

A person wearing a white helmet and a light pink t-shirt is riding a bicycle on a paved trail. The trail is bordered by a wooden fence and green grass on the left, and a body of water and trees in the background. The scene is captured from behind the cyclist, showing the path ahead.

# A

## *Design Guidelines*

Context	A-1
Shared Roadways	A-6
On-Street Bikeways	A-10
Physically Separated Bicycle Lanes	A-16
Bikeway Intersection Treatments	A-22
Bikeway Amenities	A-36
Retrofitting Streets	A-46
Off-Street Facilities	A-50
Trail Intersection Treatments	A-54





## CONTEXT: GUIDANCE BASIS

The sections that follow serve as an inventory of bicycle and trail design treatments and provide guidelines for their development. These treatments and design guidelines are important because they represent the tools for creating a safe and accessible community. The guidelines are not, however, a substitute for a more thorough evaluation by a landscape architect or engineer upon implementation of facility improvements.

## NATIONAL GUIDANCE

The following standards and guidelines are referred to in this guide:

- The Federal Highway Administration's (FHWA) ***Manual on Uniform Traffic Control Devices (MUTCD)*** defines the standards used by road managers nationwide to install and maintain traffic control devices on all public streets, highways, bikeways, and private roads open to public traffic. The MUTCD is the primary source for guidance on lane striping requirements, signal warrants, and recommended signage and pavement markings.
- American Association of State Highway and Transportation Officials (AASHTO) ***Guide for the Development of Bicycle Facilities*** (2012) provides guidance on dimensions, use, and layout of specific bicycle facilities.
- The National Association of City Transportation Officials' (NACTO) ***Urban Bikeway Design Guide*** (2012) is the newest publication of nationally recognized bikeway design standards, and offers guidance on the current state of the practice designs.
- The ***AASHTO A Policy on Geometric Design of Highways and Streets*** (2011) commonly referred to as the "Green Book," contains the current design research and practices for highway and street geometric design.
- NCDOT's Bicycle & Pedestrian Project Development & Design Guidance webpage provides a comprehensive list of links to national guidance resources. For more information - <https://connect.ncdot.gov/projects/BikePed/Pages/Guidance.aspx>

## IMPACT ON SAFETY AND CRASHES

Bicycle facilities can have a significant influence on user safety. The Federal Highway Administration ***Crash Modification Factor Clearinghouse*** (<http://www.cmfclearinghouse.org/>) is a web-based database of Crash Modification Factors (CMF) to help transportation engineers identify the most appropriate countermeasure for their safety needs. Where available and appropriate, CMFs or similar study results are included for each treatment.



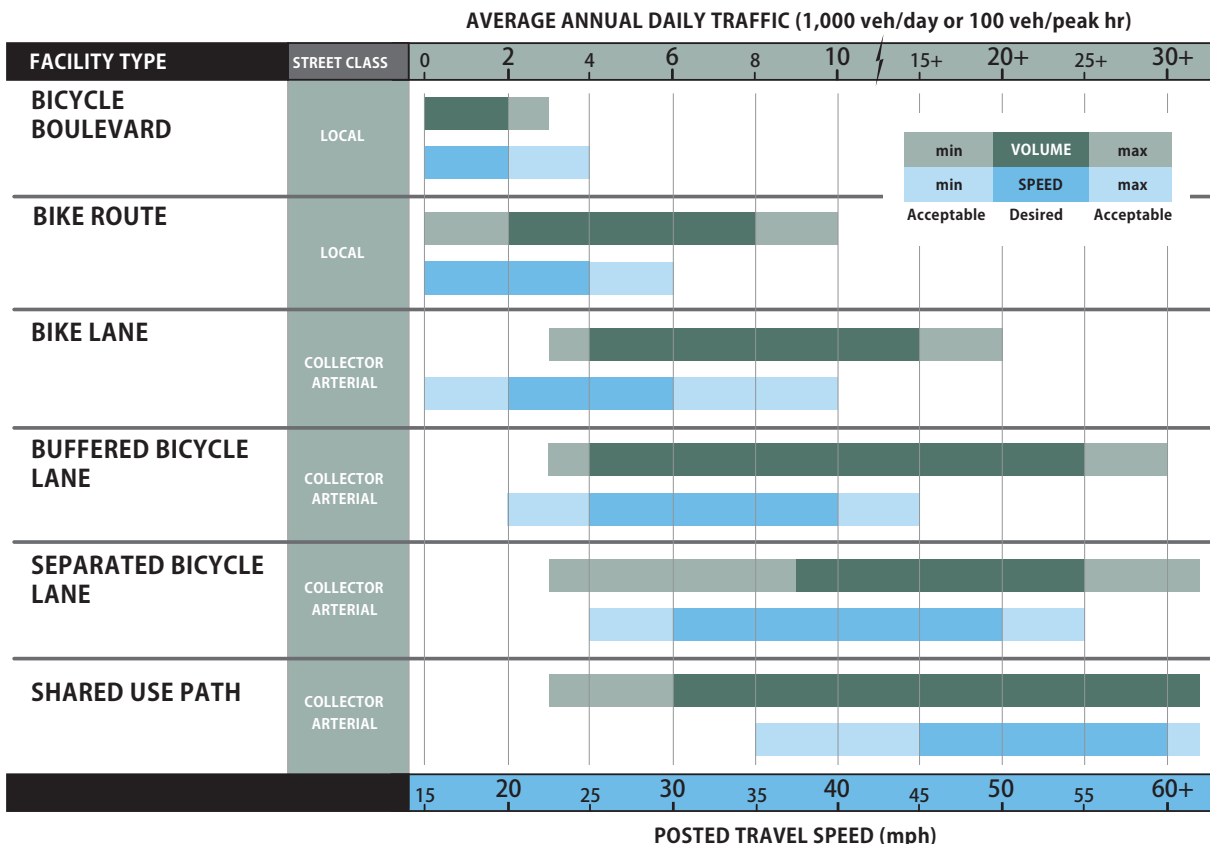
## FACILITY SELECTION

Selecting the best bikeway facility type for a given roadway can be challenging, due to the range of factors that influence bicycle users' comfort and safety. There is a significant impact on cycling comfort when the speed differential between bicyclists and motor vehicle traffic is high and motor vehicle traffic volumes are high.

