NACTO DESIGNING CITIES DENVER 2023

Don’t Stress It:

Bikeway Level of Comfort Metrics

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Panel

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DON'T STRESS IT: BIKEWAY LEVEL OF COMFORT

1. Topic Overview
2. Panelists' Approach to Quantifying Bike Facility Adequacy
3. Group Discussion on Applying LTS to Facility Selection
4. Group Discussion on Bicycle (& Pedestrian) Safety @ Intersections

DON'T STRESS IT: BIKEWAY LEVEL OF COMFORT

Topic Overview

Transportation System Performance: What's Most Important?

- Mobility?
- Accessibility?
- Safety?

DON'T STRESS IT: BIKEWAY LEVEL OF COMFORT

Topic Overview
Transportation System Performance: What Metrics Matter?

- Comprehensive Planning?
- Development Review?
- Project Planning?
- Design Guidance?
- System Evaluation?

DON'T STRESS IT: BIKEWAY LEVEL OF COMFORT

Panel Discussion:
Panelists' Approach to Quantifying Bike Facility Adequacy

City of Fort Collins

Fort Collins MMLOS

Tyler Stamey, P.E.

Existing Requirements

- Adopted in 1997
- Level of Subjectivity
- Established requirement for MMLOS
- Bicycle Standards shown

Figure 3. Bicycle LOS Standards

connectivity required for levels of service:

A	directly connected to both North-South and East-West on-street lanes
B	directly connected to both North-South and East-West corridors at least one of which is a set of on-street lanes
C	directly connected to either a North-South or an East-West corridor which is a set of on-street lanes
D	directly connected to either a North-South or an East-West corridor which is an off-street path
E	indirectly connected via an on-street unstriped route along a low volume local street to one or more of the above within 1/4 mile
F	no direct or indirect connections to either North-South or East-West corridors

minimum LOS

base city-wide minimum level:	C
public school sites:	A
recreation sites:	B
community / neighborhood commercial centers:	B

Existing Requirements

Table P- 3: Targeted Level of Service by Pedestrian Priority Area

	Directness	Continuity	Street Crossing	Visual Interest and Amenity	Security
Pedestrian Districts	A	A	B	A	A
Activity Centers and Corridors	B	B	C	B	B
School Walking Areas	B	B	B	C	B
Transit Corridors	B	C	C	C	B
Other Areas Within City	C	C	C	C	C

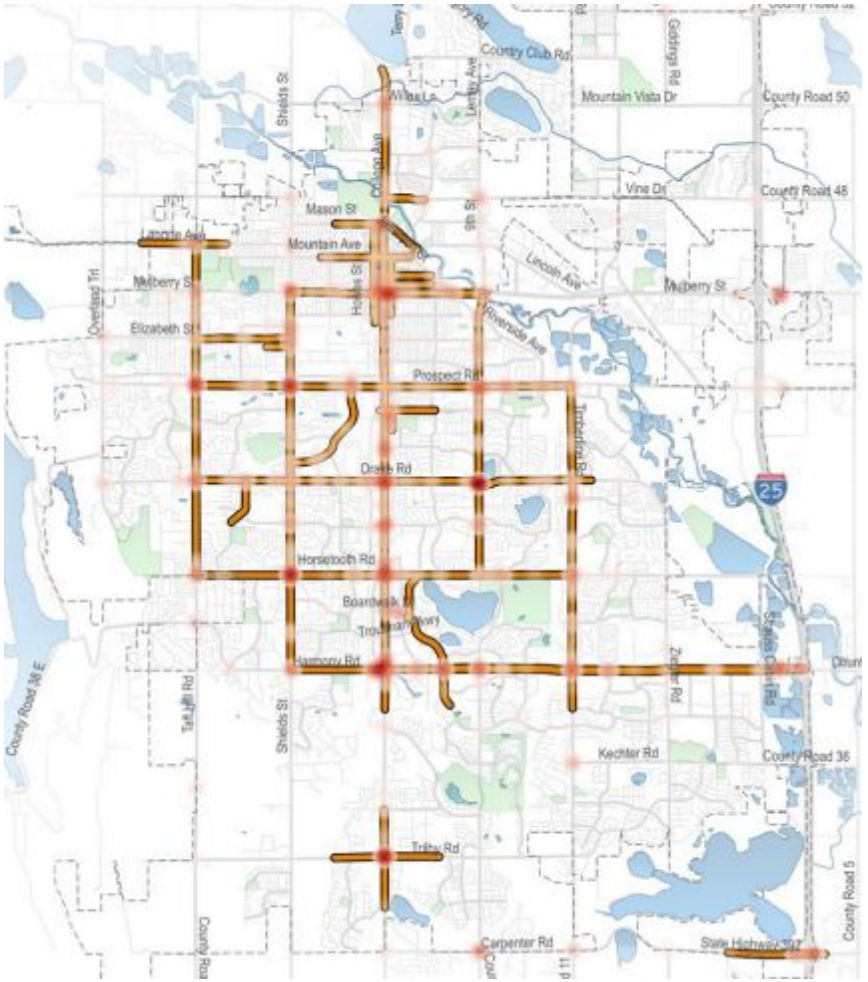
- Different standard by area type

Challenges

- Subjectivity
- Requirements to implement change
- Coordination
- Cost

Proposed Changes

- Revised Process Flowchart
- Pulls in Active Modes Plan
- Links to Vision Zero Action Plan
- Require more analysis in TIS for anything that is not a car



Proposed Changes

Table 1. Bicycle Trip Generation Criteria, Peak Hour Bicycle Trip – Draft Proposal

Infrastructure Criteria	No approved TDM Plan	With <5 TDM points	With >5 TDM points
There are no existing bicycle facilities connecting to the development	2% of vehicular trips	3% of vehicular trips	5% of vehicular trips
There are existing but deficient bicycle facilities (do not meet AMP standard), without key destinations within sphere of influence	4% of vehicular trips	6% of vehicular trips	8% of vehicular trips
There are existing but deficient bike facilities and key destinations within sphere of influence	6% of vehicular trips	8% of vehicular trips	12% of vehicular trips
There are existing bicycle facilities	8% of vehicular trips	12% of vehicular trips	18% of vehicular trips

Proposed Changes

Table 2. Bicycle Desired Flow Rate

Bike Lane Width (ft)	Peak Hour Directional Volume
One-way PBL	
5.5 - 8.5	150
8.5 - 10	750
Two-way PBL	
9 - 12	150
12 - 16	350

Table 3. Bike Impact Fee Calculation Example – Draft Proposal

Desired Bike Flow Rate / hr	150	From Draft AASHTO Bike Guide Table 7.3 and 7.4
Existing Bike Volume / hr	130	From counts
Threshold for bike fee contribution	80%	Determine by local jurisdiction
Existing Bike Lane Capacity Ratio	0.87	
Site Gen Bike Trip	25	From bike trip generation table
Total Bike Volume	155	
Proposed Bike Lane Capacity Ratio	1.03	
Bike Impact Proportion	17%	Difference between existing and proposed ratio
Cost of Bike Improvement	$ 2,500,000	Random example
Length of project	5	mile
Cost / mile	$ 500,000	
Segment in bike influence area	0.5	mile
Total cost in influence area	$ 250,000	
Bike Impact Fee	$ 41,666.67	

Thank you!

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Don’t Stress It: Bikeway Level of Comfort Metrics

Francisco Lovera, P.E., Complete Streets Engineer, MassDOT

Charles River Dam Road

mass
Massachusetts Departm

MassDOT
Healthy Transportation Policy & Engineering Directive

Policy requires all state transportation projects to increase biking, transit, and walking options.

Healthy Transportation Policy (2013)

New Engineering Directive – Design Criteria (2014)

New controlling criteria released to implement policy directive. Focused on pedestrian and bicycle accommodations.

Policy review and evaluation

Policy Evaluation (2017-2018)

Updated Engineering Directive and new Design Justification Process (2020)

NEW **criteria and process to ensure that people of all ages and abilities are afforded the opportunity for safe travel regardless of mode.**

https://www.mass.gov/doc/controlling-criteria-and-design-justification-process-for-massdot-highway-division-projects-e/download

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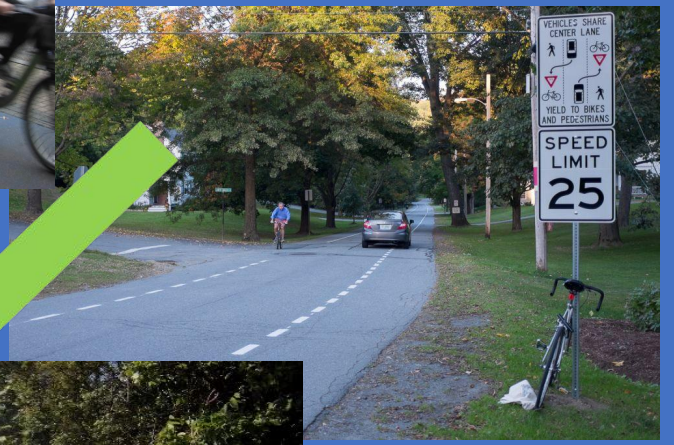

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Target Speed

Mass.gov/safe-speeds

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Pedestrian Facilities Criteria

- Sidewalks on both sides required if…
  - Roadway in an urbanized area, urban cluster, or rural village (where pedestrians are legally allowed)
  - Roadway on or under a bridge where legally allowed
  - Roadways with a High Potential for Everyday Walking
- Minimum width 5’-0”
- Marked crosswalks across all legs of signalized intersections where sidewalks are present or proposed
- Marked crosswalks shall be provided at existing crosswalks

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Bicycle Facilities Criteria

- Bicycle facilities required (where bicycles are legally allowed) *except* for local roads
- Bicycle facilities shall have separation (shared use path, side path, separated bike lane, buffered bike lane) if…
  - Posted speed limit ≥ 40 MPH
  - Vehicular volumes ≥ 10,000 vehicles per day
  - Roadway has more than one travel lane in a single direction
  - Intersection more than one travel lane in a single direction
  - Roadway classified as corridor with a High Potential for Everyday Biking
- Minimum width 5’-0” (single direction), 10’-0” (bi-directional)
  - Does not include curbs, buffers

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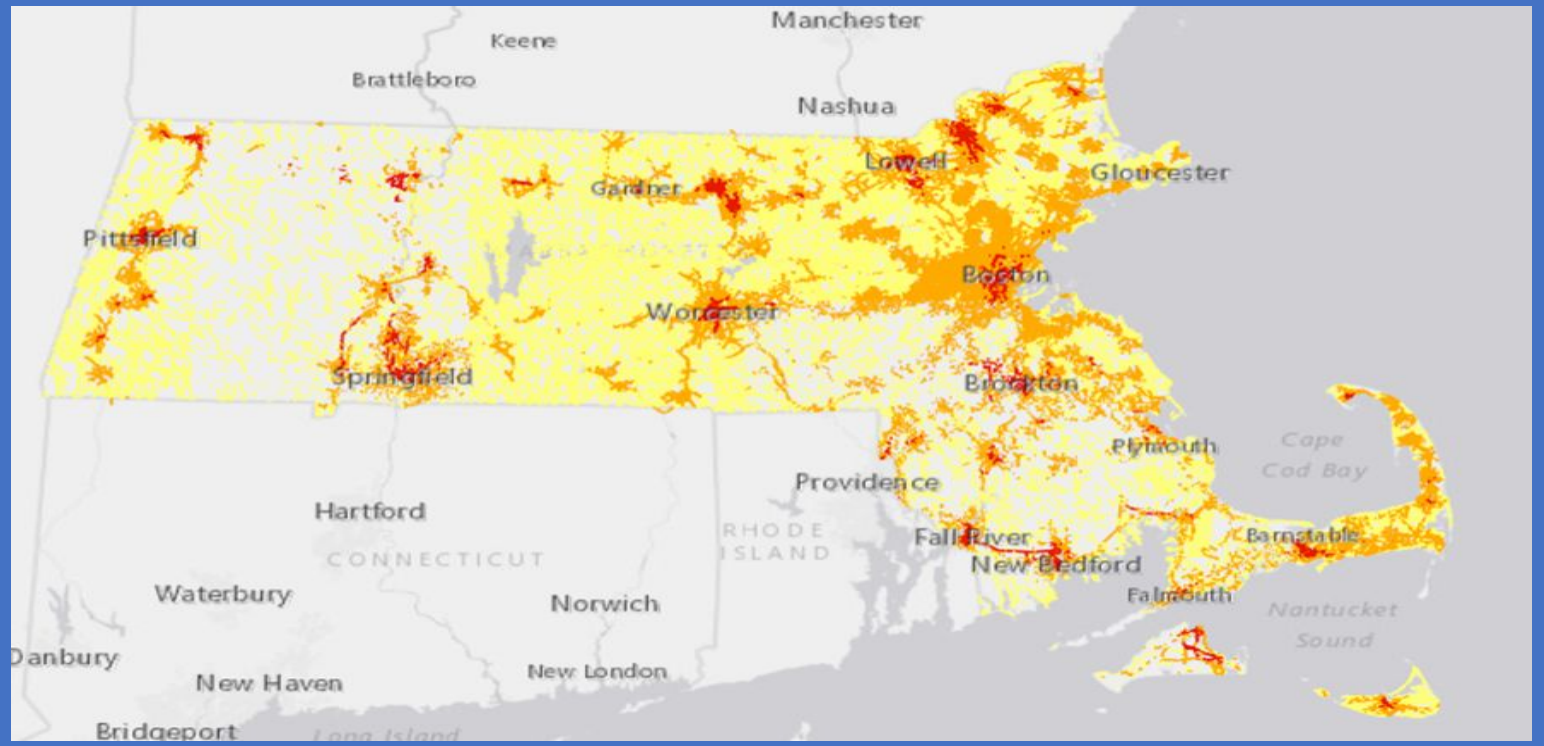
Potential for Everyday Biking



Legend

Biking_Potential_Layer

Potential

- High
- Medium
- Low

The Potential for Everyday Biking methodology calculates the likelihood of everyday short trips by bike if safe, comfortable, and convenient bikeways existed. Available for Potential for Walkable Trips too.

https://www.mass.gov/service-details/bicycle-plan

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Design Justification Workbook

MassDOT Design Justification Workbook

Project: 60XXXX Description: MUNICIPALITY- PROJECT DESCRIPTION

PEDESTRIAN FACILITIES

Facility: Street Road (Route X)

☐ **If pedestrians are not legally allowed on the facility, check this box and do not fill out this sheet.**

(Fill in information about the proposed Pedestrian Accommodations on this facility.)
(For the purposes of this Workbook, the entries for this criterion have been split into several "subcriteria".)

Type of Pedestrian Accommodation:

Subcriterion: Width

Minimum: 5.0 FT Existing: FT Proposed: 5.0 FT

(If the width varies, provide a minimum.)

Source used for minimum: MassDOT Controlling Criteria

Justify the proposed width.

(Attach additional sheets as necessary.)

Subcriterion: Presence

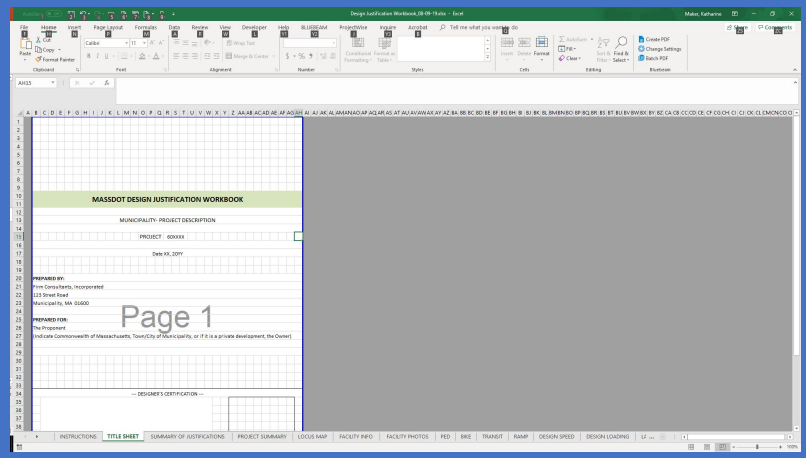
Pedestrian facilities exist on _____ of the facility.
Pedestrian facilities are proposed on _____ of the facility.

(Check the boxes if any of the following apply:)

☐ The roadway is in an urbanized area, an urban cluster, or a rural village.
☐ The project involves work on or underneath a bridge.
☐ The roadway is identified as having a High Potential of Walkable Trips in the Pedestrian Plan.

Justify the proposed number of sidewalks.

(Attach additional sheets as necessary.)



