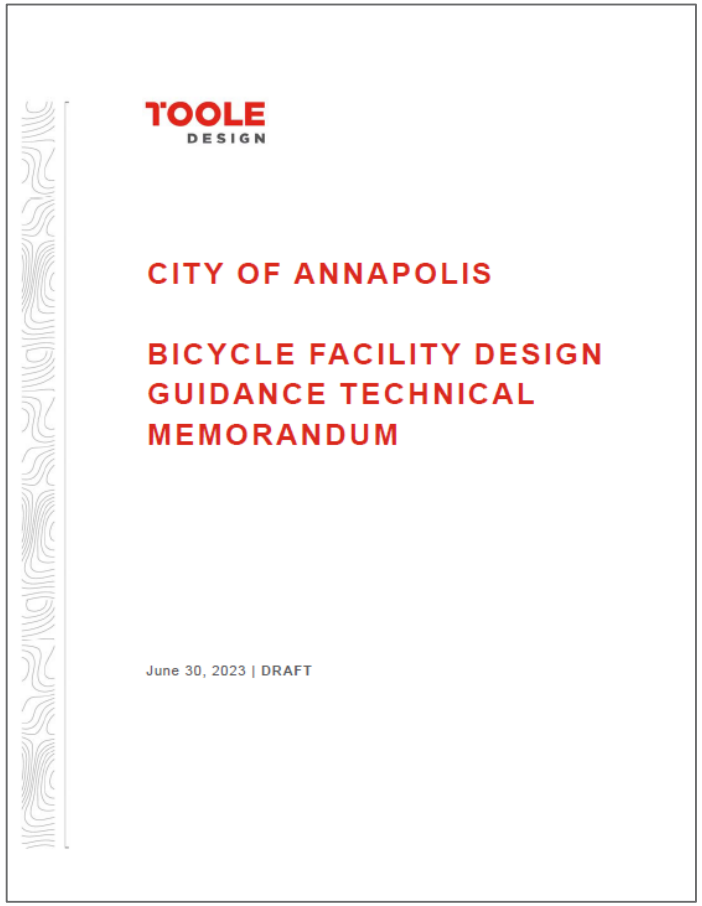
Draft Bike Facility Design Guidance Technical Memo - Overview

City of Annapolis City Council, Transportation Committee Meeting
September 13, 2023

Draft Technical Memorandum

- **Purpose** – to provide design guidance
- **Process** – draft memo submitted to city staff in late June. Initial feedback was received and edits are ongoing
- **Goal for tonight's meeting** – Provide memo overview, engage in discussion and Q&A with Transportation Committee



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Toole Design – Mission

Toole Design was founded twenty years ago with a simple mission: to support innovative streets and dynamic communities where people of all ages and abilities can enjoy walking, biking, and access to transit.

Source: Toole Design

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Toole Design – National Work

Nationally relevant publications authored or co-authored by Toole Design staff

- AASHTO Guide for the Development of Bicycle Facilities
- AASHTO Guide for the Planning, Design and Operation of Pedestrian Facilities
- FHWA Achieving Multimodal Networks: Applying Design Flexibility and Reducing Conflicts
- FHWA Incorporating On-Road Bicycle Networks into Resurfacing Projects
- FHWA Innovative Street Design and Accessibility

Source: Toole Design

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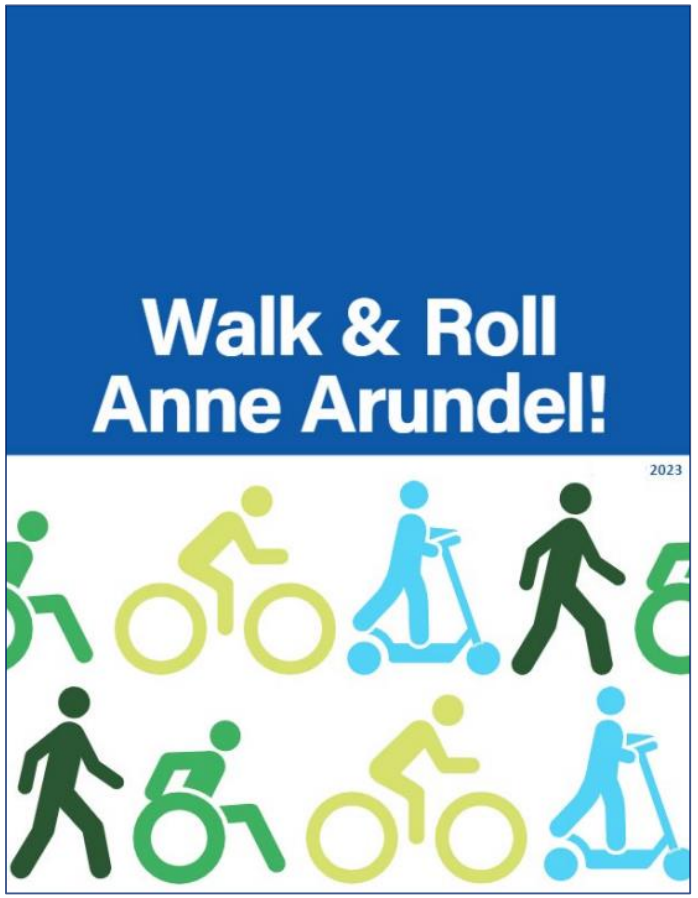
Toole Design – Regional Work