### FACILITY SELECTION TABLE

As a starting point to identify a preferred facility, the chart below can be used to determine the recommended type of bikeway to be provided in particular roadway speed and volume situations. To use this chart, identify the appropriate daily traffic volume and travel speed on or the existing or proposed roadway, and locate the facility types indicated by those key variables.

Other factors beyond speed and volume which affect facility selection include traffic mix of automobiles and heavy vehicles, the presence of on-street parking, intersection density, surrounding land use, and roadway sight distance. These factors are not included in the facility selection chart below, but should always be considered in the facility selection and design process.



## BICYCLIST USER TYPE

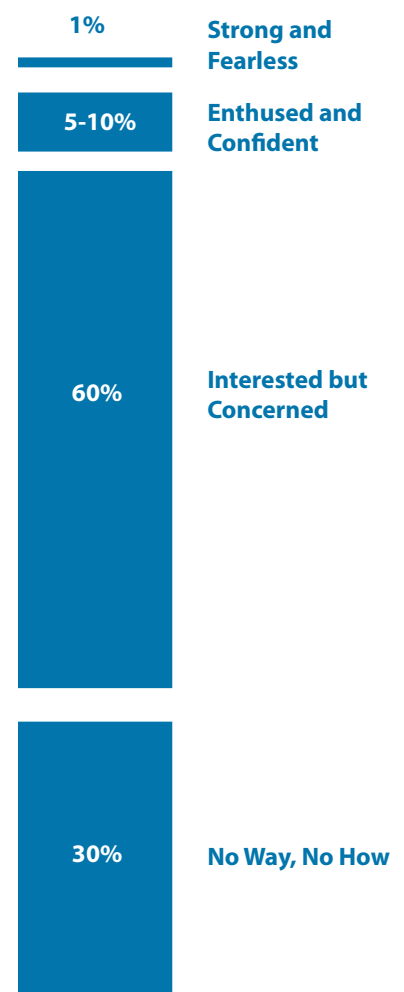
The current AASHTO Guide to the Development of Bicycle Facilities encourages designers to identify their rider type based on the trip purpose (Recreational vs Transportation) and on the level of comfort and skill of the rider (Causal vs Experienced). A user-type framework for understanding a potential rider's willingness to bike is illustrated in the figure below. Developed by planners in Portland, OR\* and supported by research\*\*, this classification identifies four distinct types of bicyclists.

**Strong and Fearless** – Characterized by bicyclists that will typically ride anywhere regardless of roadway conditions or weather. These bicyclists can ride faster than other user types, prefer direct routes and will typically choose roadway connections -- even if shared with vehicles -- over separate bicycle facilities such as shared-use paths.

**Enthusied and Confident** - This user group encompasses bicyclists who are fairly comfortable riding on all types of bikeways but usually choose low traffic streets or shared-use paths when available. These bicyclists may deviate from a more direct route in favor of a preferred facility type. This group includes all kinds of bicyclists such as commuters, recreationalists, racers and utilitarian bicyclists.

**Interested but Concerned** – This user type comprises the bulk of the cycling population and represents bicyclists who typically only ride a bicycle on low traffic streets or shared-use paths under favorable weather conditions. These bicyclists perceive significant barriers to their increased use of cycling, specifically traffic and other safety issues. These people may become “Enthusied & Confident” with encouragement, education and experience.

**No Way, No How** – Persons in this category are not bicyclists, and perceive severe safety issues with riding in traffic. Some people in this group may eventually become more regular cyclists with time and education. A significant portion of these people will not ride a bicycle under any circumstances.



**Typical Distribution of Bicyclist Types**

\* Roger Geller, City of Portland Bureau of Transportation. Four Types of Cyclists. <http://www.portlandonline.com/transportation/index.cfm?a=237507>. 2009.

\*\* Dill, J., McNeil, N. Four Types of Cyclists? Testing a Typology to Better Understand Bicycling Behavior and Potential. 2012.





## USER DESIGN DIMENSIONS

The purpose of this section is to provide the facility designer with an understanding of how bicyclists operate and how their bicycle influences that operation. Bicyclists, by nature, are much more affected by poor facility design, construction, and maintenance practices than motor vehicle drivers.

Bicyclists lack the protection from the elements and roadway hazards provided by an automobile's structure and safety features. By understanding the unique characteristics and needs of bicyclists, a facility designer can provide quality facilities and minimize user risk.

