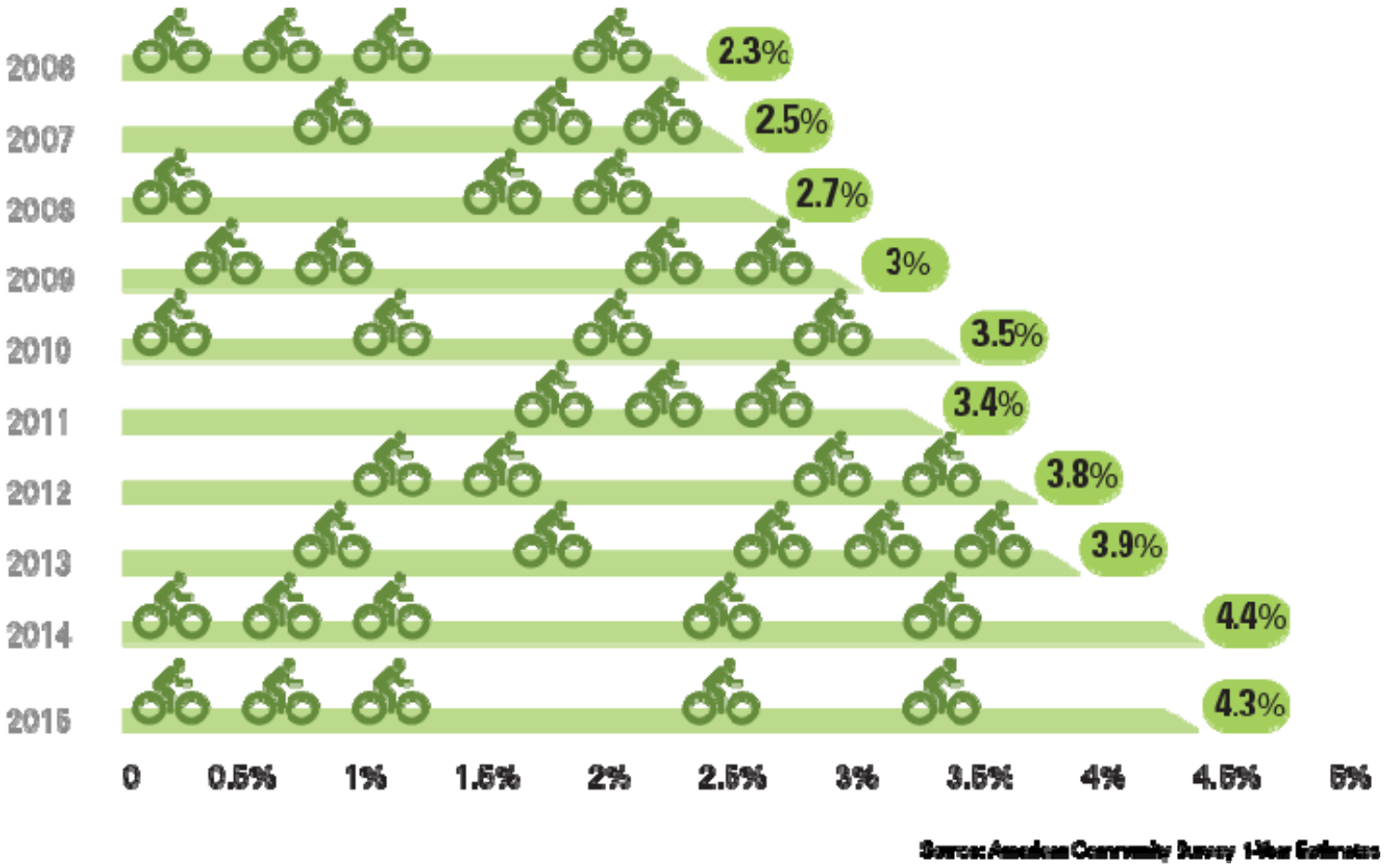
PRIORITIZE PEDESTRIANS

CYCLISTS AS PART OF PUBLIC LIFE

EVERYONE IS A PEDESTRIAN

STREET USER FAMILIES

Commuting Trends in SF



	Bike	Walk	Surface Transit	BART	Drive Alone	Caltrain	Carpool	Other
2016	3.9%	11.1%	23.7%	8.8%	33.7%	1.8%	6.7%	10.4%
2006	2.3%	9.6%	23.3%	6.1%	40.5%	0.8%	7.7%	9.7%

SFMTA
Municipal Transportation Agency

Recent Survey Results

51% of SF residents enjoy biking. Just 15% do not.

1/3 residents can bike, but won't in San Francisco.

7 in 10 people cite safety concerns as a major impact on their decision to bike.