- Walk & Roll Anne Arundel!
- Anne Arundel County Safe Routes to School
- Baltimore Complete Streets Manual
- Baybrook Connector Shared Use Path
- Salisbury Rail Trail
- Capital Crescent Surface Trail



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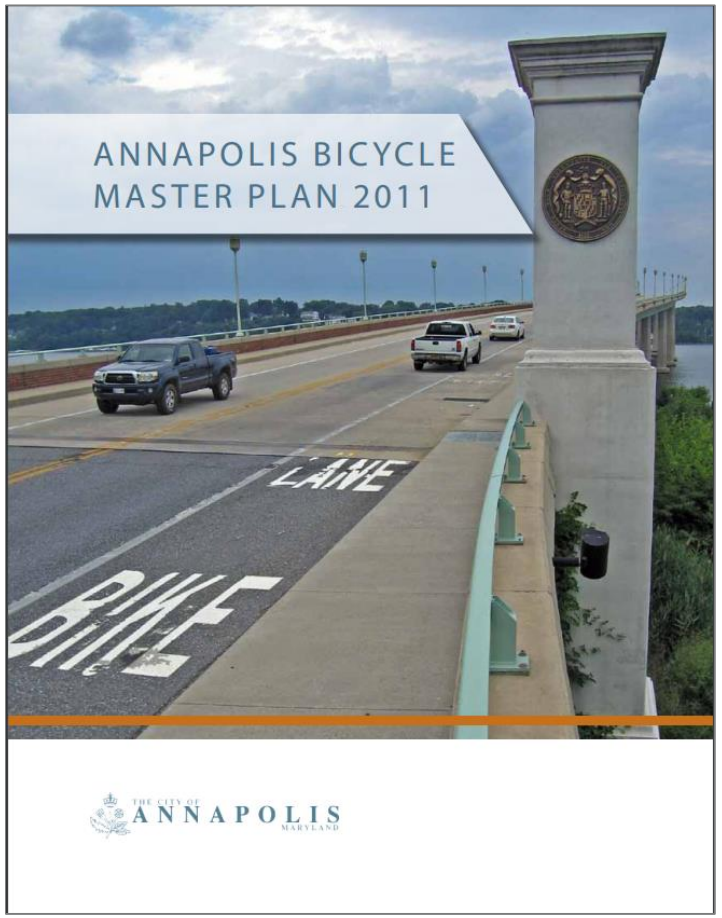
Context

- Planning Context
  - Annapolis Comprehensive Plan (2009)
  - Annapolis Bicycle Master Plan (2011)
  - Move Anne Arundel! (2019)
  - Walk & Roll Anne Arundel! (2023)
  - Annapolis Ahead 2040 Draft Comprehensive Plan (2023)
- Evolving industry and best practices
- Guide provides various bike facility designs offering more customized, context-sensitive solutions
- Helps create a connected network of facilities to support a wide range of users with varying ages, abilities and comfort.



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Setting the Stage for Implementation

- Bike design guidance can assist the City
  - **Set a course for strategic investments** that add value, improve user accessibility, and enhance multimodal connectivity across Annapolis.
  - **Pursue funding opportunities** such as MDOT Bikeways funding
  - **Inform when improvements will be implemented** (Developing a pipeline of projects, adding/enhancing existing facilities or designing new facilities)
  - **Inform how improvements will be implemented** (Roadway Paving Program, Capital Improvement Projects)
  - **Streamline decision making** between City departments and community stakeholders to guide more predictable outcomes