Subcriterion: Width Standard not met.

Minimum: 5.0 FT Existing: FT Proposed: 4.5 FT

(If the width varies, provide a minimum.)

Source used for minimum: MassDOT Controlling Criteria

Justify the proposed width.

(Attach additional sheets as necessary.)

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Vision

All people in Massachusetts will have a **safe, comfortable, and convenient** option to walk for short trips.

Goal 1

Eliminate pedestrian fatalities and serious injuries.

Goal 2

Increase the percentage of short trips made by walking.

MASSACHUSETTS
BICYCLE TRANSPORTATION PLAN

#MABIKEPLAN

massDOT

Vision

Biking in Massachusetts will be a **safe, comfortable, and convenient** option for everyday travel.

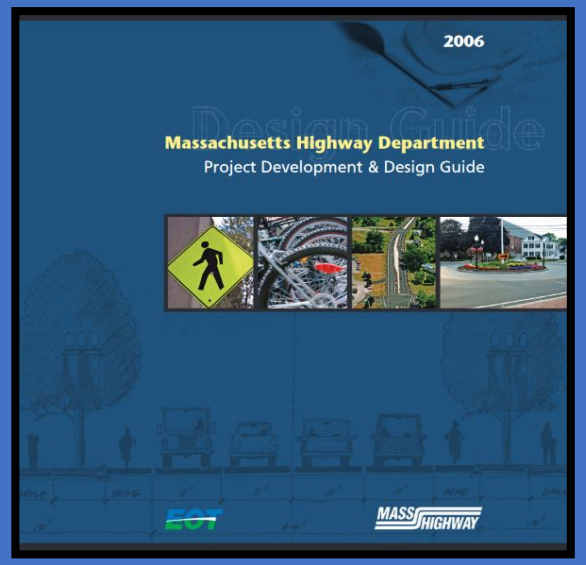
Goal 1

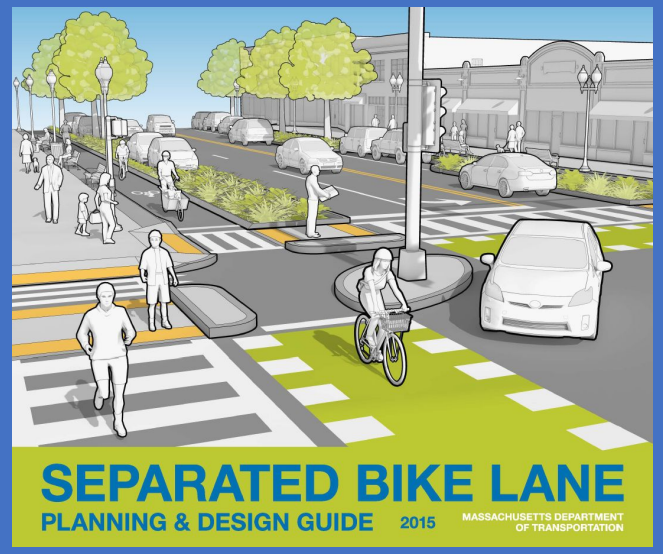
Eliminate bicyclist fatalities and serious injuries.

Goal 2

Increase the percentage of everyday trips made by bicycling.

Design Guides





https://www.mass.gov/lists/design-guides-and-manuals

Metric for Infrastructure Projects

- Looking for alternative to motor vehicle Level of Service for evaluating projects.

- Project Development and Design Guide Update
  - Removing LOS references for pedestrian and bicycle modes
  - Focusing on safety rather than level of service

- Infrastructure that work for all, as early as 3-year-old and their caregivers.

- Comfortable for all. A step above safety

Project Example

- Highland Ave

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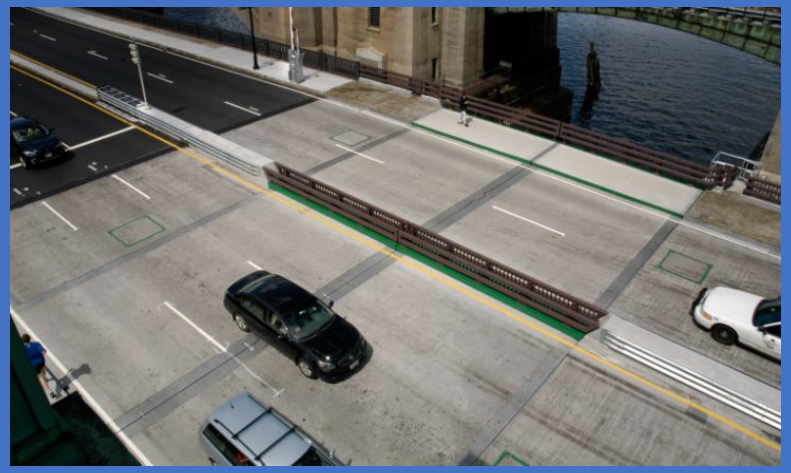
Project Example

- Route 135

Project Example

- Charles River Dam Road



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Project Example

- Route 28

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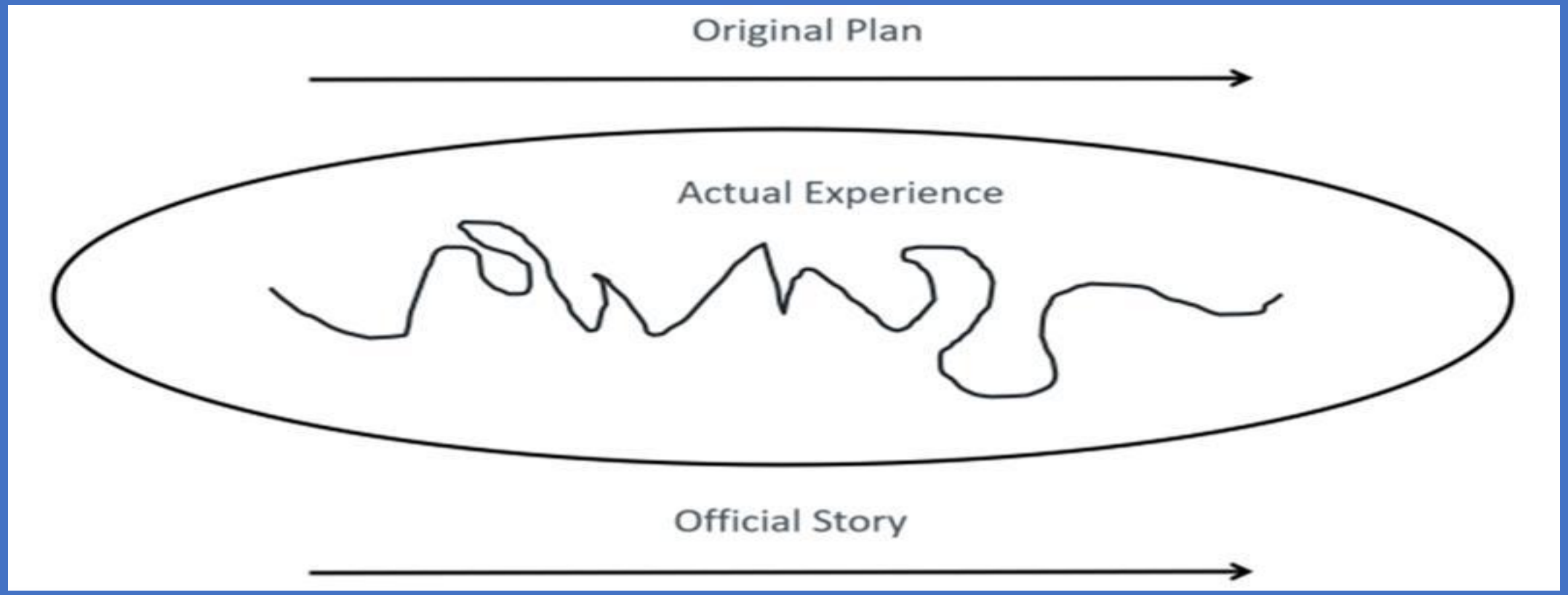
Process



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Don’t Stress It: Bikeway Level of Comfort Metrics

Celeste Gilman, Strategic Policy Administrator, Active Transportation Division
Washington State Department of Transportation

May 15, 2023

Level of Stress and Route Directedness

Level of Traffic Stress - Bicycle

All riders

LTS 1

Most riders

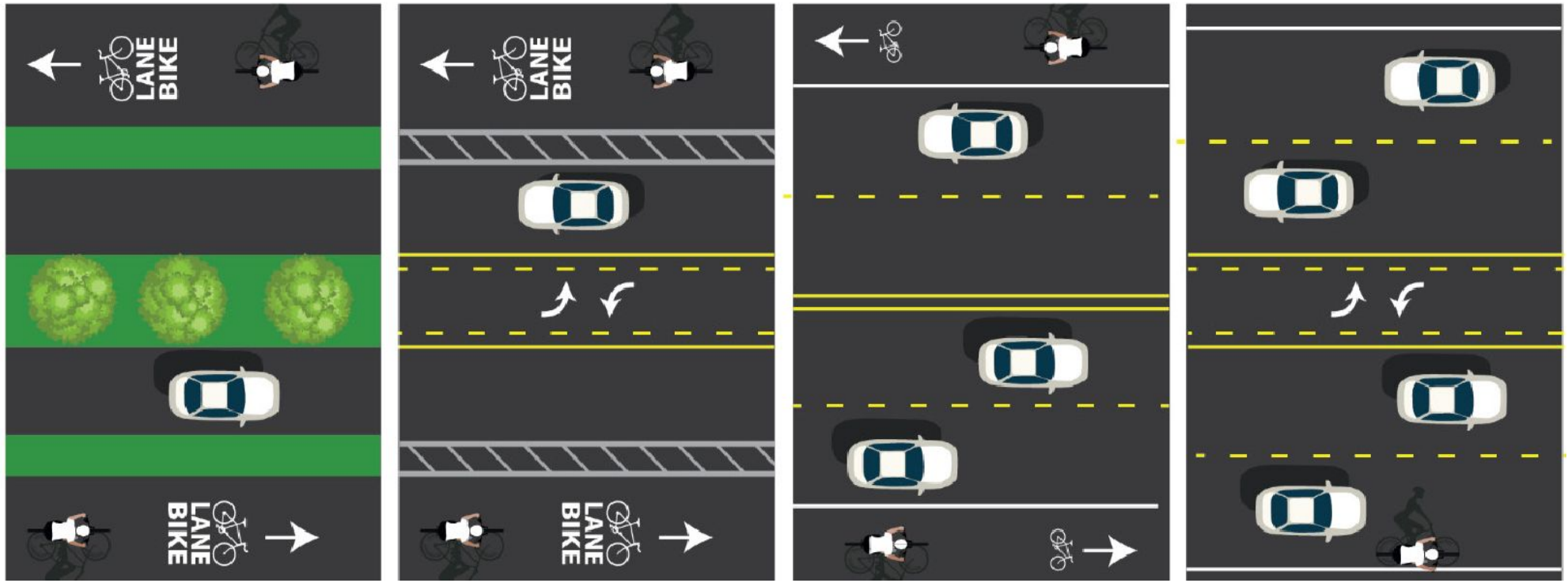
LTS 2

Few riders

LTS 3

1% of riders

LTS 4



Basic LTS

General Linear LTS (no sidewalk / no marked bike lane / with or without shoulder)								
Lanes	AADT	<=20	25	30	35	40	45	50+
1 thru lane per direction (or 1 lane one-way street)	0-750	1	1	3	4	4	4	4
	751-1500	1	2	3	4	4	4	4
	1501-3000	2	2	3	4	4	4	4
	3000+	2	3	3	4	4	4	4
2 thru lanes per direction	0-6000	3	3	3	4	4	4	4
	>6000	3	3	4	4	4	4	4
3+ thru lanes per direction	Any ADT	4	4	4	4	4	4	4

Conventional Bike Lanes (5' or greater)								
Lanes	AADT	<=20	25	30	35	40	45	50+
1 thru lane per direction (or 1 lane one-way street)	0-750	1	2	2	4	4	4	4
	751-1500	1	2	2	4	4	4	4
	1501-3000	1	2	2	4	4	4	4
	3000+	2	2	2	4	4	4	4
2 thru lanes per direction	0-6000	2	2	3	4	4	4	4
	>6000	3	3	3	4	4	4	4
3+ thru lanes per direction	Any ADT	3	3	4	4	4	4	4

Basic LTS

Buffered Bike Lanes (minimum 2' buffer / greater than or equal to 7 feet total)								
Lanes	AADT	<=20	25	30	35	40	45	50+
1 thru lane per direction (or 1 lane one-way street)	0-750	1	1	2	3	4	4	4
	751-1500	1	1	2	3	4	4	4
	1501-3000	1	1	2	3	4	4	4
	3000+	2	2	2	3	4	4	4
2 thru lanes per direction	0-6000	2	2	2	3	4	4	4
	>6000	2	2	3	3	4	4	4
3+ thru lanes per direction	Any ADT	3	3	3	4	4	4	4

Separated Bicycle Lane								
Lanes	AADT	<=20	25	30	35	40	45	50+
1 thru lane per direction (or 1 lane one-way street)	0-750	1	1	1	2	2	2	2
	751-1500	1	1	1	2	2	2	2
	1501-3000	1	1	1	2	2	2	2
	3000+	2	2	2	2	2	2	2
2 thru lanes per direction	0-6000	2	2	2	2	2	2	2
	>6000	2	2	2	2	2	2	2
3+ thru lanes per direction	Any ADT	2	2	2	2	2	2	2

Refined LTS Criteria - DRAFT

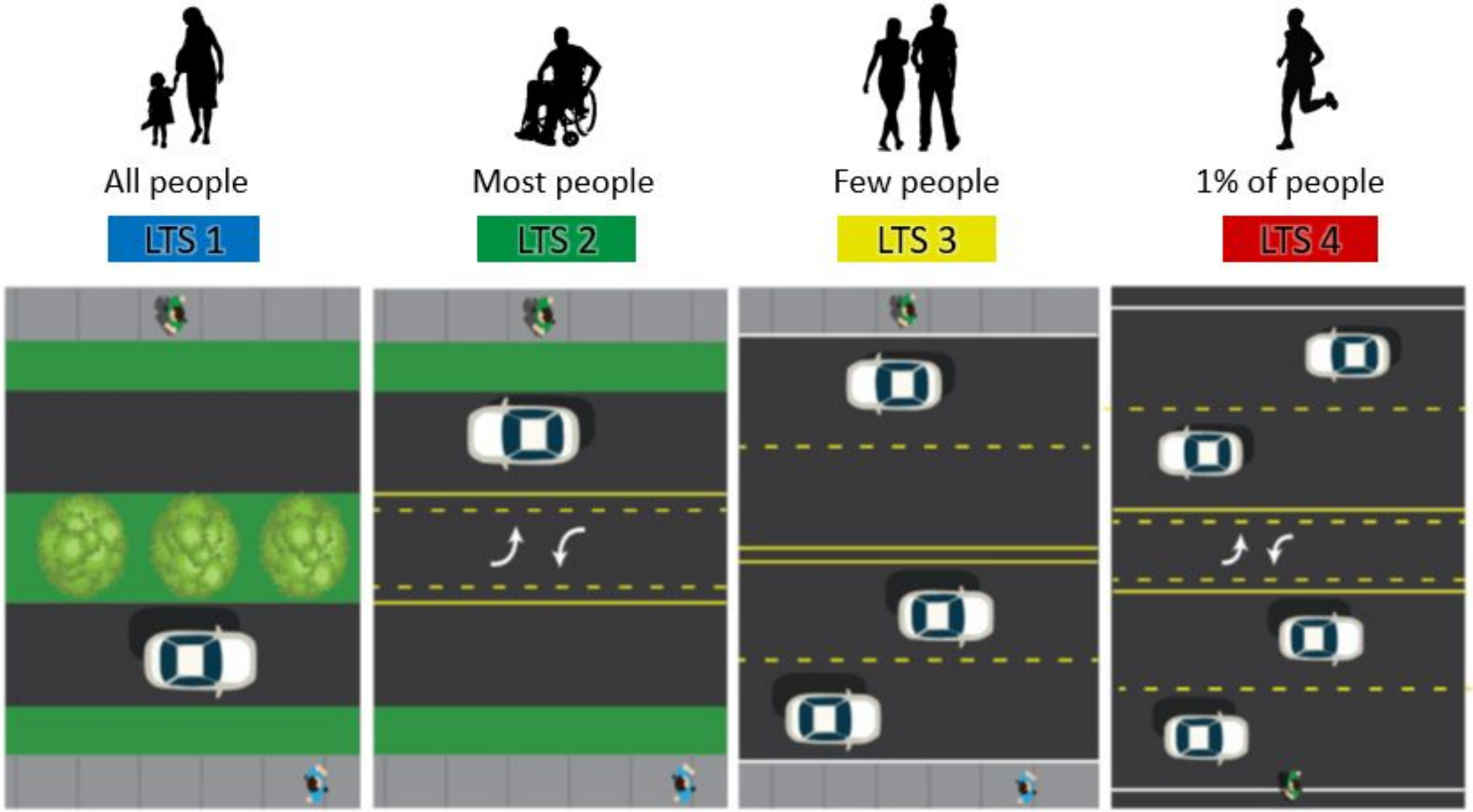
Characteristic	Target / Treatment
Operating speeds	Lowest acceptable vehicle travel speed (target speed)
Driveways (especially commercial)	Minimize number of accesses, provide smooth transitions for the PAR
Turn lanes	Only when necessary, seek alternatives
Parking lanes	Prioritize roadside parking as an additional buffer
Crossing distances	Reduce distances using bulbouts and median islands
Crossing barriers (e.g. median channelization)	Minimize the use of traffic barriers
Large (e.g. freight) vehicle traffic	Encourage slower travel speeds and turning movements by minimizing curb radii at intersections.
Minor pinch points (culverts, drain grates, offroad gravel intrusion, etc)	Minimize
Surface	Smooth and free of abrupt changes in vertical elevation