59% believe that bike lanes and paths should be **separated from cars.**

55% don't feel **safe** riding a bike near traffic.

People know what improvements are effective.

- 64% say physically separated bike lanes are effective
- 61% wanted clearer markings to better separate bikes and cars
- 60% want more green-painted bike lanes

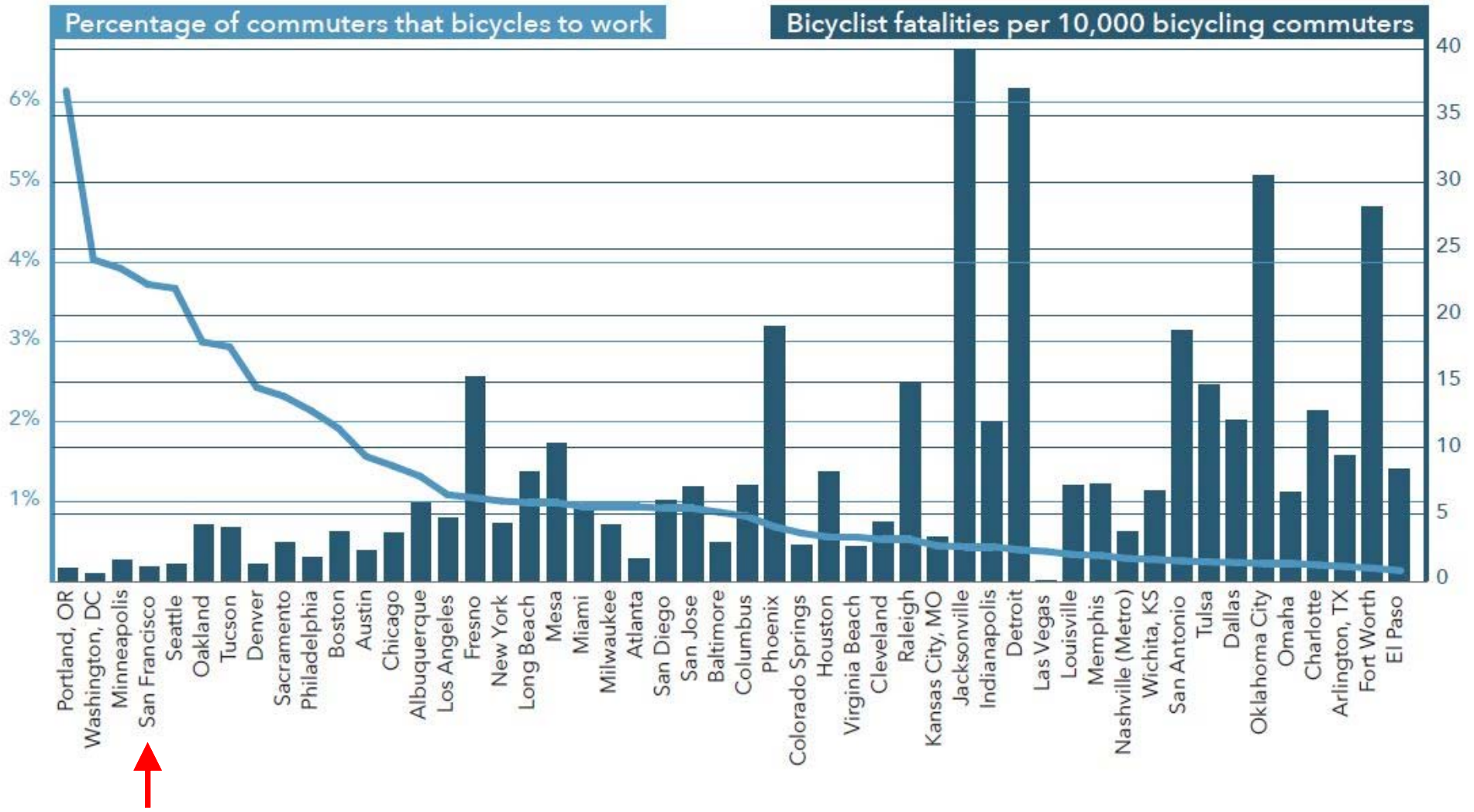