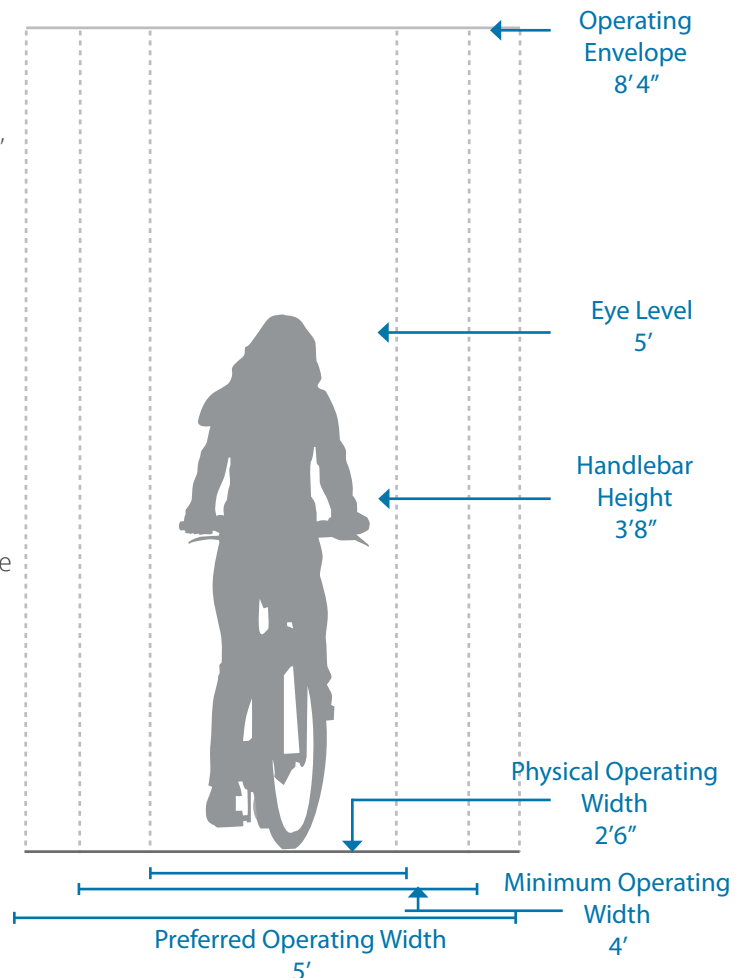
### BICYCLE AS A DESIGN VEHICLE

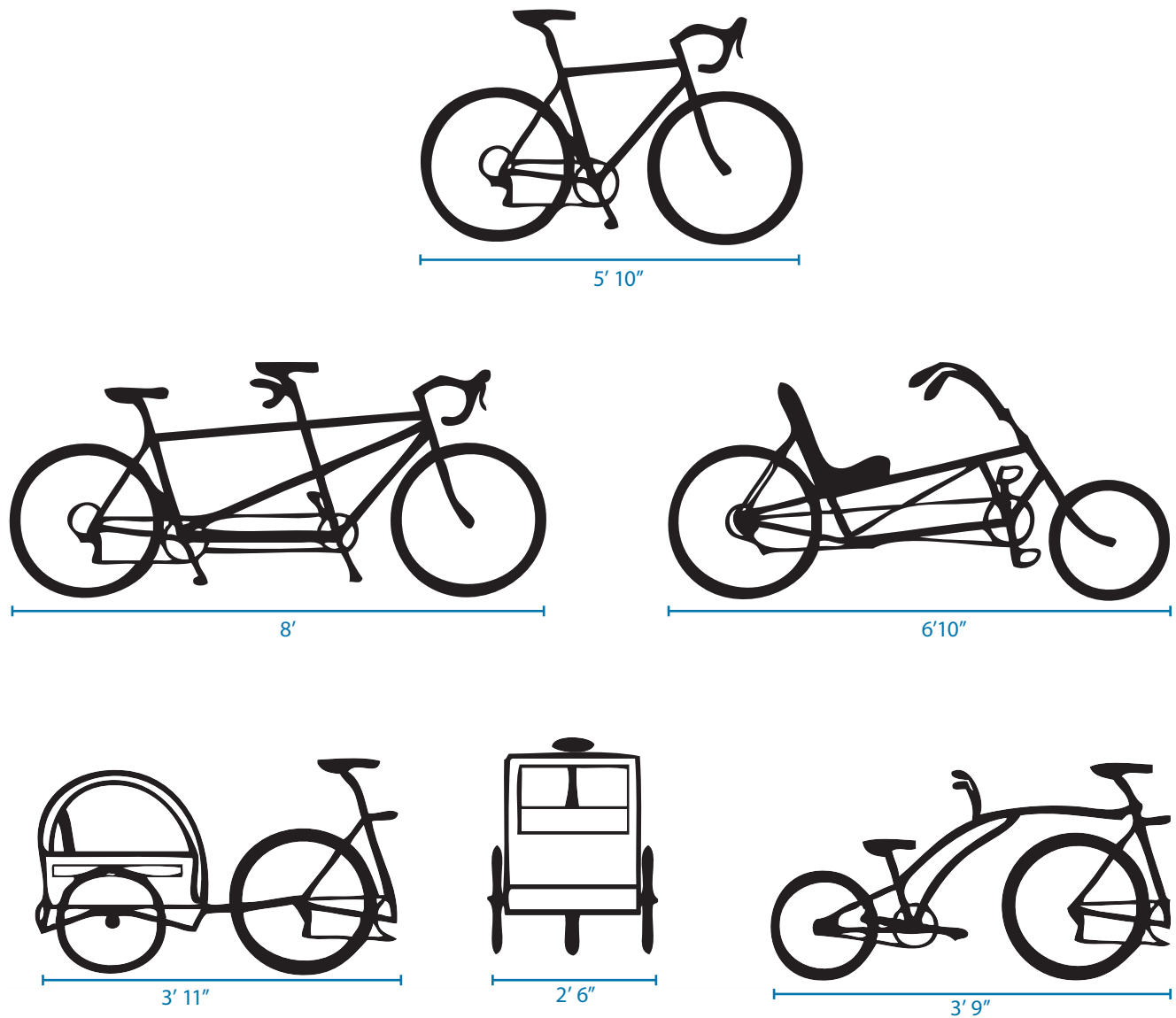
Similar to motor vehicles, bicyclists and their bicycles exist in a variety of sizes and configurations. These variations occur in the types of vehicle (such as a conventional bicycle, a recumbent bicycle or a tricycle), and behavioral characteristics (such as the comfort level of the bicyclist). The design of a bikeway should consider reasonably expected bicycle types on the facility and utilize the appropriate dimensions.

The figure to the right illustrates the operating space and physical dimensions of a typical adult bicyclist, which are the basis for typical facility design. Bicyclists require clear space to operate within a facility. This is why the minimum operating width is greater than the physical dimensions of the bicyclist. Bicyclists prefer five ft or more operating width, although four ft may be minimally acceptable.

In addition to the design dimensions of a typical bicycle, there are many other commonly used pedal-driven cycles and accessories to consider when planning and designing bicycle facilities. The most common types include tandem bicycles, recumbent bicycles, and trailer accessories. The figure to the left summarizes the typical dimensions for bicycle types.

*Bicycle Rider - Typical Dimensions*





Source: AASHTO *Guide for the Development of Bicycle Facilities*, 4th Edition

The expected speed that different types of bicyclists can maintain under various conditions also influences the design of facilities such as shared use paths. The table to the right provides typical bicyclist speeds for a variety of conditions.