Characteristic	Target/Treatment
Grade and cross slope	Minimized grade and linear distance of slope
Bikeway width	Matched to expected volumes, providing shy space from traffic and obstacles.
Roadway width	Minimized to reduce crossing distances
Separation	Maximized by using shoulders, bike lanes, landscaped buffers, parking
Sight distance	Maximized for drivers and pedestrians by using curb extensions and removing obstructions including parking near intersections
Traffic conditions	Speeds are managed and lane numbers are minimized
Intersections/crossings	See intersection guidance
Conflict points	Eliminated, reduced, or spread out
Access to adjacent land use	Provide direct path between destinations
Lighting	Specifically designed to improve bicyclist vision, with other considerations including bicycle conspicuity to drivers and personal security

Bicycle Facility Selection for LTS2 or Better - DRAFT

Roadway Context			All Ages & Abilities Bicycle Facility
Target Motor Vehicle Speed	Target Motor Vehicle Volume	Motor Vehicle Lanes	
25 mph (or less)	up to 7000	2 or less E.D.	Bicycle Boulevard, Conventional Bike Lane, Buffered Bike Lane, Separated Bike Lane
	>7000	2 or more lanes E.D.	Buffered Bike Lane, Separated Bike Lane
	Any	3 or more lanes E.D.	Separated Bike Lane
30 mph	up to 7000	Single lanes	Bicycle Boulevard, Conventional Bike Lane, Buffered Bike Lane, Separated Bike Lane
		2 lanes E.D.	Buffered Bike Lane, Separated Bike Lane
	> 7000	2 or more lanes E.D.	Separated Bike Lane
> 30 mph	Any	Any	Separated Bike Lane

Level of Traffic Stress - Pedestrian



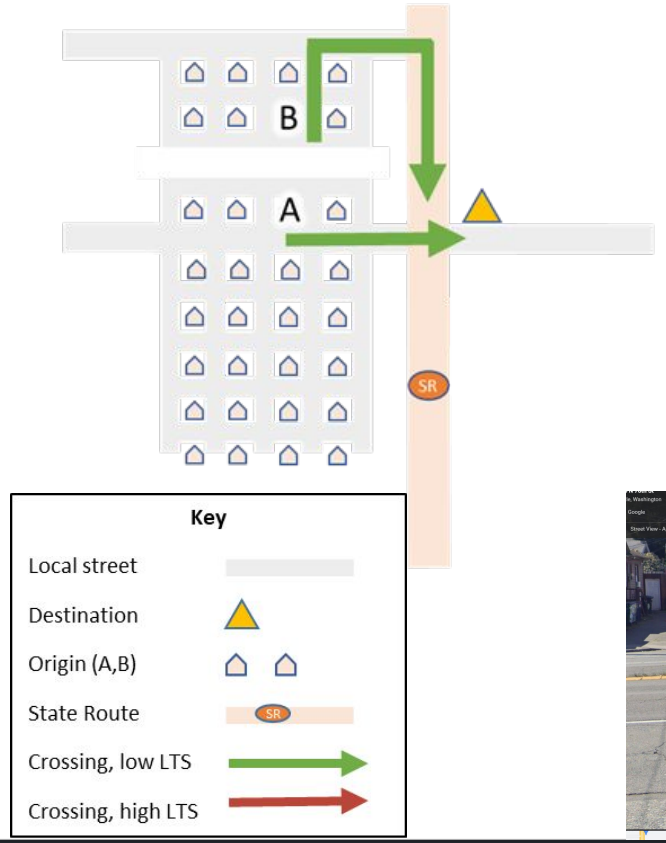
Route Directness Index

Route Directness Index (RDI)

- "How far out of my way do I need to go to cross the highway?"
- WSDOT Multimodal Permeability Pilot
- RDI tied to LTS

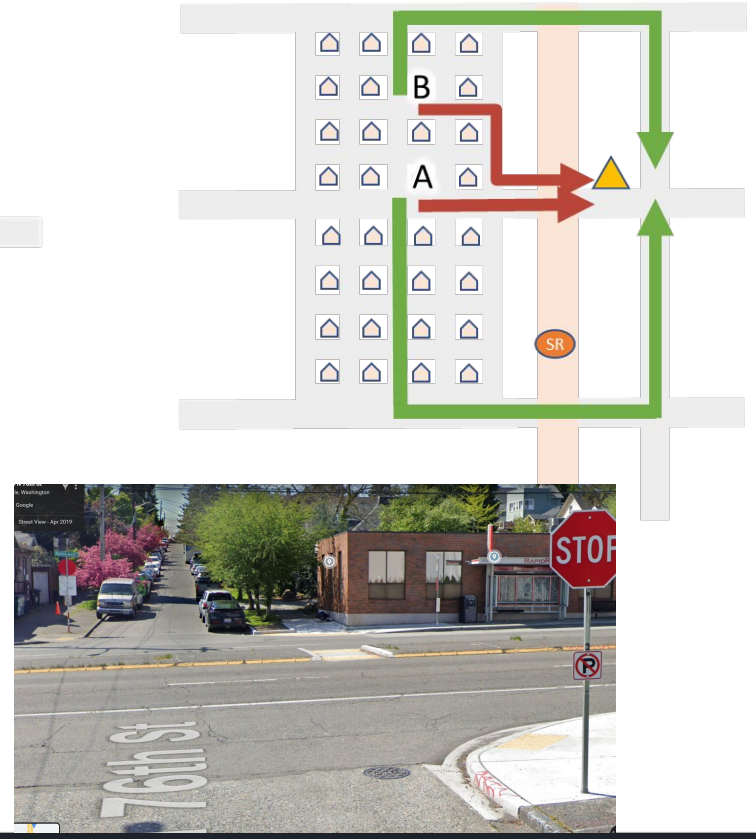
Physically high RDI:

Person B must go out of their way to reach a destination due to network design



Functionally high RDI:

Both person A and B must go out of their way to find a reasonable crossing.



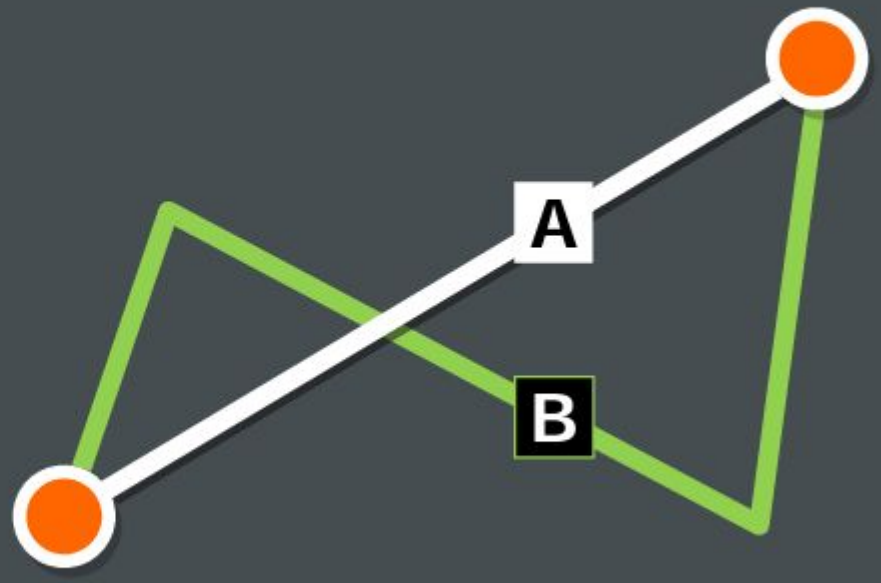
Route Directness Index

What is Route Directness Index?

straight-line distance “A”

actual route distance “B”

RDI = B / A

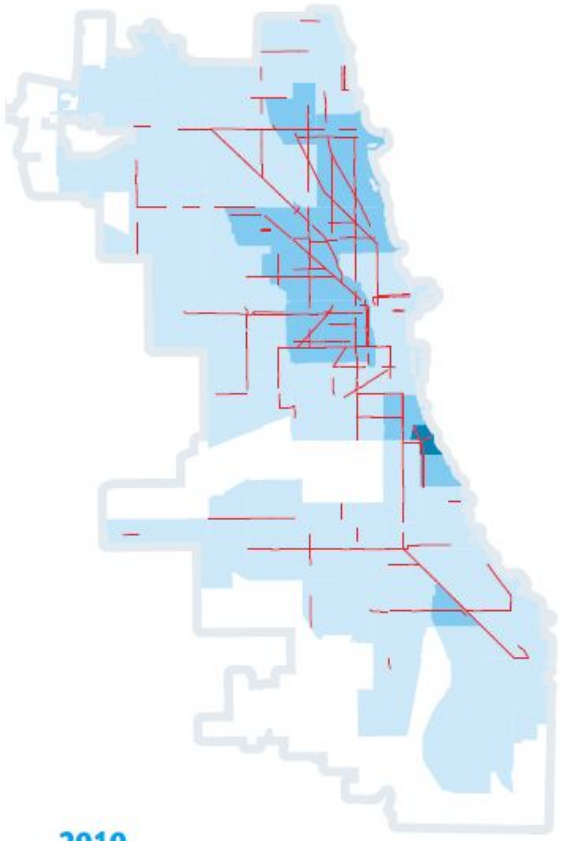


Route Directness Index

Resources

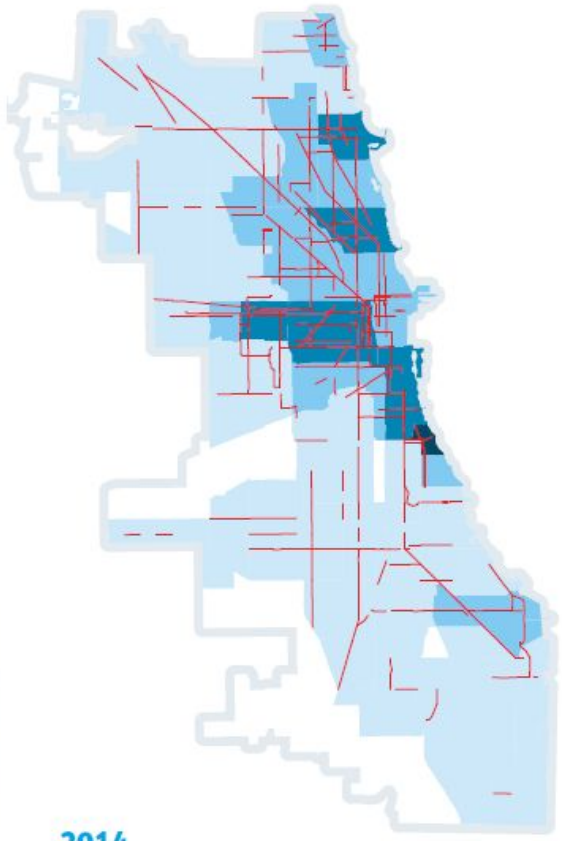
- WSDOT Active Transportation Plan: https://wsdot.wa.gov/construction-planning/statewide-plans/active-transportation-plan
- Multimodal Permeability Pilot: https://wsdot.wa.gov/sites/default/files/2021-11/MultimodalPermeabilityPilotReport-Aug2021.pdf
- WSDOT Complete Streets: https://wsdot.wa.gov/construction-planning/complete-streets
- Celeste Gilman presentation on WSDOT Complete Streets for PSU TREC: https://trec.pdx.edu/events/professional-development/friday-transportation-seminar-10142022
- NCHRP 1036 - Guidebook for Cross Section Reallocation: https://www.trb.org/Publications/Blurbs/182870.aspx
- Celeste Gilman, gilmanc@wsdot.wa.gov, 206.492.0993

Biking is Booming in Chicago

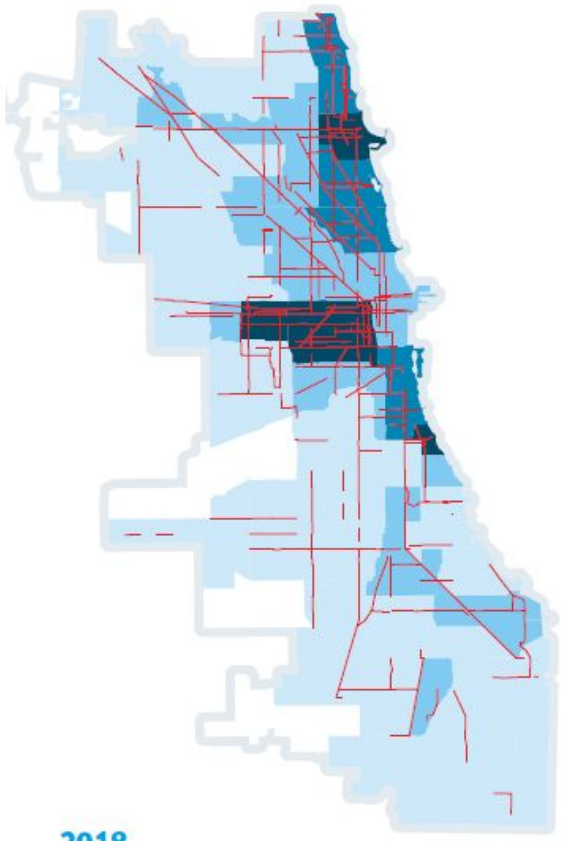


2010

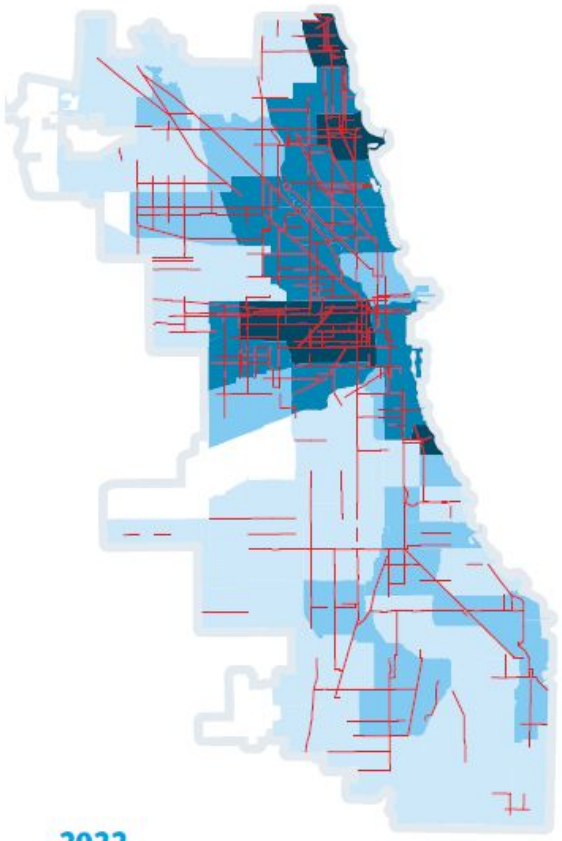
Total Network
193.2 miles
65% population within 1/2 mile
Low-Stress Network
47.2 miles
18% population within 1/2 mile