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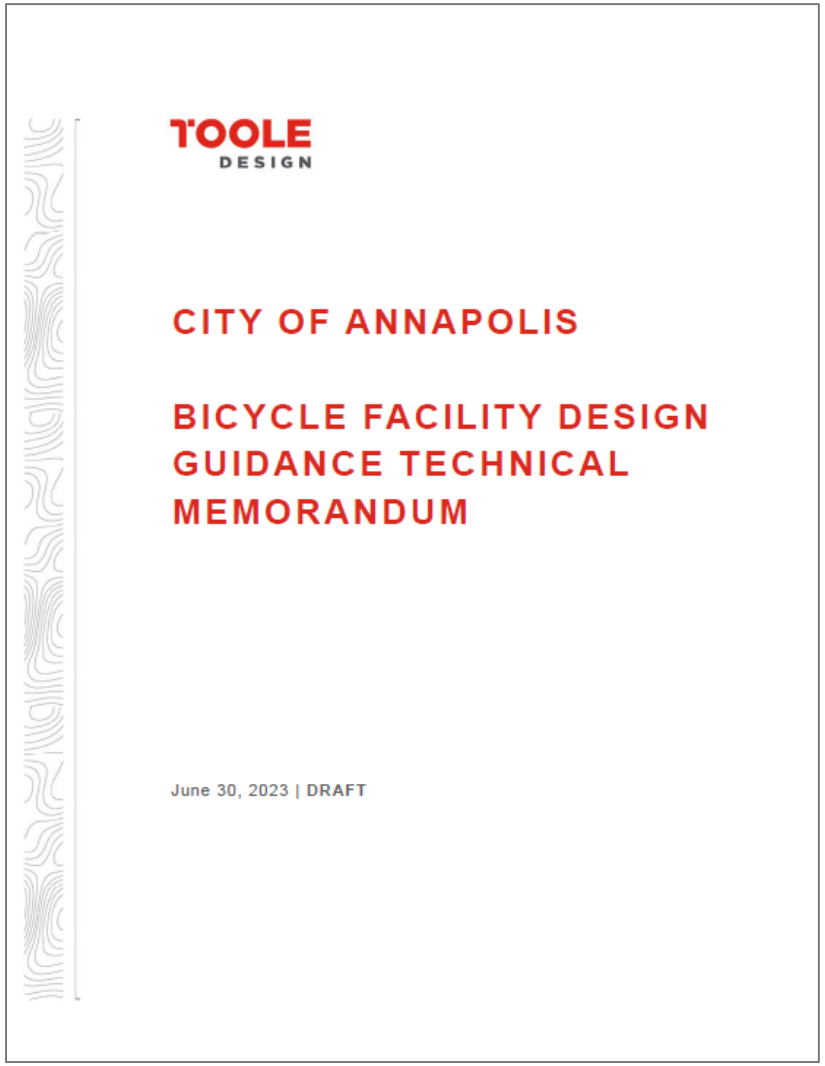
Draft Technical Memorandum

- Each project will have context-specific elements and unique existing conditions, requiring involvement of planning and engineering staff to engage with the community to identify the appropriate bike design solutions and help prioritize projects.
- Not all design guidance will always be applicable



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Technical Memo – Key Sections

- Planning Considerations
- Defining Bike Facilities
- Aligning Bike Facilities and Users
- Design Guidance & Best Practices
- Wayfinding & Signage Best Practices

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References

The memo references documents that reflect the most current industry best practices:

- FHWA Bikeway Selection Guide (2019)
- NACTO Bikeway Design Guide (2013)
- MSHA Bicycle Policy & Design Guidelines (2015) – Note: Applies only to SHA roadways and does not include current best practices for separated bicycle facilities or bicycle boulevards.
- Maryland Manual on Uniform Traffic Control Devices (2011 Edition)
- Ohio Department of Transportation Multimodal Design Guide (2023)
- Massachusetts Department of Transportation - Separated Bike Lane Planning & Design Guide (2015)

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Planning Considerations

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Design Principles

Safety
The frequency and severity of crashes are minimized and conflicts with motor vehicles are limited

Comfort
Conditions do not deter bicycling due to stress, anxiety, or concerns over safety

Connectivity
All destinations can be accessed using the bicycling network and there are no gaps or missing links

Directness
Bicycling distances and trip times are minimized

Cohesion
Distances between parallel and intersecting bike routes are minimized

Attractiveness
Routes direct bicyclists through lively areas and personal safety is prioritized

Unbroken Flow
Stops, such as long waits at traffic lights, are limited and street lighting is consistent

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Source: 2019 FHWA Bikeway Selection Guide

Level of Traffic Stress (LTS)

- This analysis quantifies how stressful the bicycling experience is based on:
  - Prevailing speed
  - Daily trips
  - Number of travel lanes
  - Presence of bike facilities/widths
  - Location of bike facility in roadway
- The rating scale is from LTS 1 to LTS 4, with 1 being the lowest stress conditions and 4 being the most stressful conditions.