#### Bicycle as Design Vehicle - Design Speed Expectations

Bicycle Type	Feature	Typical Speed
<b>Upright Adult Bicyclist</b>	Paved level surfacing	8-12 mph*
	Crossing Intersections	10 mph
	Downhill	30 mph
	Uphill	5 -12 mph
<b>Recumbent Bicyclist</b>	Paved level surfacing	18 mph

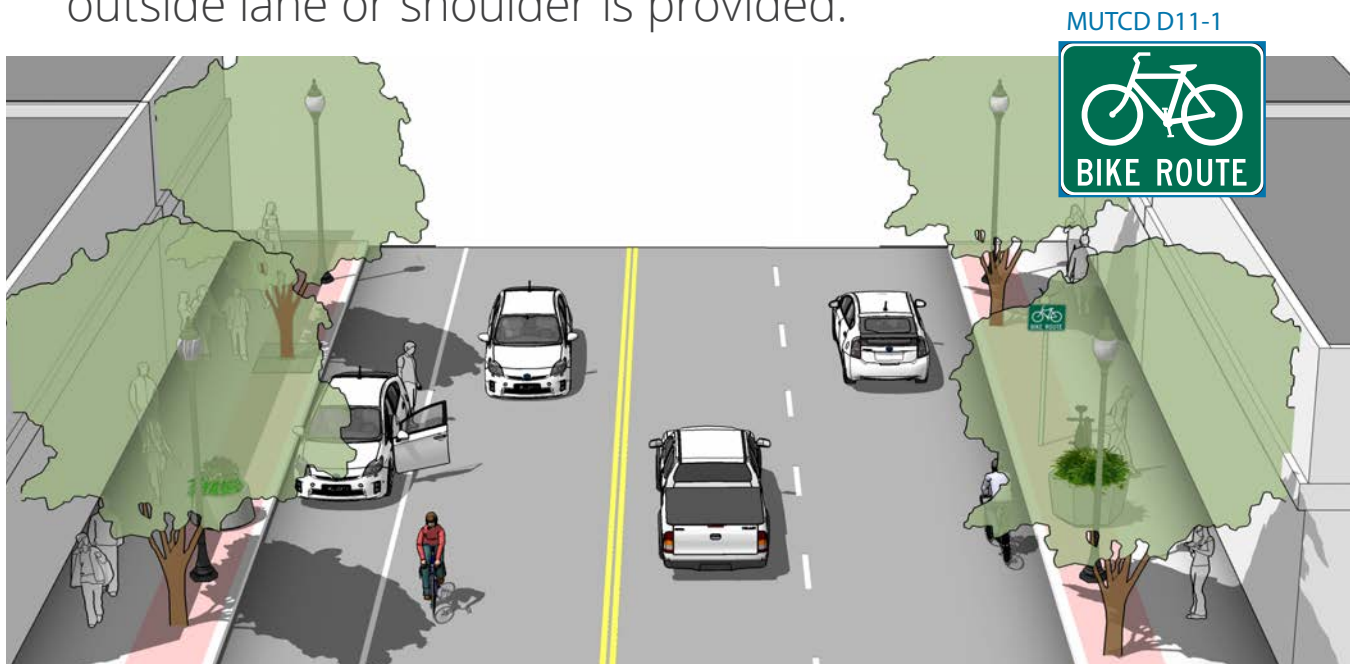
\* Typical speed for causal riders per AASHTO 2013.



## SHARED ROADWAYS

### SIGNED SHARED ROADWAYS

Signed shared roadways are facilities shared with motor vehicles. They are typically used on roads with low speeds and traffic volumes, however can be used on higher volume roads with wide outside lanes or shoulders. A motor vehicle driver will usually have to cross over into the adjacent travel lane to pass a bicyclist, unless a wide outside lane or shoulder is provided.



#### TYPICAL APPLICATION

- Signed Shared Roadways serve either to provide continuity with other bicycle facilities (usually bike lanes) or to designate preferred routes through high-demand corridors.
- This configuration differs from a bike boulevard due to a lack of traffic calming, wayfinding, pavement markings and other enhancements designed to provide a higher level of comfort for a broad spectrum of users.

#### DESIGN FEATURES

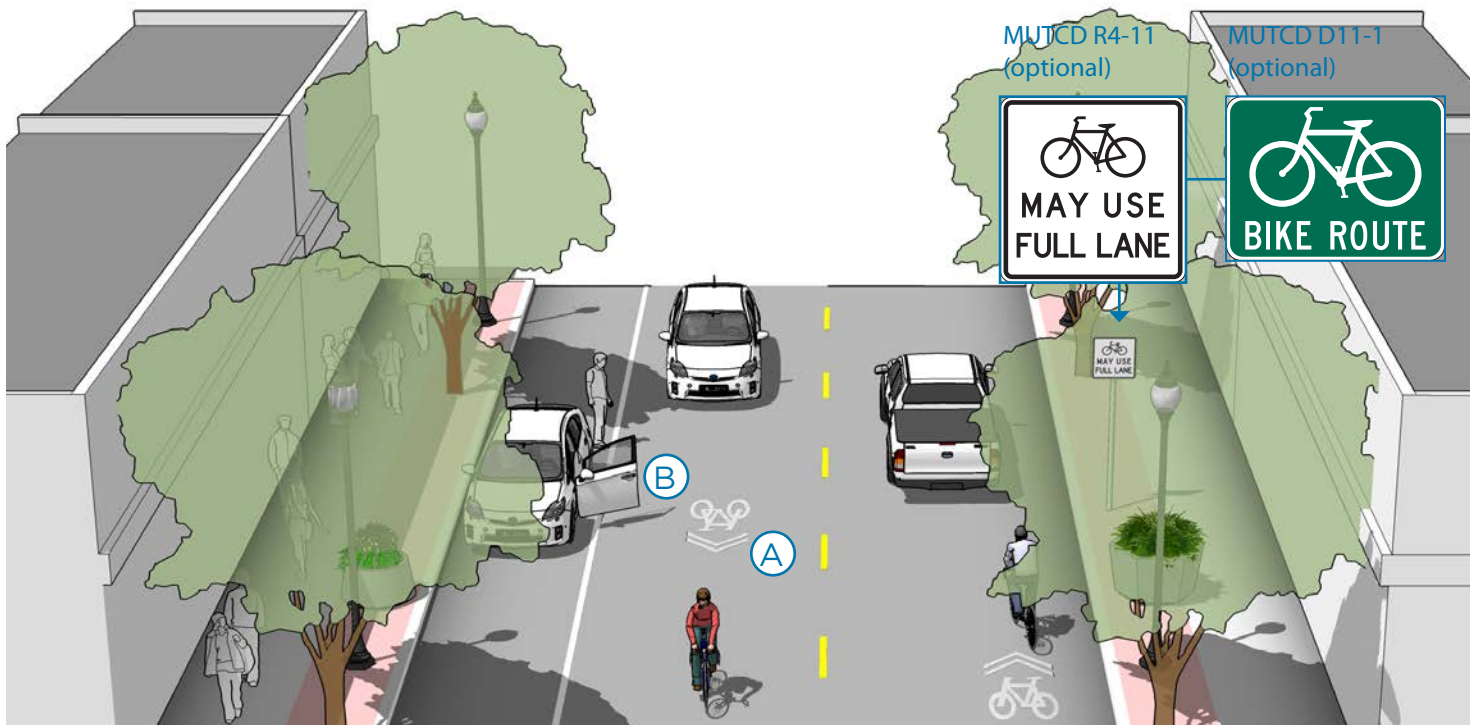
- Lane width varies depending on roadway configuration.
- Bike route signage (D11-1) should be applied at intervals frequent enough to keep bicyclists informed of changes in route direction and to remind motorists of the presence of bicyclists. Commonly, this includes placement at:
  - Beginning or end of Bicycle Route.
  - At major changes in direction or at intersections with other bicycle routes.
  - At intervals along bicycle routes not to exceed ½ mile.