2014



2018

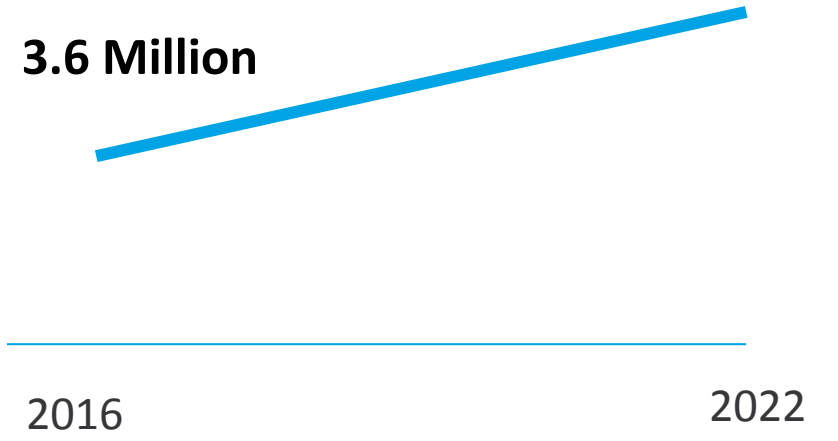


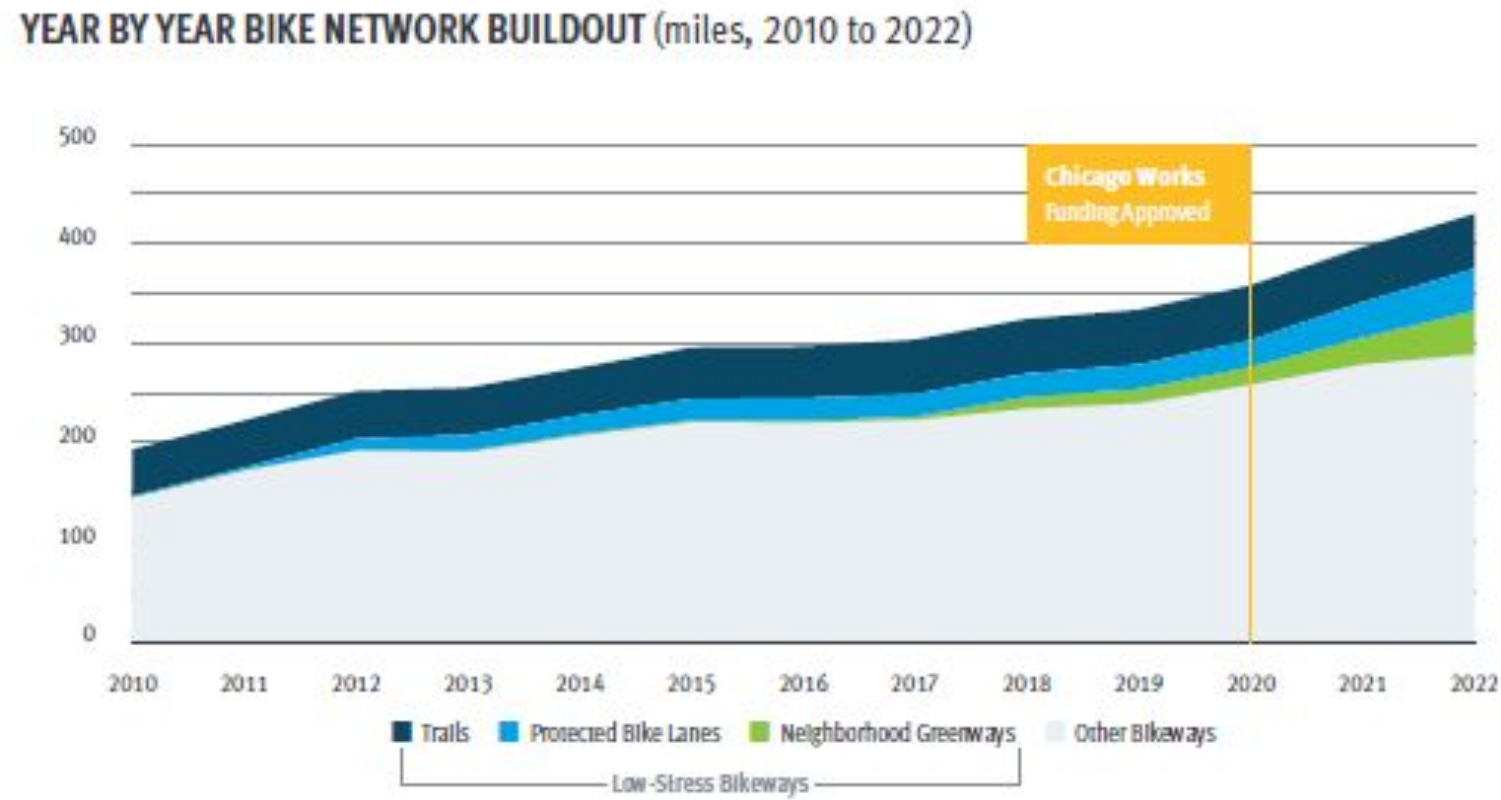
2022

Total Network
423.4 miles
86% population within 1/2 mile
Low-Stress Network
132.1 miles
51% population within 1/2 mile

Biking is Booming in Chicago

Annual Bikeshare Ridership





CDOT

Belmont Cragin youth victorious after two-year fight brings bike lanes to neighborhood

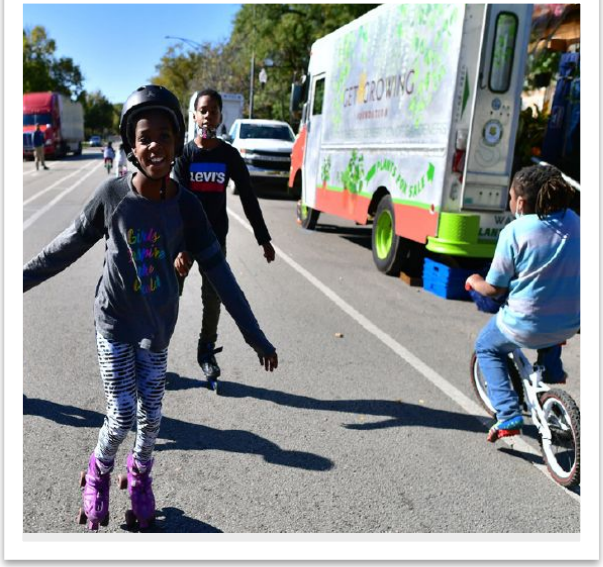
CHICAGO SUN-TIMES

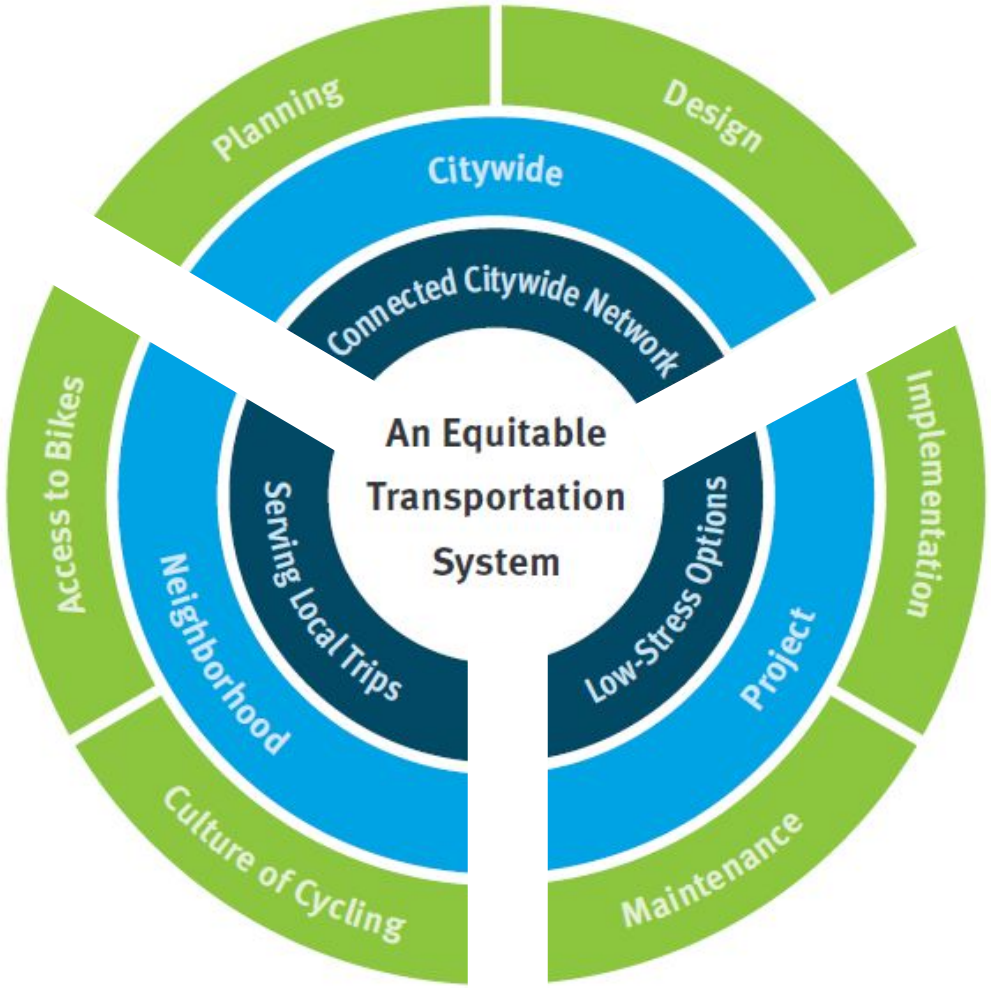
CDOT

Chicago to Add Concrete Barriers to All Protected Bike Lanes by 2023

5 CHICAGO

Comfort Looks Like This…





CDOT

DON'T STRESS IT

Low Stress Bikeways Intersection Selection

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Chicago Department
of Transportation

DEVELOPMENT REVIEW:
A COMPREHENSIVE TRANSPORTATION REVIEW

LAND DEVELOPMENT REVIEW: COMPREHENSIVE TRANSPORTATION REVIEW

Transportation System Performance: What's Most Important?

- Mobility?
- Accessibility?
- Safety?

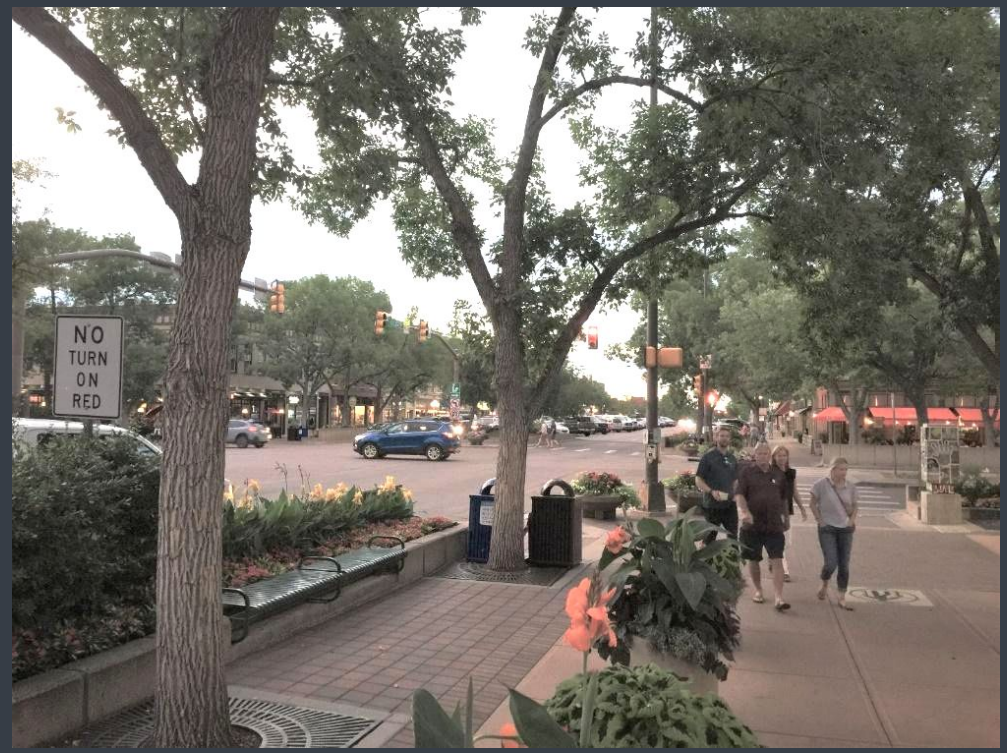
WHAT INFRASTRUCTURE IS SUFFICIENT TO MAXIMIZE SAFETY FOR CYCLISTS & PEDESTRIANS?

Context Matters!

Urban, Suburban, Rural?

Near a Mobility Hub, School Zone?

What's the Modal Priority of the Street(s)?



Approach in Year 2004:

Objective: Improve Pedestrian / Cyclist Safety

Create an Intersection Rating System

- Excellent
- Good
- Adequate
- Sub-par
- Poor

PEDESTRIAN RATING: POOR

- Inadequate Signal Timing
- Unwarranted “Hot Right” Lanes
- Sight Distance Problems

PEDESTRIAN RATING: SUB-PAR

- No Pedestrian Walk Signals
- Basic Traffic Infrastructure

PEDESTRIAN RATING: ADEQUATE

"SUB-PAR" ELEMENTS, PLUS:

- PEDESTRIAN WALK / DON'T WALK SIGNALS
- PEDESTRIAN REFUGE ISLANDS, WHERE POSSIBLE

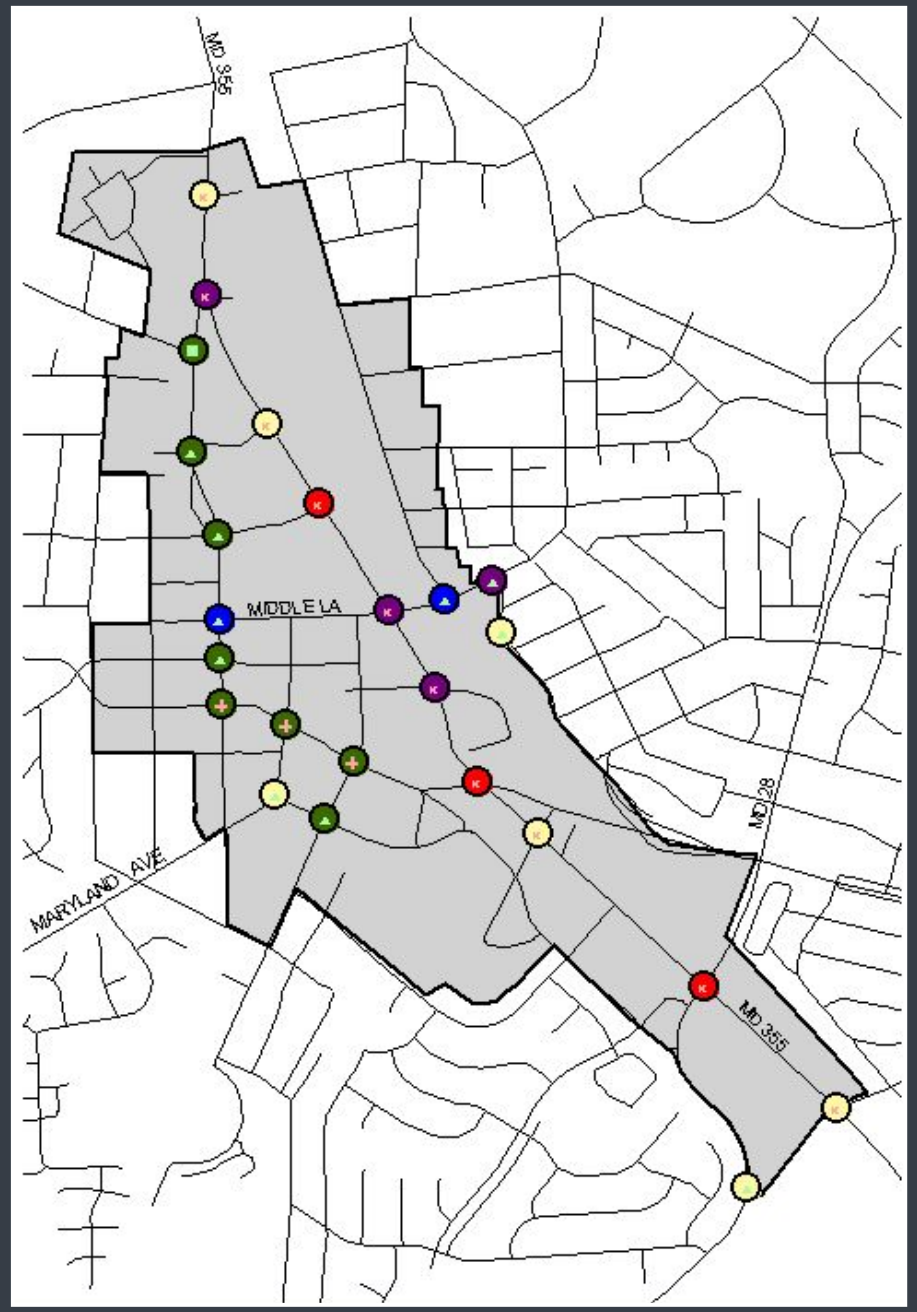
PEDESTRIAN RATING: GOOD

"Adequate" Elements, Plus:

- "Yield to Pedestrians" Signs
- Turn Restrictions
- Hatched Crosswalks

Pedestrian Rating: Excellent

"Good" Elements, Plus
Innovative Treatments,
Such as Paddle Signs, etc.