Mixed traffic criteria								
		Prevailing Speed						
Number of lanes	Effective ADT*	< 20 mph	25 mph	30 mph	35 mph	40 mph	45 mph	50+mph
Unlaned 2-way street (no centerline)	0-750	LTS 1	LTS 1	LTS 2	LTS 2	LTS 3	LTS 3	LTS 3
	751-1500	LTS 1	LTS 1	LTS 2	LTS 3	LTS 3	LTS 4	LTS 4
	1501-3000	LTS 2	LTS 2	LTS 3	LTS 3	LTS 4	LTS 4	LTS 4
	3000+	LTS 3	LTS 3	LTS 4	LTS 4	LTS 4	LTS 4	LTS 4
1 thru lane per direction (1-way, 1-lane street or 2-way street with centerline)	0-750	LTS 1	LTS 1	LTS 2	LTS 2	LTS 3	LTS 3	LTS 3
	751-1500	LTS 2	LTS 2	LTS 2	LTS 3	LTS 3	LTS 4	LTS 4
	1501-3000	LTS 2	LTS 3	LTS 3	LTS 4	LTS 4	LTS 4	LTS 4
	3001-6000	LTS 3	LTS 3	LTS 4	LTS 4	LTS 4	LTS 4	LTS 4
	6001-10000	LTS 3	LTS 4	LTS 4	LTS 4	LTS 4	LTS 4	LTS 4
	10001+	LTS 4	LTS 4	LTS 4	LTS 4	LTS 4	LTS 4	LTS 4
2 thru lanes per direction	0-6000	LTS 3	LTS 3	LTS 3	LTS 3	LTS 4	LTS 4	LTS 4
	6001-12000	LTS 3	LTS 3	LTS 4	LTS 4	LTS 4	LTS 4	LTS 4
	12001+	LTS 4	LTS 4	LTS 4	LTS 4	LTS 4	LTS 4	LTS 4
3+ thru lanes per direction	any ADT	LTS 4	LTS 4	LTS 4	LTS 4	LTS 4	LTS 4	LTS 4

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Source: Toole Design

Types of Users

37%

No Way, No How

Don't ride a bike/have no plans to start

51%

Interested but Concerned

Only feel safe on separated trails/paths with few traffic crossings

5%

Enthusiastic and Confident

Prefer separated paths, but will ride on roads where space is available and traffic is manageable

7%

Strong and Fearless

Confident and comfortable riding with traffic in most situations

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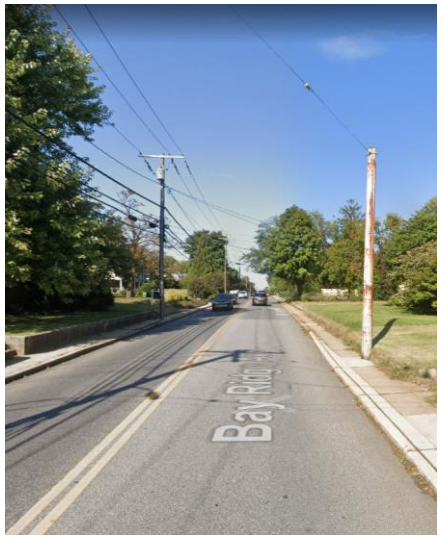
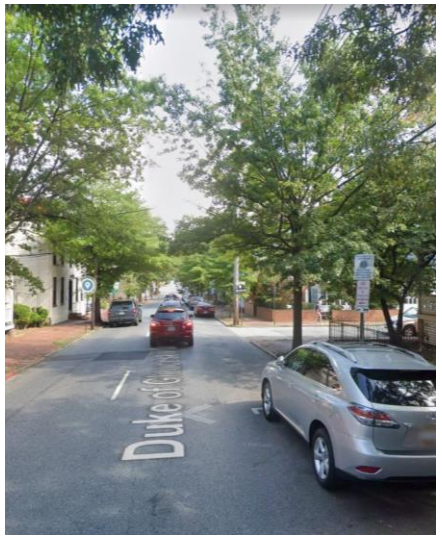
Source: Toole Design

Destinations and Local Considerations



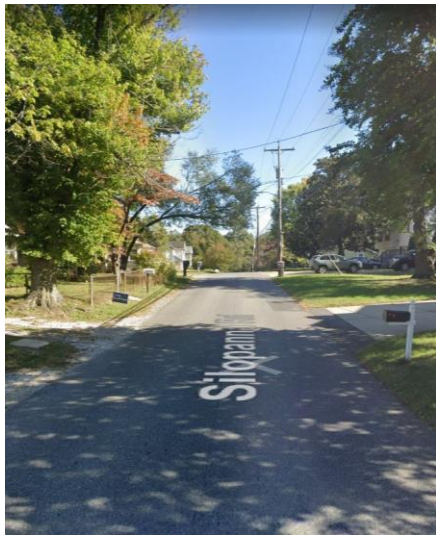
Bay Ridge Avenue



Duke of Gloucester Street

Edgewood Road

Taylor Avenue



Silopanna Road

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Defining Bike Facilities and Aligning with Users

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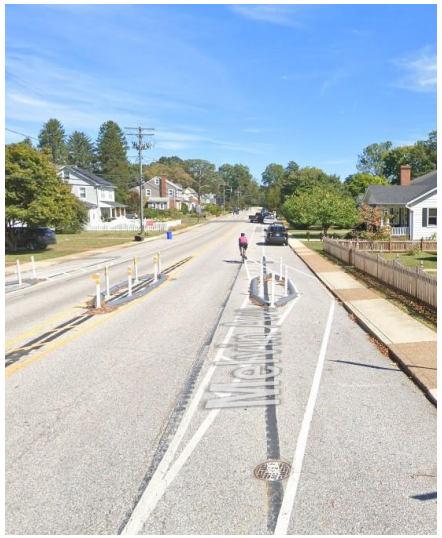
Types of Bike Facilities



Standard Bike Lane

Melvin Ave / Tucker St

Buffered Bike Lane

Ann Arbor, MI

Separated Bike Lane

Jennifer Rd / Admiral Dr.