## MARKED SHARED ROADWAY

A marked shared roadway is a general purpose travel lane marked with shared lane markings (SLM) used to encourage bicycle travel and proper positioning within the lane.



### TYPICAL APPLICATION

- In constrained conditions, the SLMs are placed in the middle of the lane. On a wide outside lane, the SLMs can be used to promote bicycle travel to the right of motor vehicles.
- In all conditions, SLMs should be placed outside of the door zone of parked cars.

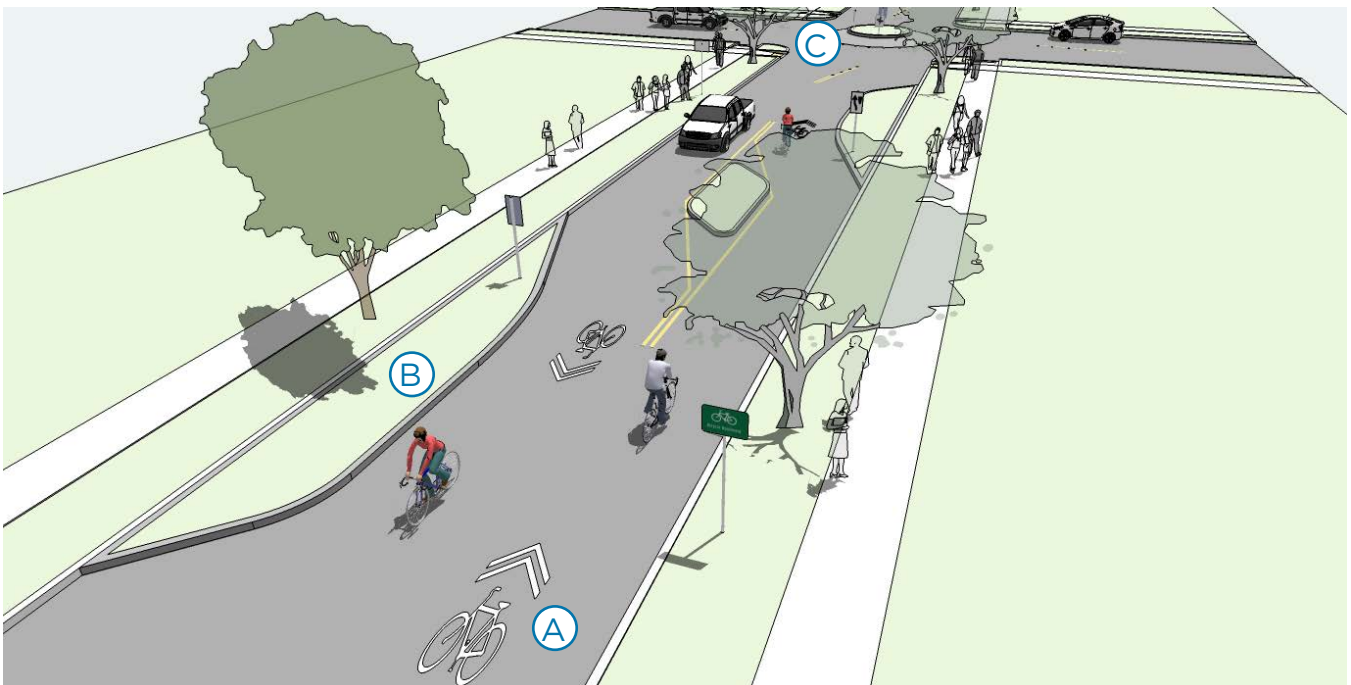
### DESIGN FEATURES

- May be used on streets with a speed limit of 35 mph or under. Lower than 30 mph speed limit preferred.
- (A) In constrained conditions, preferred placement is in the center of the travel lane to minimize wear and promote single file travel.
- (B) Minimum placement of SLM marking centerline is 11 feet from edge of curb where on-street parking is present, 4 feet from edge of curb with no parking. If parking lane is wider than 7.5 feet, the SLM should be moved further out accordingly.



## BICYCLE BOULEVARDS

Bicycle boulevards are low-volume, low-speed streets modified to enhance bicyclist comfort by using treatments such as signage, pavement markings, traffic calming and/or traffic reduction, and intersection modifications. These treatments allow through movements of bicyclists while discouraging similar through-trips by non-local motorized traffic.