Application:
Off-site Study of Intersection Safety

Define "Adequate" / Requirements

Convey Application to Other Planning Functions

Intersection Ratings:

- Excellent
- Good
- Adequate
- Sub-par
- Poor

TIME TO UPDATE THE RATING SYSTEM!

CONTACT

Lawrence Marcus, Founder
Forward Progress, LLC

LMARCUS.@FORWARD-PROGRESS.COM

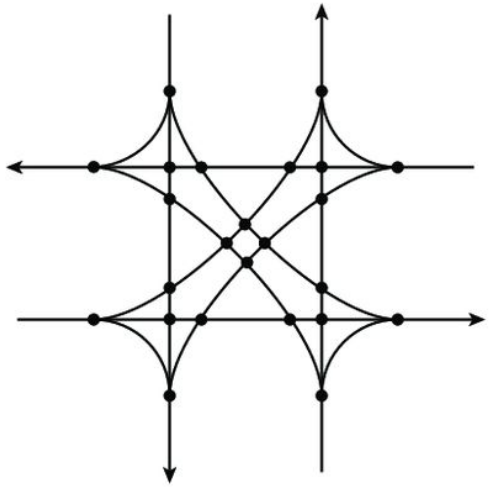
FORWARD PROGRESS

DON'T STRESS IT

Low Stress Bikeways Intersection Selection

CDOT
Chicago Department
of Transportation

Low Stress Intersection Selection



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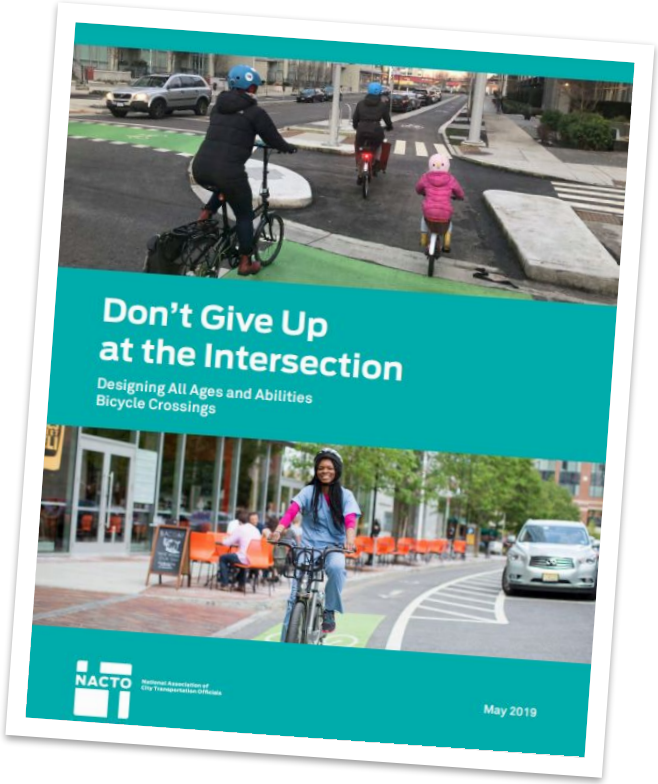


2019

CDOT

The Real Reason Ford Is Phasing Out Its Sedans

WALL STREET JOURNAL

Home / News

Lincoln Continental Is Canceled as Brand Shifts to All-SUV Lineup

CAR AND DRIVER

Dead: Chevy Bolt EV and Bolt EUV

The Bolt EV and Bolt EUV don't have much of a future with the upcoming Blazer EV and Equinox EV.

JALOPNIK

CAR BUYING

Trucks And SUVs Are Now Over 80 Percent Of New Car Sales In The U.S.

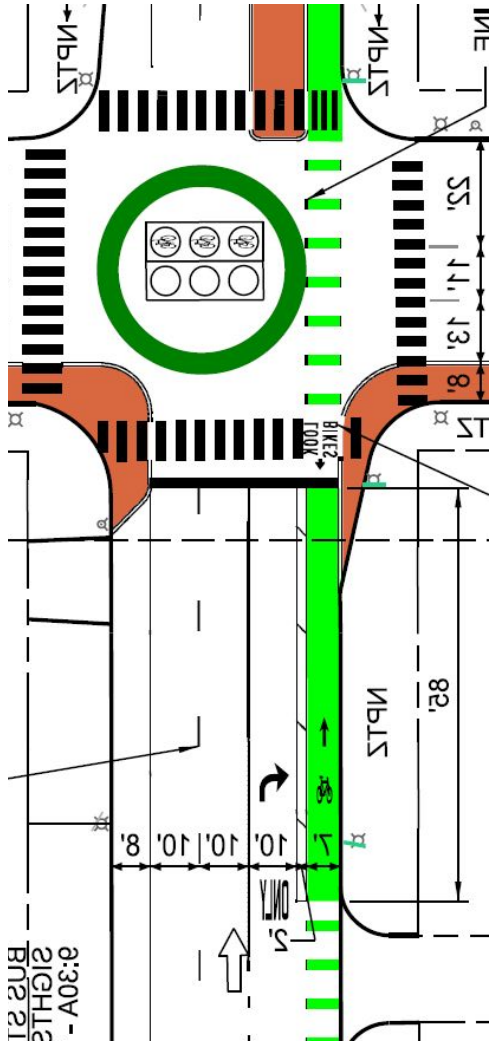
JALOPNIK

CDOT

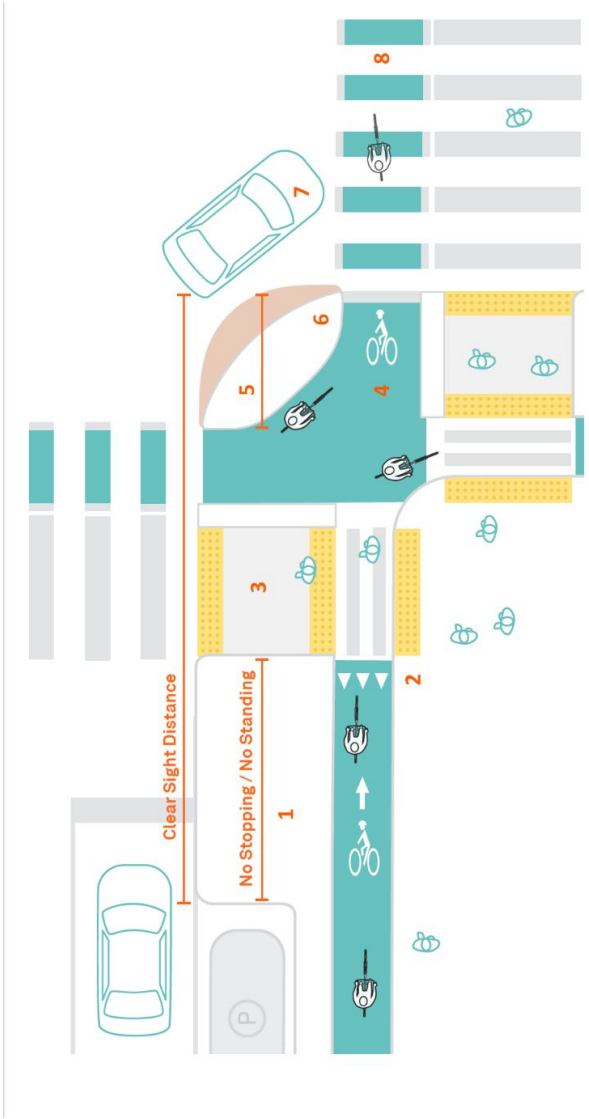
TODAY

CDOT

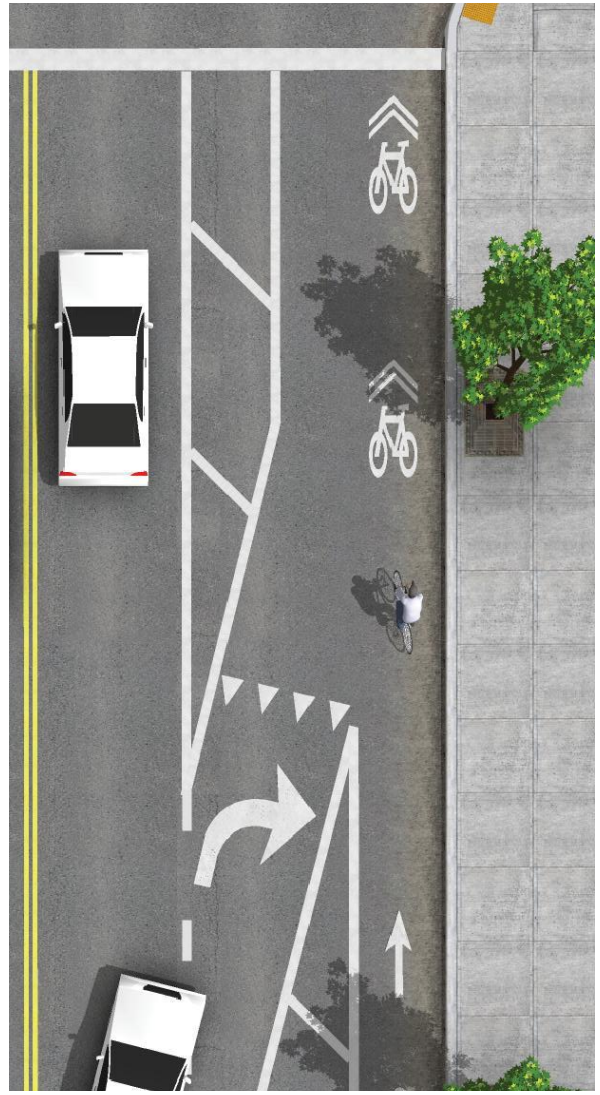
BIKE SIGNAL / SPLIT PHASE



OFFSET / PROTECTED INTERSECTION



MIXING ZONE



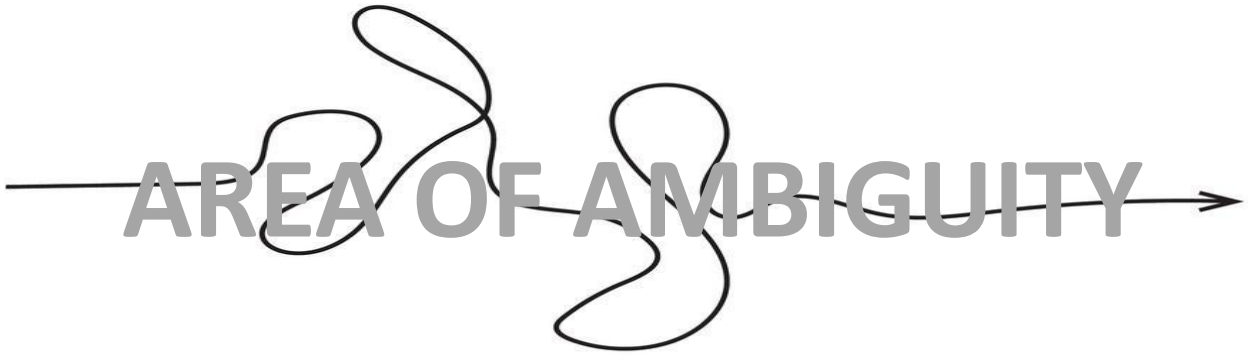
CDOT

One Way PBL Intersection Selection Matrix

Vehicles per hour turning across PBL	Bike Signal	Offset Intersection
LOW	Not Recommended	Preferred
HIGH	Preferred	Not Recommended

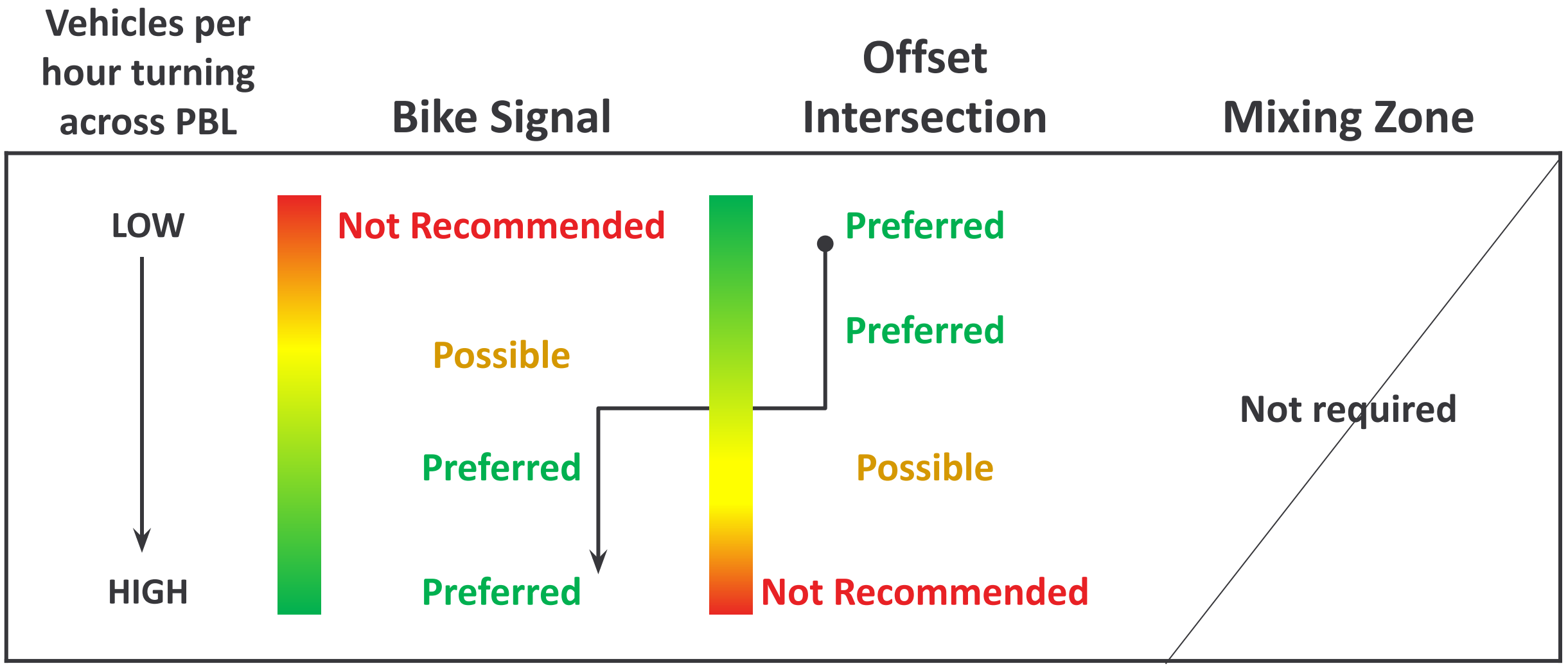
CDOT

One Way PBL Intersection Selection Matrix

Vehicles per hour turning across PBL	Bike Signal	Offset Intersection	Mixing Zone
LOW	Not Recommended	Preferred	Not Preferred but *possible*
			