Shared Use Path

Forest Dr / Cherry Grove Av

Bicycle Boulevard

Franklin St

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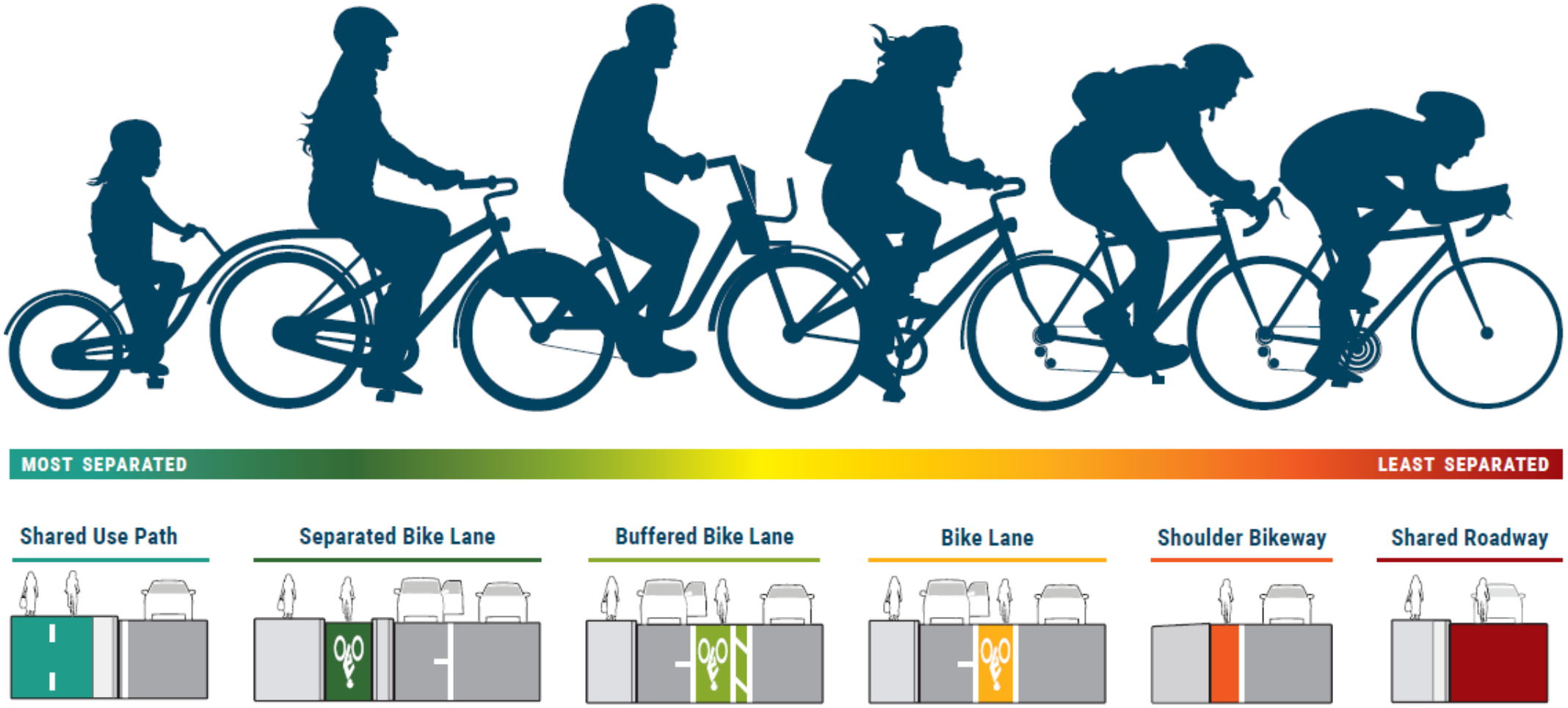
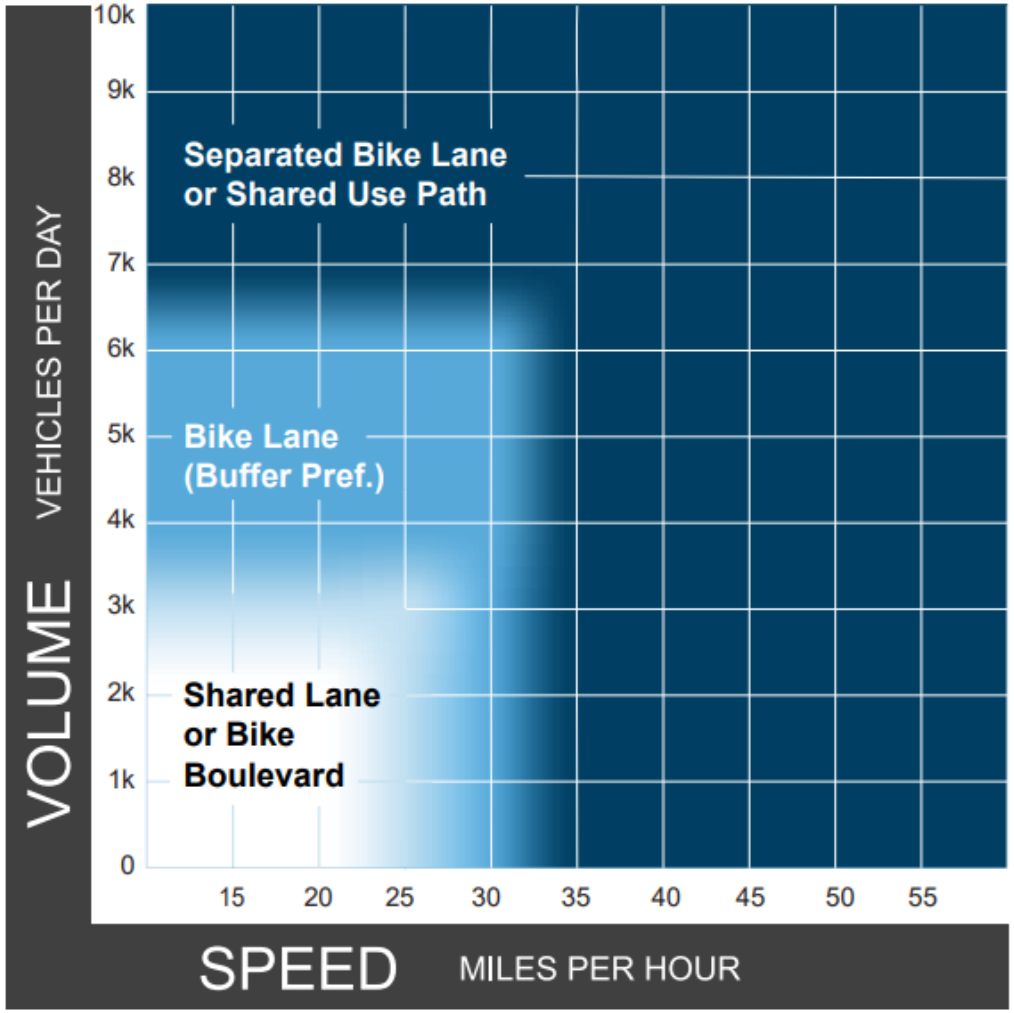
Aligning Bike Facilities and Users