### TYPICAL APPLICATION

- Parallel with and in close proximity to major thoroughfares (1/4 mile or less).
- Follow a desire line for bicycle travel that is ideally long and relatively continuous (2-5 miles).
- Avoid alignments with excessive zigzag or circuitous routing. The bikeway should have less than 10 percent out of direction travel compared to shortest path of primary corridor.
- Streets with travel speeds at 25 mph or less and with traffic volumes of fewer than 3,000 vehicles per day.

### DESIGN FEATURES

- (A) Signs and pavement markings are the minimum treatments necessary to designate a street as a bicycle boulevard.
- (B) Implement volume control treatments based on the context of the bicycle boulevard, using engineering judgment. Target motor vehicle volumes range from 1,000 to 3,000 vehicles per day.
- (C) Intersection crossings should be designed to enhance safety and minimize delay for bicyclists.



## Bicycle Boulevards



*Bicycle boulevards are established on streets that improve connectivity to key destinations and provide a direct, low-stress route for bicyclists, with low motorized traffic volumes and speeds, designated and designed to give bicycle travel priority over other modes.*

## Traffic Calming



*Streets along classified neighborhood bikeways may require additional traffic calming measures to discourage through trips by motor vehicles.*

## FURTHER CONSIDERATIONS

Bicycle boulevard retrofits to local streets are typically located on streets without existing signalized accommodation at crossings of collector and arterial roadways. Without treatments for bicyclists, these intersections can become major barriers along the bicycle boulevard and compromise safety.

Traffic calming can deter motorists from driving on a street. Anticipate and monitor vehicle volumes on adjacent streets to determine whether traffic calming results in inappropriate volumes. Traffic calming can be implemented on a trial basis.

## CRASH REDUCTION

In a comparison of vehicle/cyclist collision rates on traffic-calmed side streets signed and improved for cyclist use, compared to parallel and adjacent arterials with higher speeds and volumes, the bicycle boulevard as found to have a crash reduction factor of 63 percent, with rates two to eight times lower when controlling for volume (CMF ID: 3092).

## CONSTRUCTION COSTS

Costs vary depending on the type of treatments proposed for the corridor. Simple treatments such as wayfinding signage and markings are most cost-effective, but more intensive treatments will have greater impact at lowering speeds and volumes, at a higher cost.

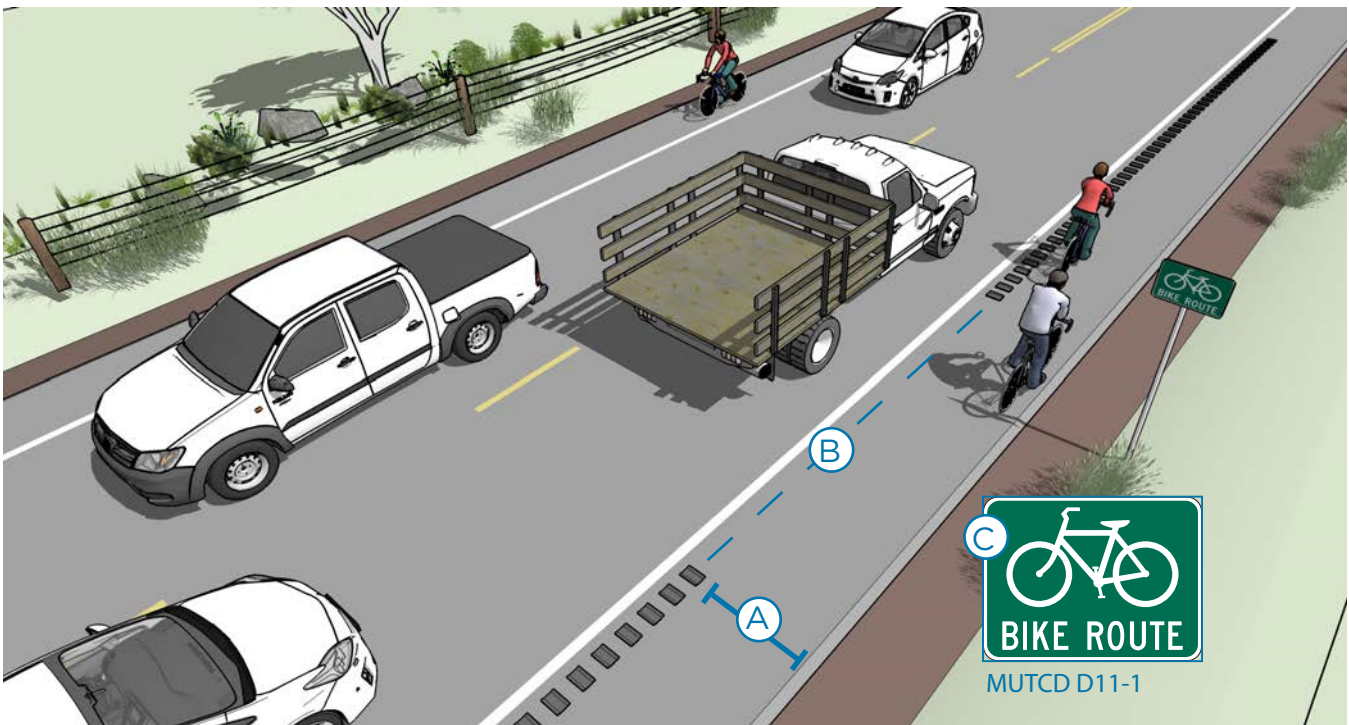




## ON-STREET BIKEWAYS

### SHOULDER BIKEWAYS

Typically found in less-dense areas, shoulder bikeways are paved roadways with striped shoulders (4'+) wide enough for bicycle travel. Shoulder bikeways often, but not always, include signage alerting motorists to expect bicycle travel along the roadway.



#### TYPICAL APPLICATION

- Located in more rural environments where there are no curbs or gutters.
- Suitable for roadways with higher speeds and lower bicycle volumes.
- Shoulder bikeways should be considered a temporary treatment, with full bike lanes planned for construction when the roadway is widened or completed with curb and gutter.