HIGH	Preferred	Not Recommended	

CDOT

One Way PBL Intersection Selection Matrix

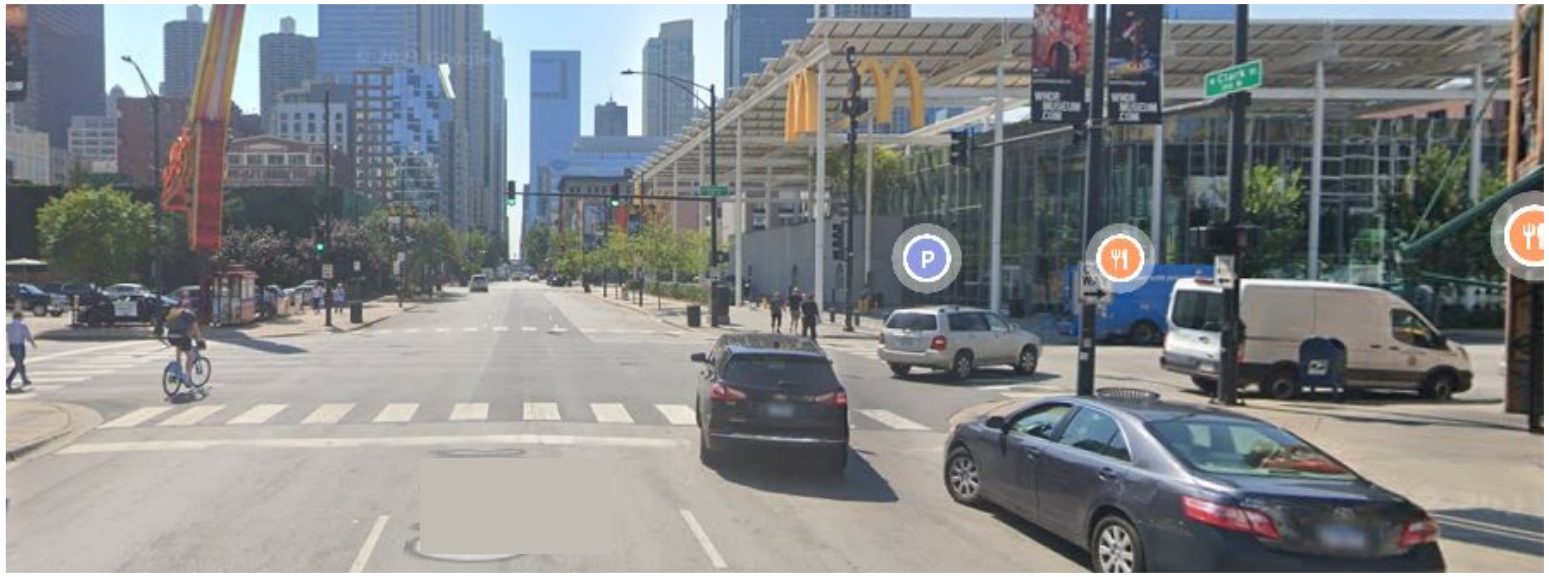


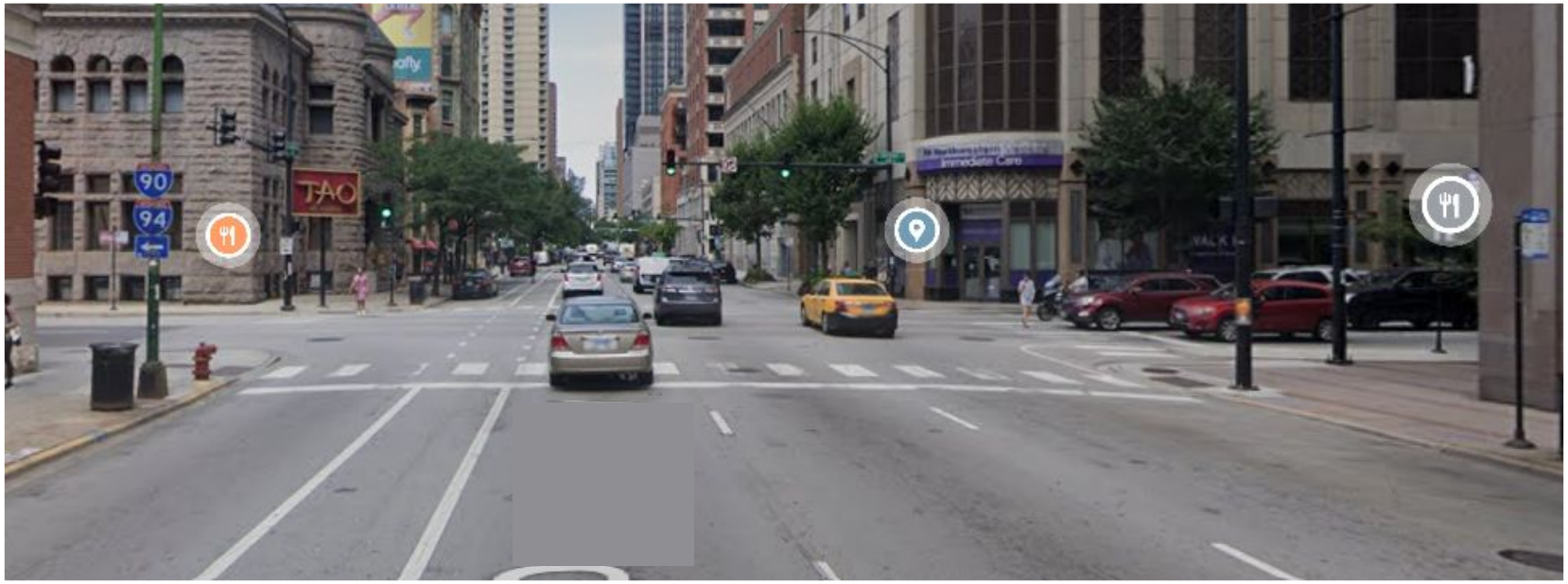
CDOT

One Way PBL Intersection Selection Matrix

Vehicles per hour turning across PBL	Bike Signal	Offset Intersection	Mixing Zone
<50	Not Recommended	Preferred	Not generally required
50 – 100	Possible	Preferred	
101 – 150	Preferred	Possible if necessary	
> 150	Preferred	Not Recommended	

CDOT

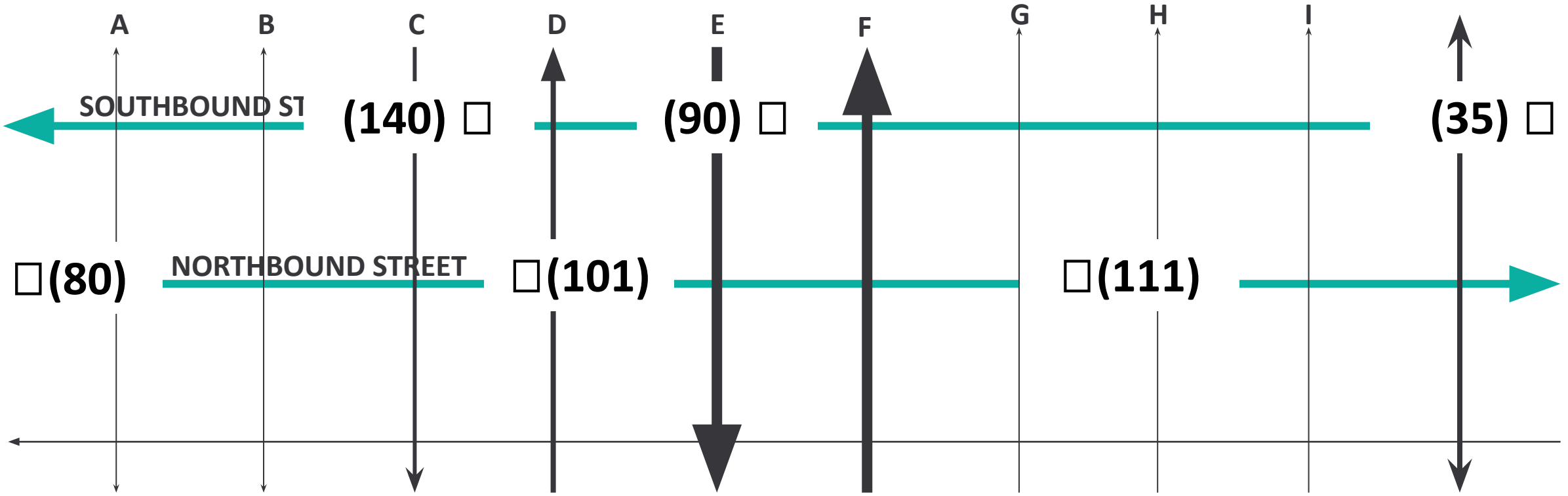




CDOT

DRAFT FOR DISCUSSION PURPOSES

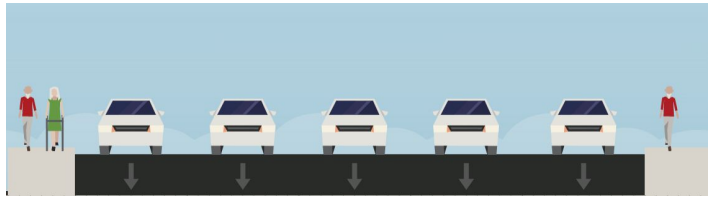
Vehicles per hour turning across PBL	Bike Signal	Offset Intersection
50 – 100	Possible if necessary	Preferred
101 – 150	Preferred	Possible if necessary



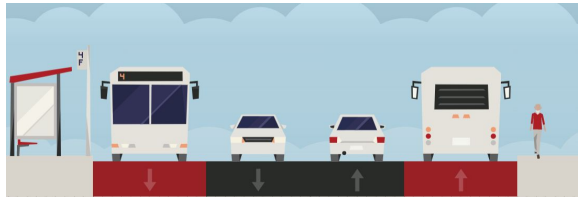
CDOT

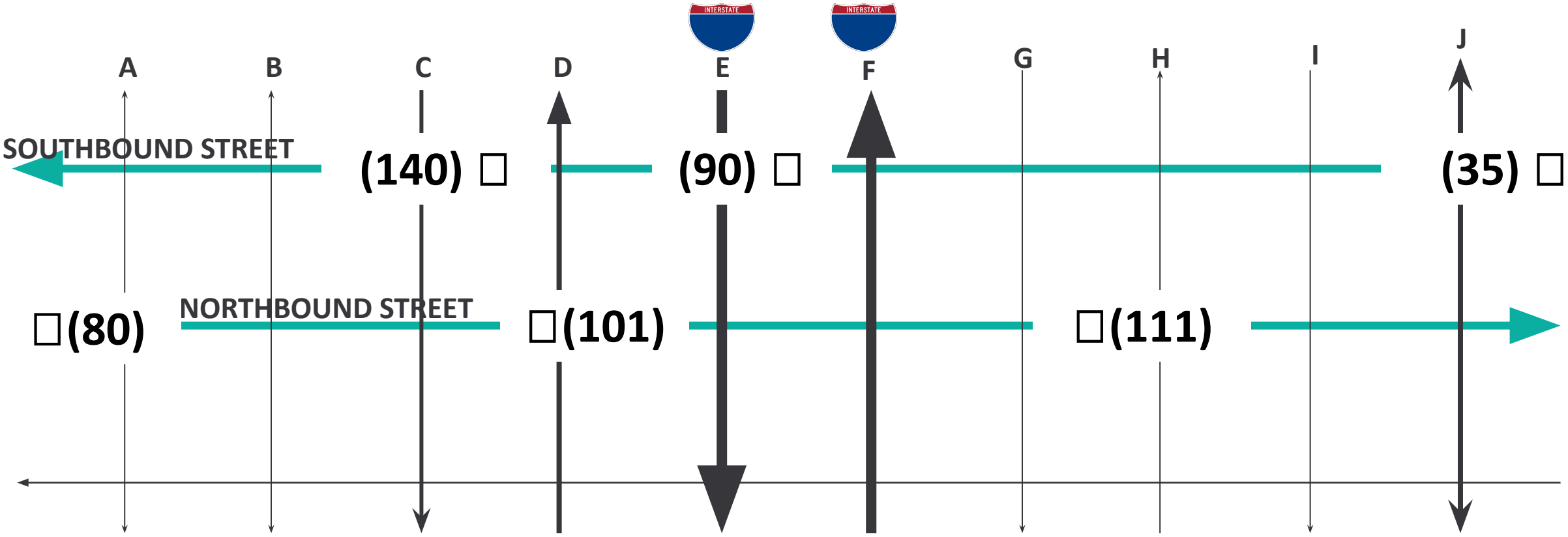
Where are the three bike signals?

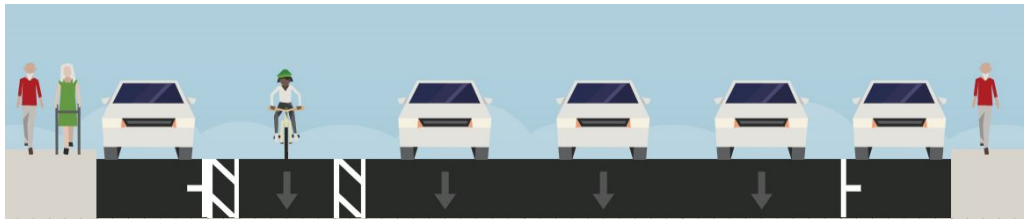
Avenue E & F



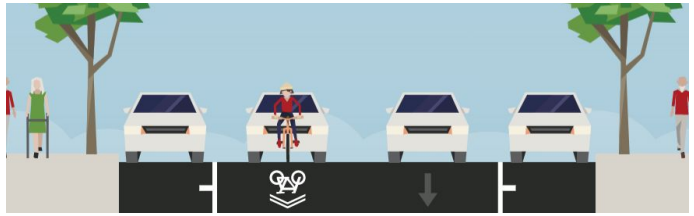
Avenue J







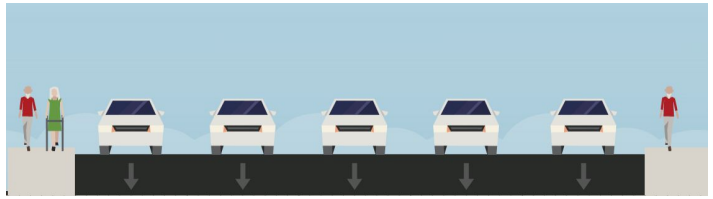
Avenue C & D



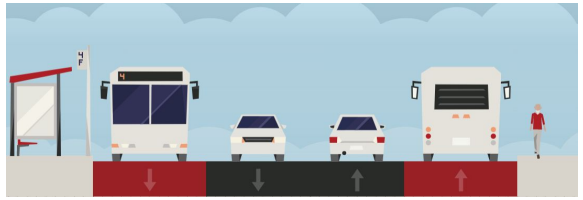
Avenue A & H

CDOT

Avenue E & F



Avenue J

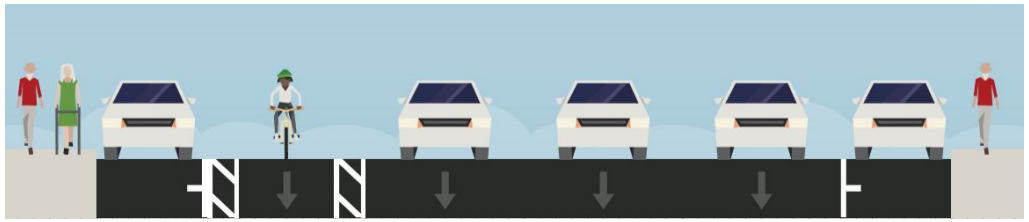


A B C D E F G H I J

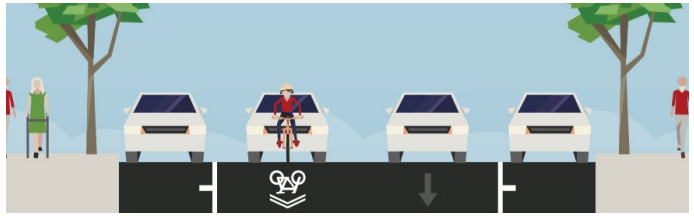
SOUTHBOUND STREET

(140) □ (90) □ (35) □

□(80) NORTHBOUND STREET □(101) □(111)



Avenue C & D



Avenue A & H

CDOT

DRAFT FOR DISCUSSION PURPOSES

Low Stress Intersection Selection…

Context Matters

Factors can amplify or mitigate the vehicle turning movement numbers

- History / expectation of bikes
- Driver mindset (commuting, local access)
- Cross street lane configuration
- Design vehicle choice
- Speed limit
- Density of pedestrians and use of LPI
- Platooning

Numbers Matter

Break down the counts

- 3600 seconds per hour
- 60 seconds per cycle (50/50 split)
- 100 vph turning across PBL
- 1.6 vehicles per cycle

How many vehicle-bike interactions, what are they, and how are they mitigated/amplified by what's happening?