Source:
Toole Design

Context for Identifying Preferred Bike Facility Type

- Speed and Volume
- Additional Factors
  - Peak Hour Activity
  - Vehicle Mix
  - Parking/Curbside Activity
  - Driveways/Intersection Frequency
  - Vulnerable populations



Source: 2019 FHWA Bikeway Selection Guide

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Bikeway Design Guidance – Best Practices

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Evaluating Feasibility – All Bike Facilities

- Space to build the facility
- Funding
- Ability to maintain the facility
- Implement as stand-alone project or design integrated into larger corridor/roadway project.

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Key Themes - All Bike Facilities

- One-way versus Two-way facilities / Facility widths
- Design Features and Materials (pavement markings, buffers, physical medians or barriers)
- Network Connectivity
- Safety
- Access to Destinations
- Intersection Operations
- Existing Corridor Activities (parking, loading, types of vehicles)

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Separated Bike Facility

One-Way Bike Lane Width (feet)

Peak Hour Directional Bicyclist Volume	Between Vertical Curbs	Adjacent to One Vertical Curb	Between Sloped Curb or at Sidewalk Level
<150	6.5 – 8.5	6 – 8	5.5 – 7.5
150-750	8.5 – 10	8 – 9.5	7.5 – 9
>750	Greater than or equal to 10	Greater than or equal to 9.5	Greater than or equal to 9
Constrained Condition*	4.5	4	3.5

Two-way Bike Lane Width (feet)

Peak Hour Directional Bicyclist Volume	Between Vertical Curbs	Adjacent to One Vertical Curb	Between Sloped Curb or at Sidewalk Level
<150	10 – 12	9.5 – 11.5	9 – 11
150 – 350	12 – 16	11.5 – 15.5	11 – 15
>350	Greater than or equal to 16	Greater than or equal to 15.5	Greater than or equal to 15
Constrained Condition*	8.5	8	7.5