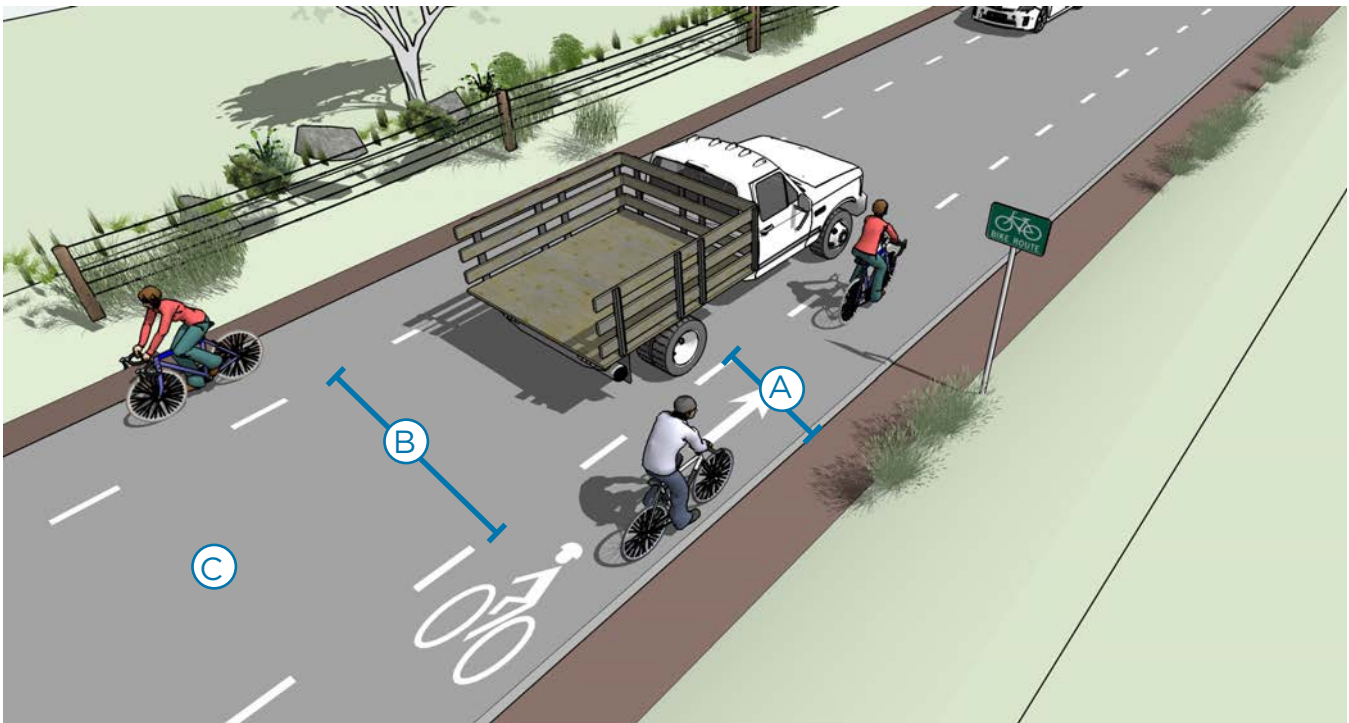
#### DESIGN FEATURES

- (A) A minimum of 4 feet of rideable surface should be available for bicycle travel. (AASHTO 2012)
- (B) Rumble strips are not recommended on shoulders used by bicyclists unless there is a minimum 4 foot clear path. 12 foot gaps every 40-60 feet should be provided to allow access as needed.
- (C) MUTCD D11-1 "Bike Route" wayfinding signage is optional.



## ADVISORY BIKE LANES

Advisory bike lanes are bicycle priority areas delineated by broken white lines, separate from a center one-lane two-way travel area. Motorists may only enter the bicycle zone when no bicycles are present. Motorists must overtake bicyclists with caution due to potential oncoming traffic.



### TYPICAL APPLICATION

- Most appropriate on streets where motor vehicle traffic volumes are low-moderate (1,500-4,500 ADT), and where there is insufficient room for conventional bicycle lanes.
- If on-street parking is present, parking lanes should be highly utilized or occupied with curb extensions to separate the parking lane from the advisory bike lane.
- This treatment may be appropriate on roadways with low volumes if the road is straight with few bends, inclines or sightline obstructions.