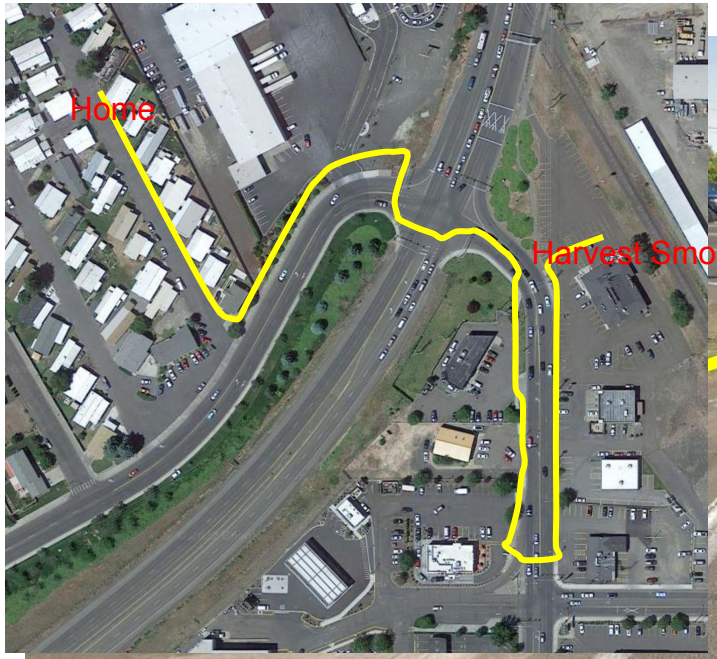
CDOT

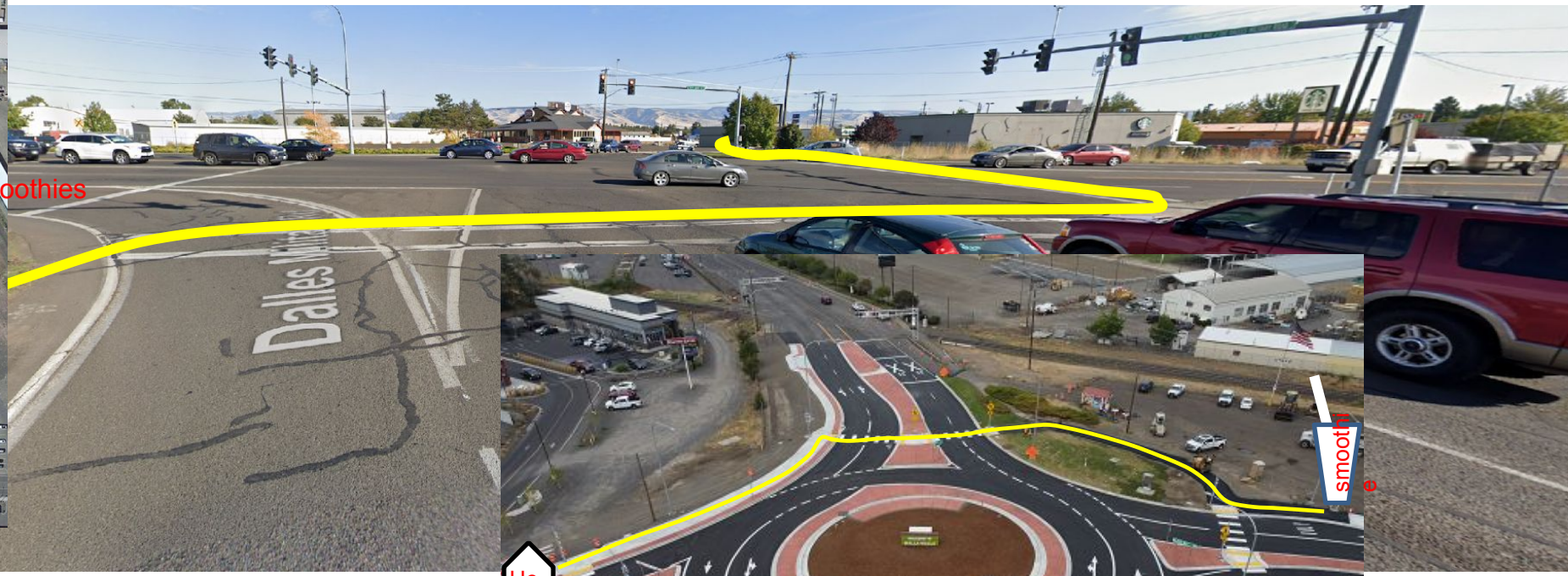
Don’t Stress It: Bikeway Level of Comfort Metrics

Celeste Gilman, Strategic Policy Administrator, Active Transportation Division
Washington State Department of Transportation

May 15, 2023

RDI Example – Walla Walla





Example Facilities

W Main Ave, Spokane

Before

After

W. Sunset Blvd, Spokane

Before

After

SR 99, Seattle

Before

By Michelle Baruchman and Asia Fields
Seattle Times staff reporters

Bergen Fuglestad, a 20-year-old University of Washington student, is an avid runner and hiker. Over the summer, she climbed 14,500-foot Mount Whitney in California and bought a 2000 Dodge camper van to better access Washington's trailheads.

On Monday evening, she was running on the upper trail around Green Lake near Aurora Avenue North when a driver hopped the curb. The vehicle struck her from behind on the path, sending her 40 feet through the air and leaving her immobile when she landed, her father, Jim Fuglestad, told The Seattle Times.

Source: Esri

MARK NOWLIN / THE SEATTLE TIMES

A statement from the Seattle Police Department said the collision occurred about 5 p.m. on the 6700 block of Aurora Avenue North — close to the path.


After


Before
Hwy 99


After

Aurora Avenue and N 92nd St

- 92nd 6 crashes (3yrs prior to project). No crashes (16 month after)
- 88th-94th (26% drop in all crashes, 47% drop in injury crashes)

Dexter Ave, Seattle

15th Ave, Seattle

Before

After

Future Projects

Burlington

Project: SR 20 Paving

Location:

- AADT 19,000, speed limit 30mph
- Identified as a portion of an overburdened community
- Gaps are identified in WSDOT's Active Transportation Plan
- The City of Burlington is excited for the opportunity to partner with WSDOT to identify improvements needed on and off the highway system to support active transportation and transit

Bellingham

Projects: SR 539/I-5 Fish Passages, Paving, ADA

Located in:

- AADT 51,000, speed limit 35mph, T2 freight route
- Identified as an overburdened community
- Transit route, no pick-ups along this busy corridor
- Gaps identified in WSDOT's Active Transportation Plan
- City of Bellingham ADA and Walking Plans identified needs
- Bicycle route identified off this corridor, this more comfortable route – not fully developed

Lots of activity squeezed into a small space

SeaTac/Tuckwila

Project: SR 99/SR 518 Pedestrian Improvements

Location

- AADT 32,320, speed limit 40mph
- Freight classification T-2
- Posted speed 40 mph
- SR 518 BRT in median with pedestrian bridge connection to light rail and possible southside redevelopment or SR 518 on-ramp
- Metro A Line on SR 99
- Transit oriented development
- Rental car facility

SeaTac/Tuckwila

Project: SR 99/SR 518 Pedestrian Improvements

Location

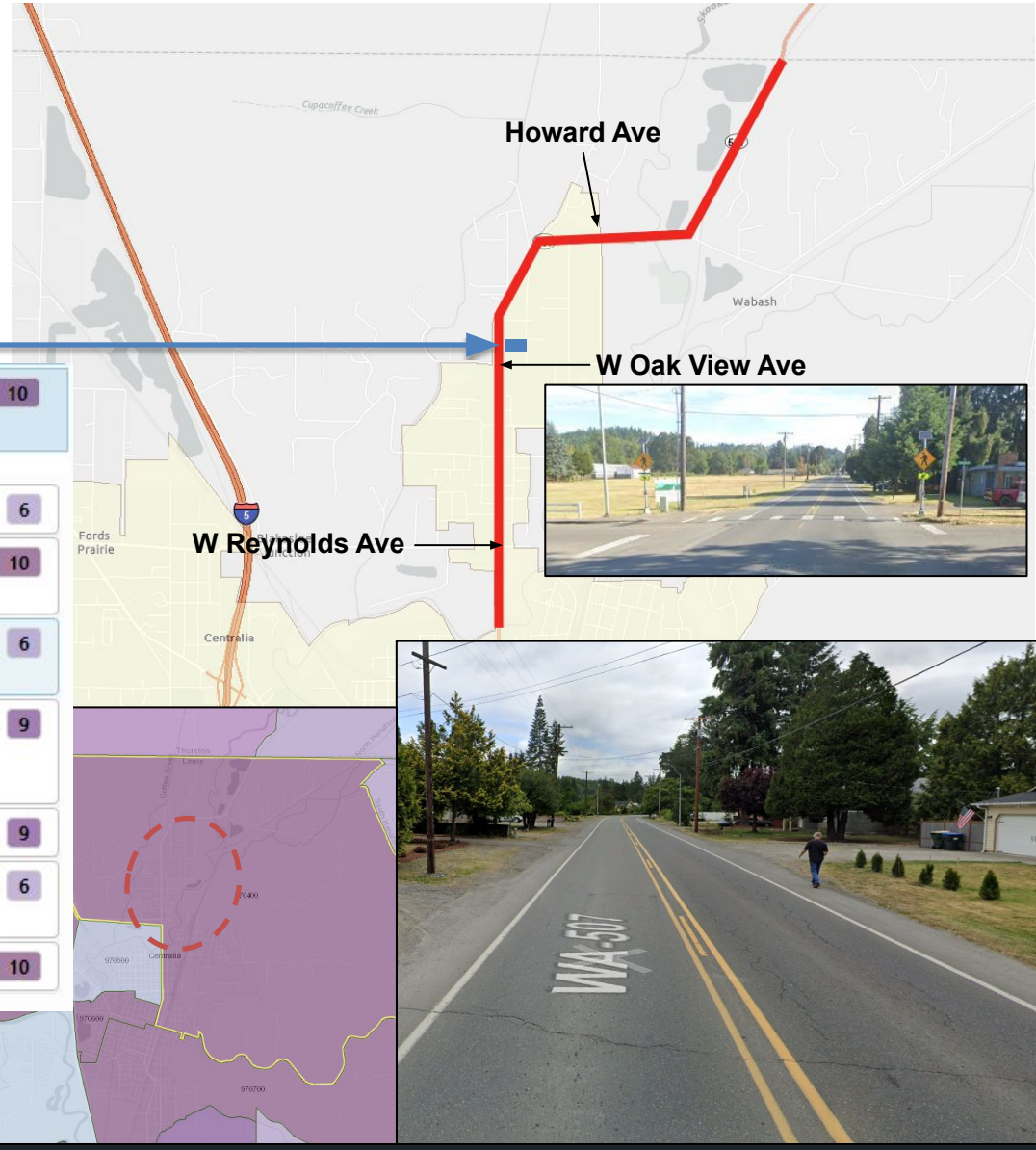
- Ramp termini
- Existing light rail station
- Bus Rapid Transit in design
- Overburdened community (Environmental Health Disparity Map rank 10)
- Gaps identified by cities, Sound Transit, and WSDOT
- Strategy identified in SR 518 Corridor Study

Centralia

Projects: SR 507/Skookumchuck River to Thurston Co Line – Pavement Rehabilitation

Characteristics:

- Oakview Elementary School
- AADT 9,400 at Reynolds, 3,800 at City limits
- 35 mph posted speed within City limits
- Designated T-3 Freight Route with significant potential for freight development to the north
- RuralTRANSIT - Route 4 stop to the south



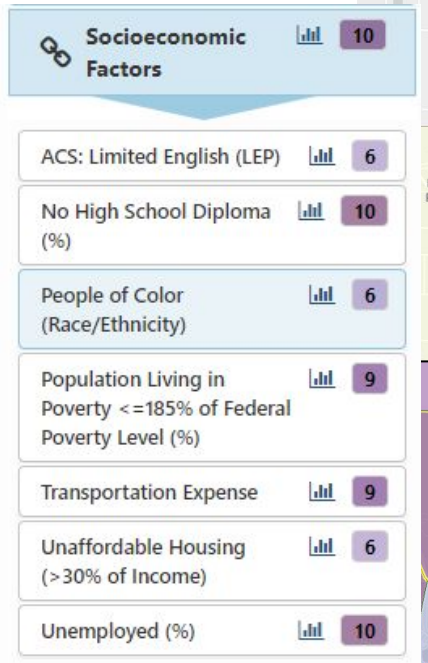
Socioeconomic Factors	10
ACS: Limited English (LEP)	6
No High School Diploma (%)	10
People of Color (Race/Ethnicity)	6
Population Living in Poverty <=185% of Federal Poverty Level (%)	9
Transportation Expense	9
Unaffordable Housing (>30% of Income)	6
Unemployed (%)	10

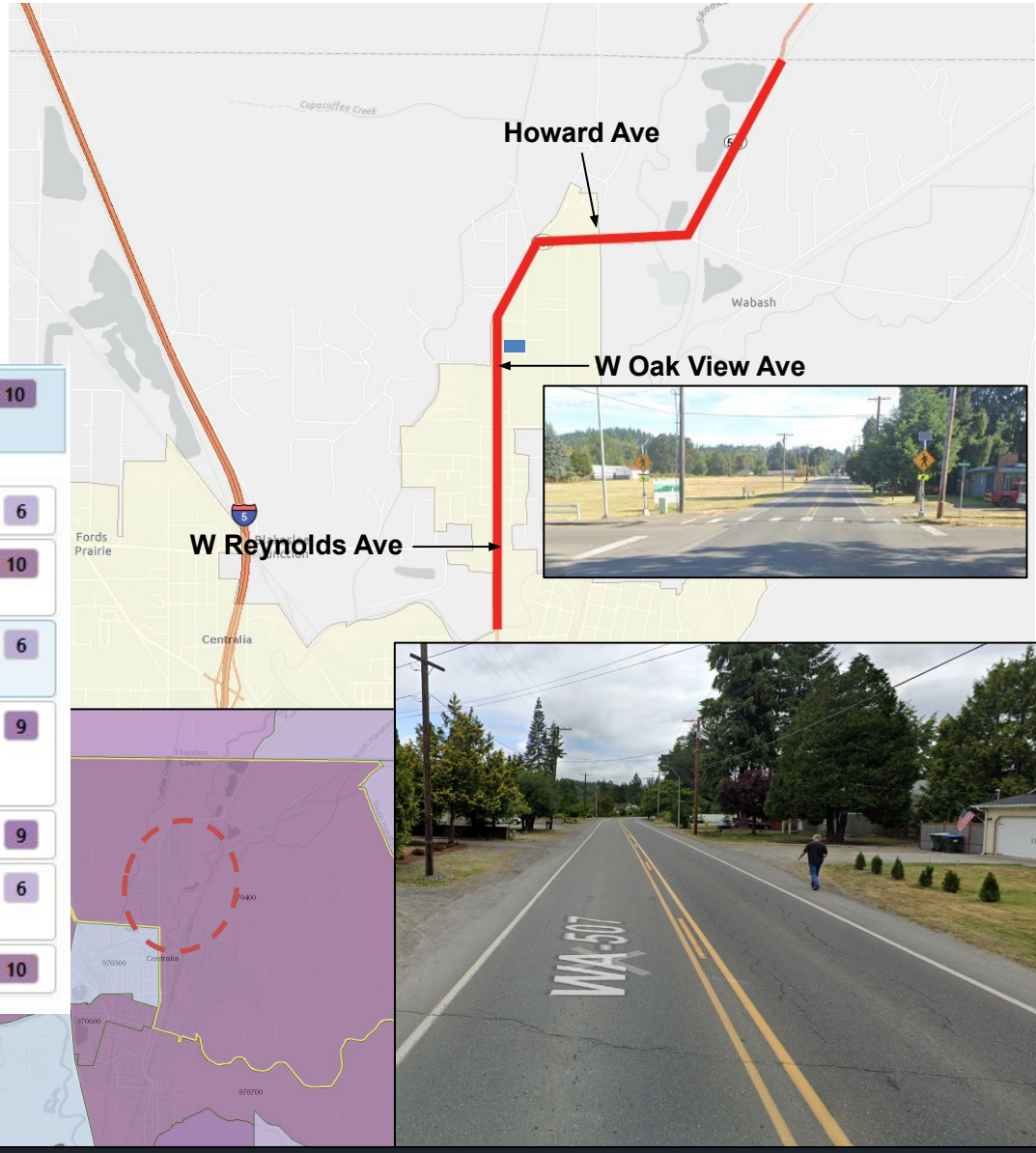
Centralia

Projects: SR 507/Skookumchuck River to Thurston Co Line – Pavement Rehabilitation

Characteristics:

- Significant flooding potential
- Mixture of residential and commercial, more commercial towards W Reynolds Ave
- Little to no sidewalk, unpaved shoulders, one enhanced crossing at W Oak View Ave
- Setback utilities = approx. WSDOT right of way available for improvements





Ritzville

Project: I-90/SR 261 EB Bridge Rehab (SR 261 between I-90 ramps)

Location:

- AADT 6,300, speed limit 35mph, T-3 freight
- City of Ritzville
- Gaps are identified in WSDOT's Active Transportation Plan
- New mixed-use development will increase demand for active transportation
- WSDOT project will explore what can be implemented within the constrained space under the existing I-90 bridges
- City study will identify additional active transportation strategies for the area, including long-term solution under I-90 for when bridges are replaced

Resources

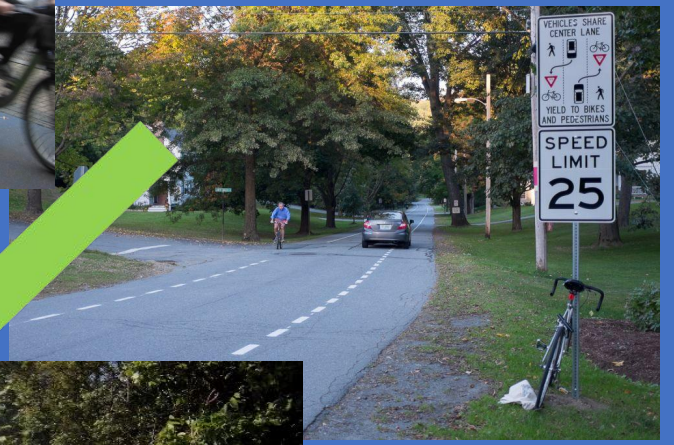
- WSDOT Active Transportation Plan: https://wsdot.wa.gov/construction-planning/statewide-plans/active-transportation-plan
- Multimodal Permeability Pilot: https://wsdot.wa.gov/sites/default/files/2021-11/MultimodalPermeabilityPilotReport-Aug2021.pdf
- WSDOT Complete Streets: https://wsdot.wa.gov/construction-planning/complete-streets
- Celeste Gilman presentation on WSDOT Complete Streets for PSU TREC: https://trec.pdx.edu/events/professional-development/friday-transportation-seminar-10142022
- NCHRP 1036 - Guidebook for Cross Section Reallocation: https://www.trb.org/Publications/Blurbs/182870.aspx
- Celeste Gilman, gilmanc@wsdot.wa.gov, 206.492.0993

Don’t Stress It: Bikeway Level of Comfort Metrics

Francisco Lovera, P.E., Complete Streets Engineer, MassDOT

Charles River Dam Road

mass
Massachusetts Departm



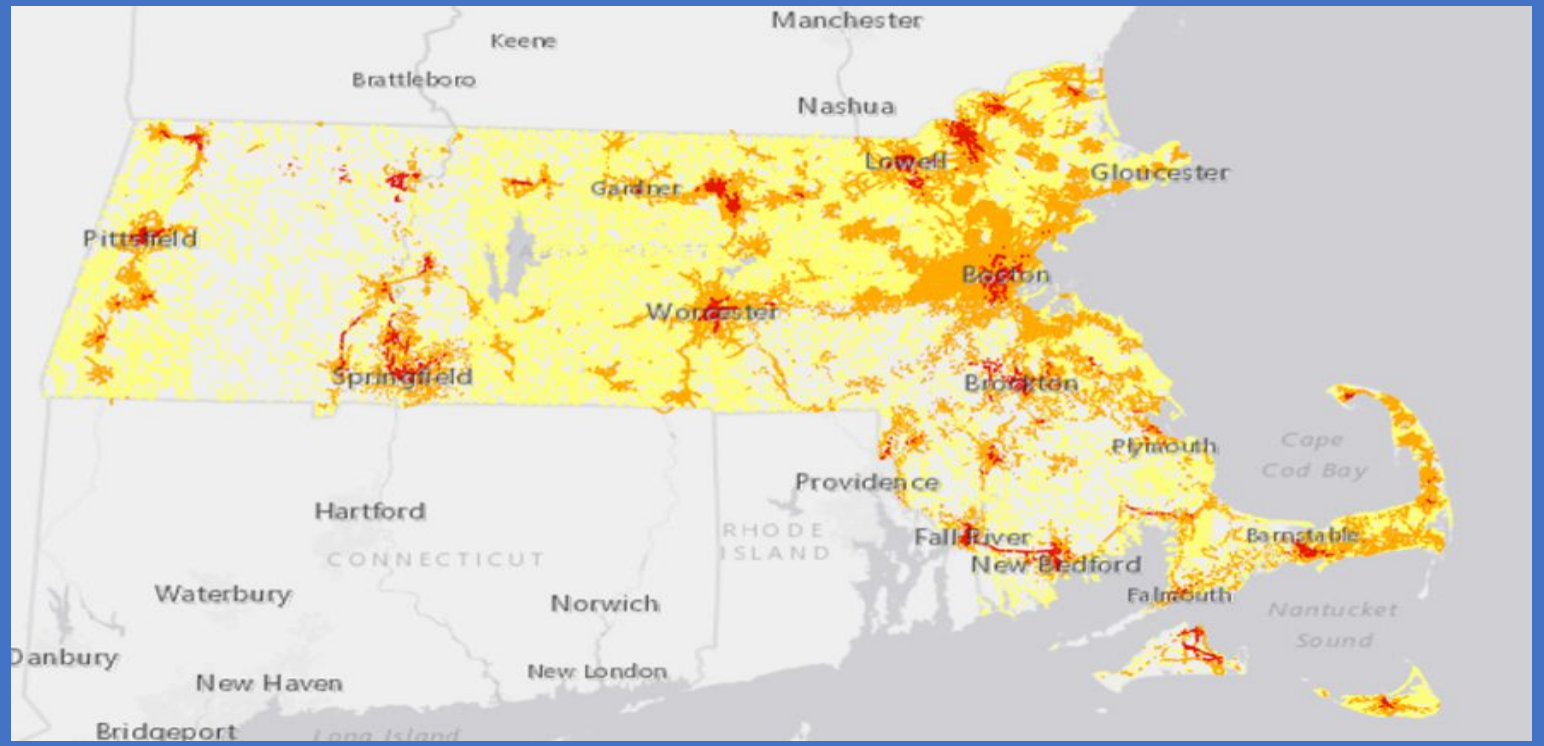
massDOT
Massachusetts Department of Transportation

Bicycle Facilities Criteria

- Bicycle facilities required (where bicycles are legally allowed) *except* for local roads
- Bicycle facilities shall have separation (shared use path, side path, separated bike lane, buffered bike lane) if…
  - Posted speed limit ≥ 40 MPH
  - Vehicular volumes ≥ 10,000 vehicles per day
  - Roadway has more than one travel lane in a single direction
  - Intersection more than one travel lane in a single direction
  - Roadway classified as corridor with a High Potential for Everyday Biking
- Minimum width 5’-0” (single direction), 10’-0” (bi-directional)
  - Does not include curbs, buffers

massDOT
Massachusetts Department of Transportation

Potential for Everyday Biking



Legend

Biking_Potential_Layer

Potential

- High
- Medium
- Low

The Potential for Everyday Biking methodology calculates the likelihood of everyday short trips by bike if safe, comfortable, and convenient bikeways existed. Available for Potential for Walkable Trips too.

https://www.mass.gov/service-details/bicycle-plan

massDOT
Massachusetts Department of Transportation

Vision

All people in Massachusetts will have a **safe, comfortable, and convenient** option to walk for short trips.

Goal 1

Eliminate pedestrian fatalities and serious injuries.

Goal 2

Increase the percentage of short trips made by walking.

MASSACHUSETTS
BICYCLE TRANSPORTATION PLAN

#MABIKEPLAN

massDOT

Vision

Biking in Massachusetts will be a **safe, comfortable, and convenient** option for everyday travel.

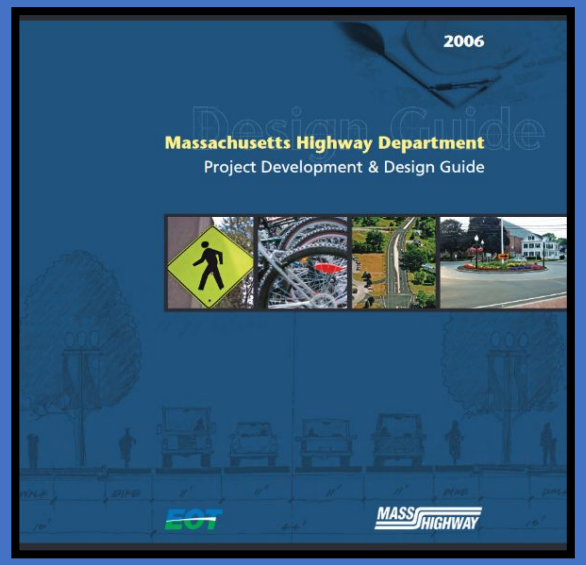
Goal 1

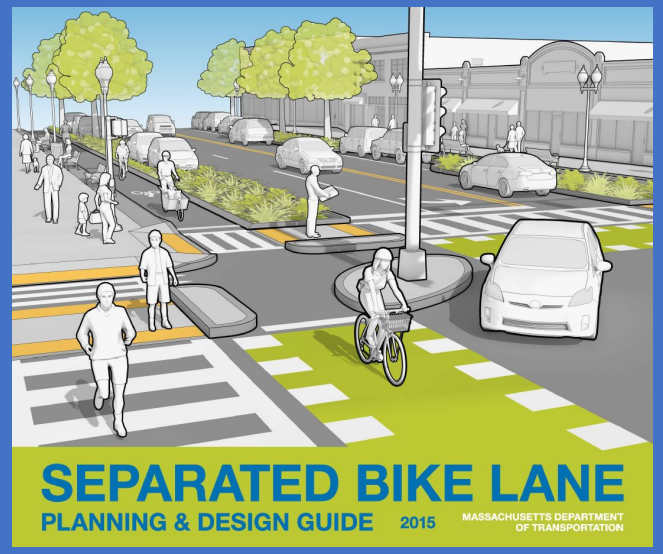
Eliminate bicyclist fatalities and serious injuries.

Goal 2

Increase the percentage of everyday trips made by bicycling.

Design Guides





https://www.mass.gov/lists/design-guides-and-manuals

Metric for Infrastructure Projects

- Looking for alternative to motor vehicle Level of Service for evaluating projects.

- Project Development and Design Guide Update
  - Removing LOS references for pedestrian and bicycle modes
  - Focusing on safety rather than level of service

- Infrastructure that work for all, as early as 3-year-old and their caregivers.

- Comfortable for all. A step above safety

City of Fort Collins

Fort Collins MMLOS

Tyler Stamey, P.E.

Existing Requirements

- Adopted in 1997
- Level of Subjectivity
- Established requirement for MMLOS
- Bicycle Standards shown

Figure 3. Bicycle LOS Standards

connectivity required for levels of service:

A	directly connected to both North-South and East-West on-street lanes
B	directly connected to both North-South and East-West corridors at least one of which is a set of on-street lanes
C	directly connected to either a North-South or an East-West corridor which is a set of on-street lanes
D	directly connected to either a North-South or an East-West corridor which is an off-street path
E	indirectly connected via an on-street unstriped route along a low volume local street to one or more of the above within 1/4 mile
F	no direct or indirect connections to either North-South or East-West corridors

minimum LOS

base city-wide minimum level:	C
public school sites:	A
recreation sites:	B
community / neighborhood commercial centers:	B

Existing Requirements

Table P- 3: Targeted Level of Service by Pedestrian Priority Area

	Directness	Continuity	Street Crossing	Visual Interest and Amenity	Security
Pedestrian Districts	A	A	B	A	A
Activity Centers and Corridors	B	B	C	B	B
School Walking Areas	B	B	B	C	B
Transit Corridors	B	C	C	C	B
Other Areas Within City	C	C	C	C	C

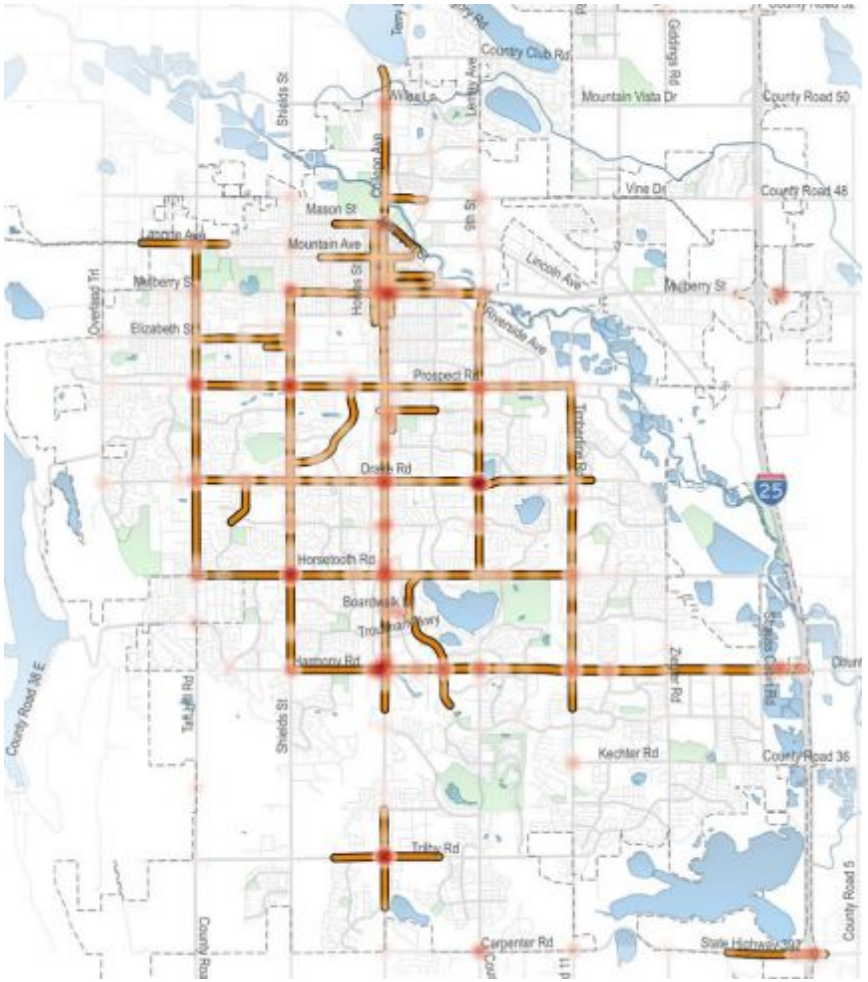
- Different standard by area type

Challenges

- Subjectivity
- Requirements to implement change
- Coordination
- Cost

Proposed Changes

- Revised Process Flowchart
- Pulls in Active Modes Plan
- Links to Vision Zero Action Plan
- Require more analysis in TIS for anything that is not a car



Proposed Changes

Table 1. Bicycle Trip Generation Criteria, Peak Hour Bicycle Trip – Draft Proposal

Infrastructure Criteria	No approved TDM Plan	With <5 TDM points	With >5 TDM points
There are no existing bicycle facilities connecting to the development	2% of vehicular trips	3% of vehicular trips	5% of vehicular trips
There are existing but deficient bicycle facilities (do not meet AMP standard), without key destinations within sphere of influence	4% of vehicular trips	6% of vehicular trips	8% of vehicular trips
There are existing but deficient bike facilities and key destinations within sphere of influence	6% of vehicular trips	8% of vehicular trips	12% of vehicular trips
There are existing bicycle facilities	8% of vehicular trips	12% of vehicular trips	18% of vehicular trips

Proposed Changes

Table 2. Bicycle Desired Flow Rate

Bike Lane Width (ft)	Peak Hour Directional Volume
One-way PBL	
5.5 - 8.5	150
8.5 - 10	750
Two-way PBL	
9 - 12	150
12 - 16	350

Table 3. Bike Impact Fee Calculation Example – Draft Proposal

Desired Bike Flow Rate / hr	150	From Draft AASHTO Bike Guide Table 7.3 and 7.4
Existing Bike Volume / hr	130	From counts
Threshold for bike fee contribution	80%	Determine by local jurisdiction
Existing Bike Lane Capacity Ratio	0.87	
Site Gen Bike Trip	25	From bike trip generation table
Total Bike Volume	155	
Proposed Bike Lane Capacity Ratio	1.03	
Bike Impact Proportion	17%	Difference between existing and proposed ratio
Cost of Bike Improvement	$ 2,500,000	Random example
Length of project	5	mile
Cost / mile	$ 500,000	
Segment in bike influence area	0.5	mile
Total cost in influence area	$ 250,000	
Bike Impact Fee	$ 41,666.67	

Thank you!

Tyler Stamey, P.E.
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NACTO DESIGNING CITIES DENVER 2023

Don’t Stress It:

Bikeway Level of Comfort Metrics

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