Image Source: Toole Design
Content Source: ODOT Multimodal Design Guidelines

Buffered Bike Lane

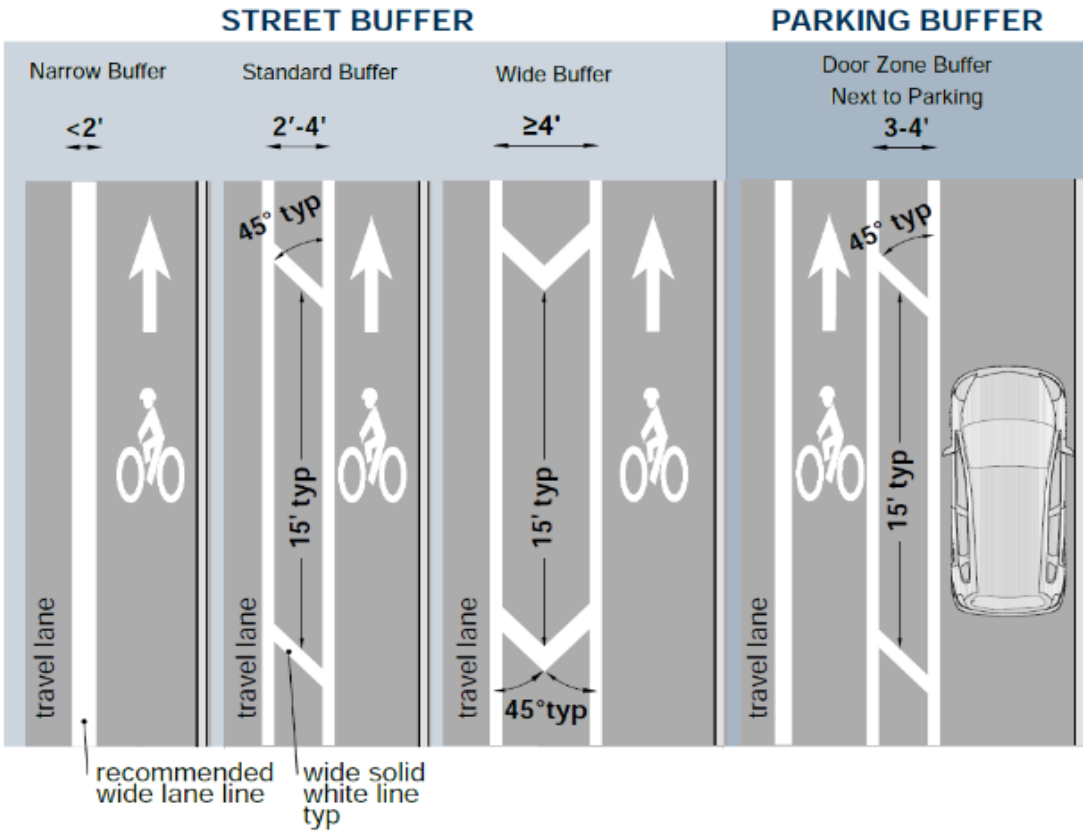

Image Source: Google Streetview

Content Source: ODOT Multimodal Design Guidelines

On-Road Bike Lane

Standard Bike Lane Width (feet)

One-Way Standard Bike Lane Width Criteria		
Bike Lane Description	**Minimum Width (feet)**	**Constrained Width (feet)**
Adjacent to curb[1] or edge of pavement	5	4
Between travel lanes or buffers	5	4
Adjacent to parking[2]	6	5
Immediate or sidewalk level raised bikelane[1]	5.5	5
To allow side by side bicycling or passing	8	7

Image Source: Google Streetview
Content Source: ODOT Multimodal Design Guidelines

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Bike Boulevards

Motorized Speed and Volume Management

	Peak Hourly Traffic Volume* (vehicles/hr.)	Average Daily Traffic Volume (ADT)	Operating Speed (mph)
Preferred	150	1,000	15
Acceptable	300	2,000	20
Maximum	450	3,000	25

Bike Boulevard Design Treatments (Low to High Impact)

- Signage
- Pavement Markings
- Intersection Treatments
- Traffic Calming
- Traffic Diversions

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Image Source: Toole Design
Content Source: ODOT Multimodal Design Guidelines

Wayfinding and Signage Best Practices

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Wayfinding Principles

- Keep it Simple
- Be Consistent
- Design for the Casual User
- Progressively Disclose Information
- Maintain Momentum for Bicyclists