SFMTA
Municipal
Transportation
Agency

BICYCLING & WALKING in the United States 2016

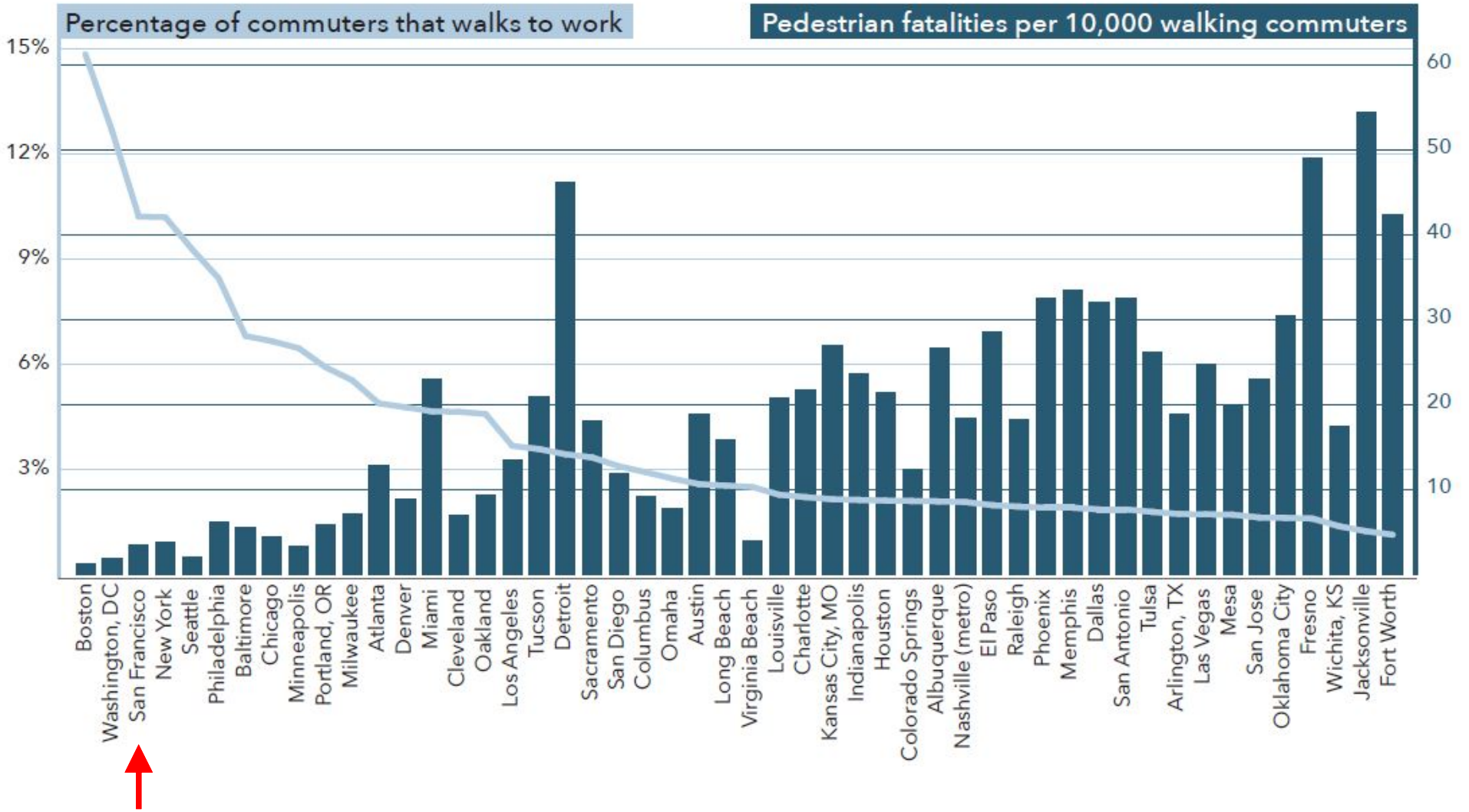
Alliance for Biking & Walking

BENCHMARKING REPORT

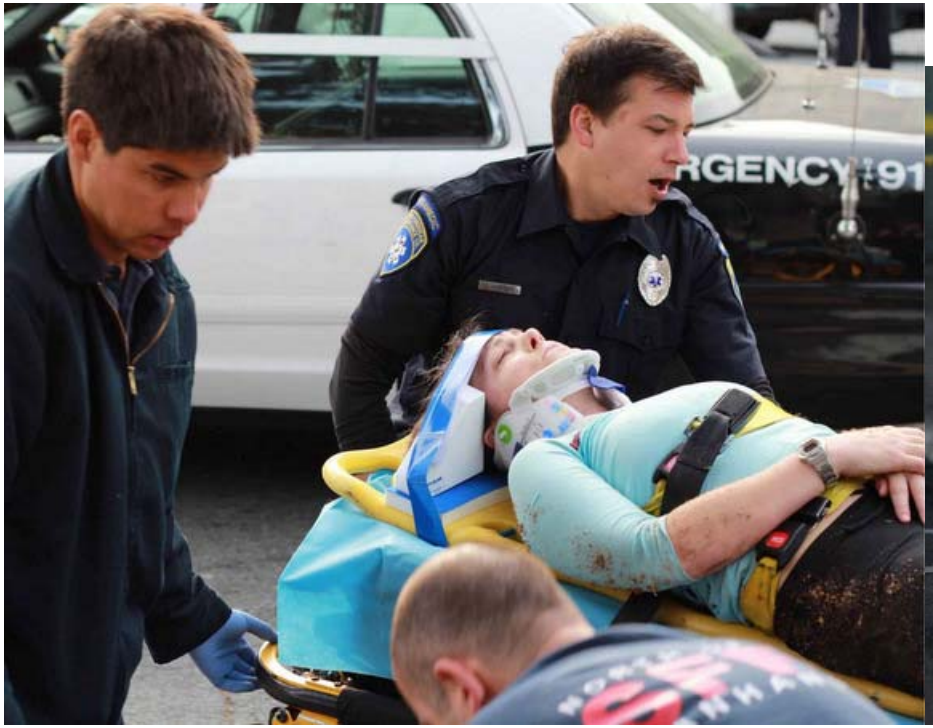
Bike Commuting and Fatality Rates for US Cities

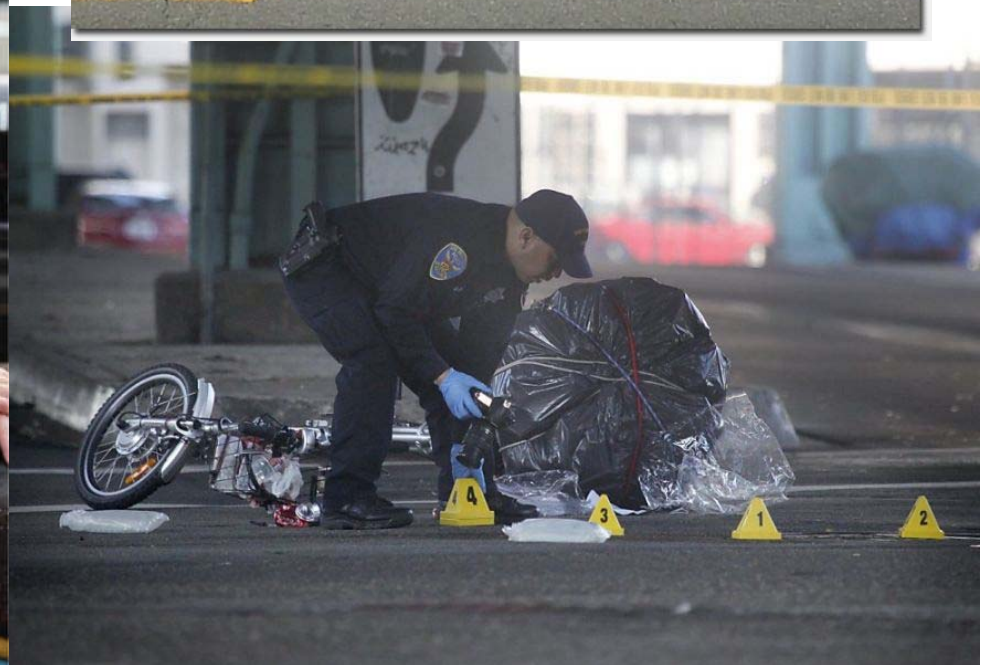


Walking Commuting and Fatality Rates for US Cities



Vision Zero: 0 Traffic Deaths by 2024





MORE:

LESS:

SFMTA
Municipal
Transportation
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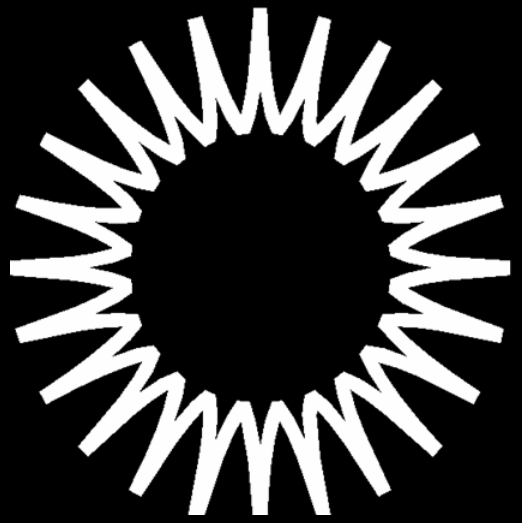
Thank You!

Mike Sallaberry, mike.sallaberry@sfmta.com



SPUR

Ideas + Action for a Better City

learn more at SPUR.org

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#BuildingBetterBikeways