Image Sources: Toole Design

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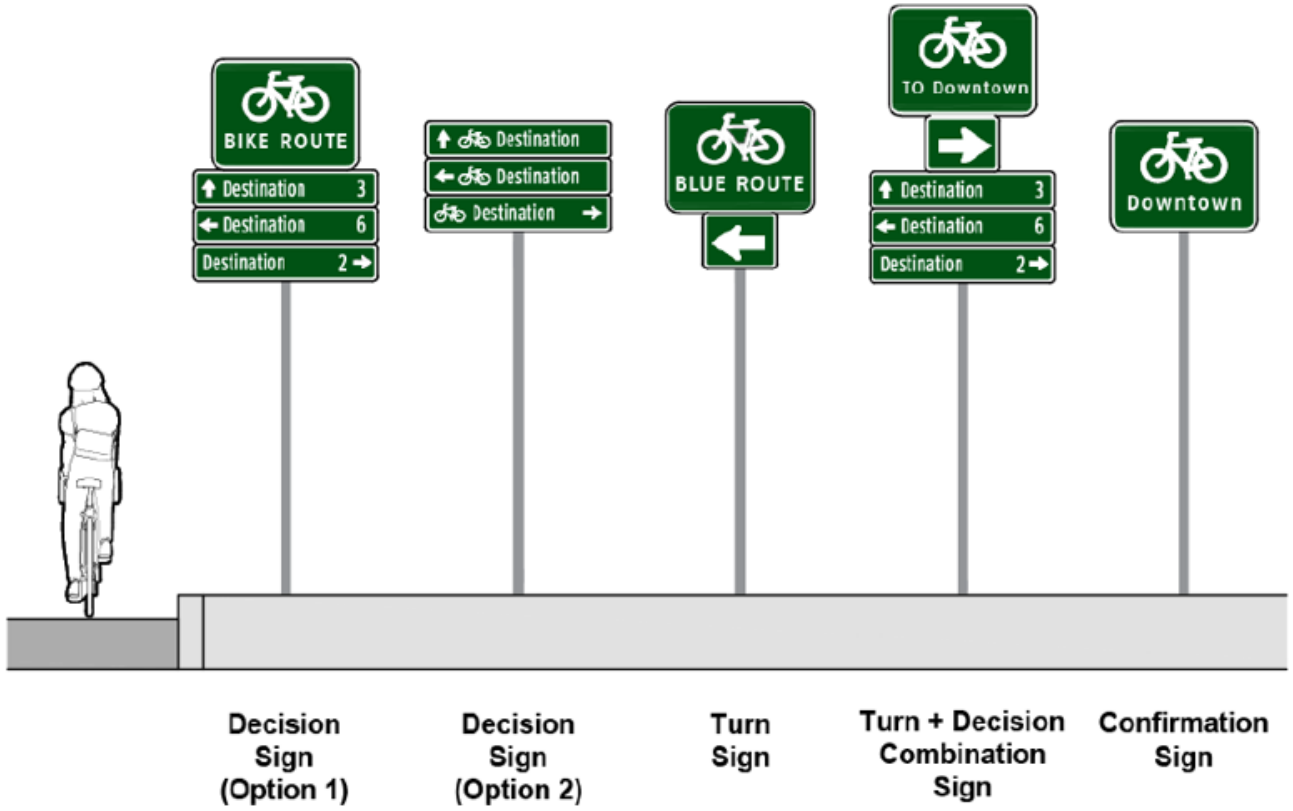
Four Stages of Navigation

- Orientation
- Decision-Making
- Confirmation
- Destination Recognition



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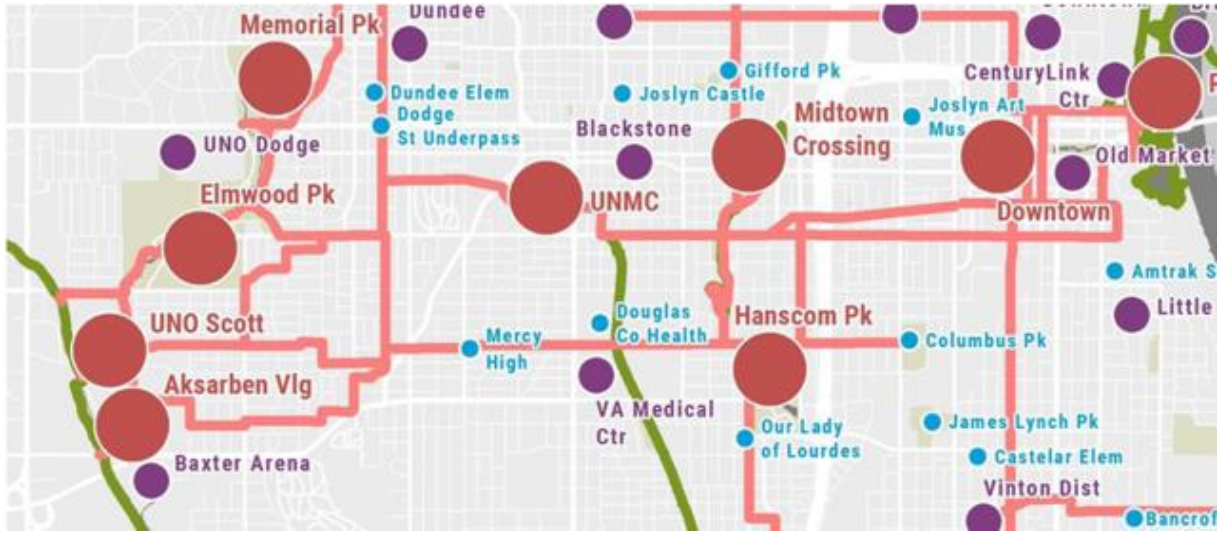
Source: Toole Design

Hierarchy of Information

- **Level 1** – Regional Destinations
- **Level 2** – Districts, Neighborhoods, Major Landmarks
- **Level 3** – Local destinations, Local Landmarks



Source: Toole Design

Questions / Discussion

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