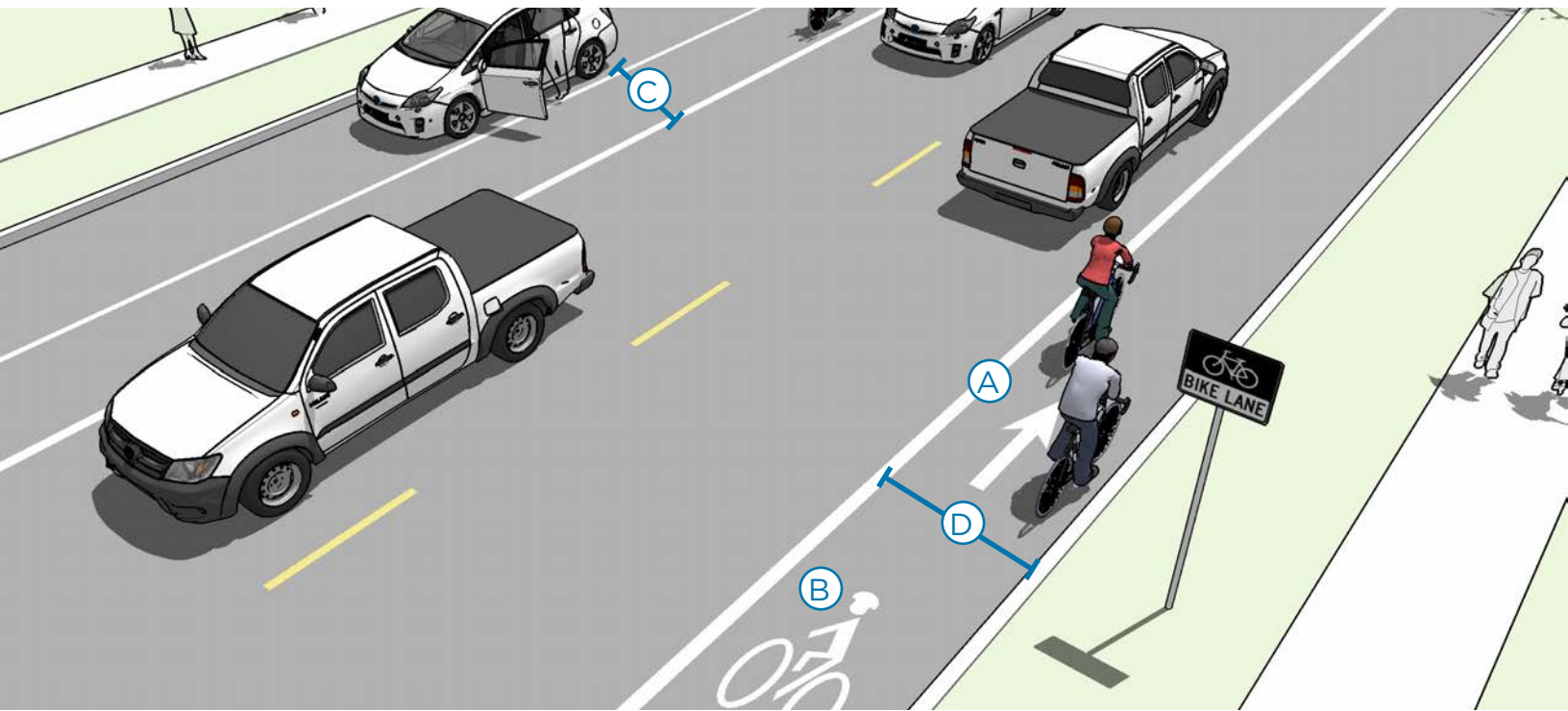
### DESIGN FEATURES

- Ⓐ Advisory bike lane width of 6 ft, 5 ft minimum.
- Ⓑ The automobile zone should be configured narrowly enough so that two cars cannot pass each other in both directions without crossing the advisory lane line. Minimum 2-way motor vehicle travel lane width of 16 ft.
- Ⓒ No centerline on roadway..



## BICYCLE LANES

On-street bike lanes designate an exclusive space for bicyclists through the use of pavement markings and signs. The bike lane is located directly adjacent to motor vehicle travel lanes and is used in the same direction as motor vehicle traffic. Bike lanes are typically on the right side of the street, between the adjacent travel lane and curb, road edge or parking lane.



### TYPICAL APPLICATION

- Bike lanes may be used on any street with adequate space, but are most effective on streets with moderate traffic volumes  $\geq 6,000$  ADT ( $\geq 3,000$  preferred).
- Bike lanes are most appropriate on streets with moderate speeds  $\geq 25$  mph.
- Appropriate for skilled adult riders on most streets.
- May be appropriate for children when configured as 6+ ft wide lanes on lower-speed, lower-volume streets with one lane in each direction.

### DESIGN FEATURES

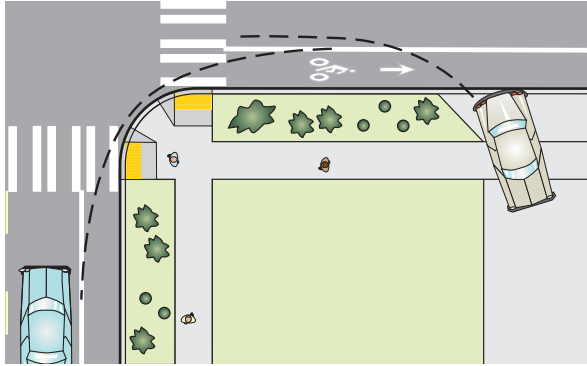
- Mark inside line with 6" stripe. Mark 4" parking lane line or "Ts".<sup>1</sup>
- Include a bicycle lane marking (**MUTCD FIGURE 9C-3**) at the beginning of blocks and at regular intervals along the route (**MUTCD 9C.04**).
- 6 ft width preferred adjacent to on-street parking (5 ft min.).
- 5–6 ft preferred adjacent to curb and gutter (4 ft min.) or 4 ft more than the gutter pan width.

<sup>1</sup> Studies have shown that marking the parking lane encourages people to park closer to the curb. FHWA, Bicycle Countermeasure Selection System, 2006.





### Place Bike Lane Symbols to Reduce Wear



*Bike lane word, symbol, and/or arrow markings (MUTCD Figure 9C-3) shall be placed outside of the motor vehicle tread path in order to minimize wear from the motor vehicle path (NACTO 2012).*

### Bicycle Lane



*Bicycle lanes provide an exclusive space, but may be subject to unwanted encroachment by motor vehicles.*

## FURTHER CONSIDERATIONS

On high speed streets ( $\geq 40$  mph) the minimum bike lane should be 6 ft.

On streets where bicyclists passing each other is to be expected, where high volumes of bicyclists are present, or where added comfort is desired, consider providing extra wide bike lanes up to 7 ft wide, or configure as a buffered bicycle lane.

It may be desirable to reduce the width of general purpose travel lanes in order to add or widen bicycle lanes.

On multi-lane and/or high speed streets, the most appropriate bicycle facility to provide for user comfort may be buffered bicycle lanes or physically separated bicycle lanes.

## MANHOLE COVERS AND GRATES:

Manhole surfaces should be manufactured with a shallow surface texture in the form of a tight, nonlinear pattern

If manholes or other utility access boxes are to be located in bike lanes within 50 ft of intersections or within 20 ft of driveways or other bicycle access points, special manufactured permanent nonstick surfaces will be required to ensure a controlled travel surface for cyclists breaking or turning.

Manholes, drainage grates, or other obstacles should be set flush with the paved roadway. Roadway surface inconsistencies pose a threat to safe riding conditions for bicyclists. Construction of manholes, access panels or other drainage elements will be constructed with no variation in the surface. The maximum allowable tolerance in vertical roadway surface will be 1/4 of an inch.

## CRASH REDUCTION

Before and after studies of bicycle lane installations show a wide range of crash reduction factors. Some studies show a crash reduction of 35 percent (CMF ID: 1719) for vehicle/bicycle collisions after bike lane installation.

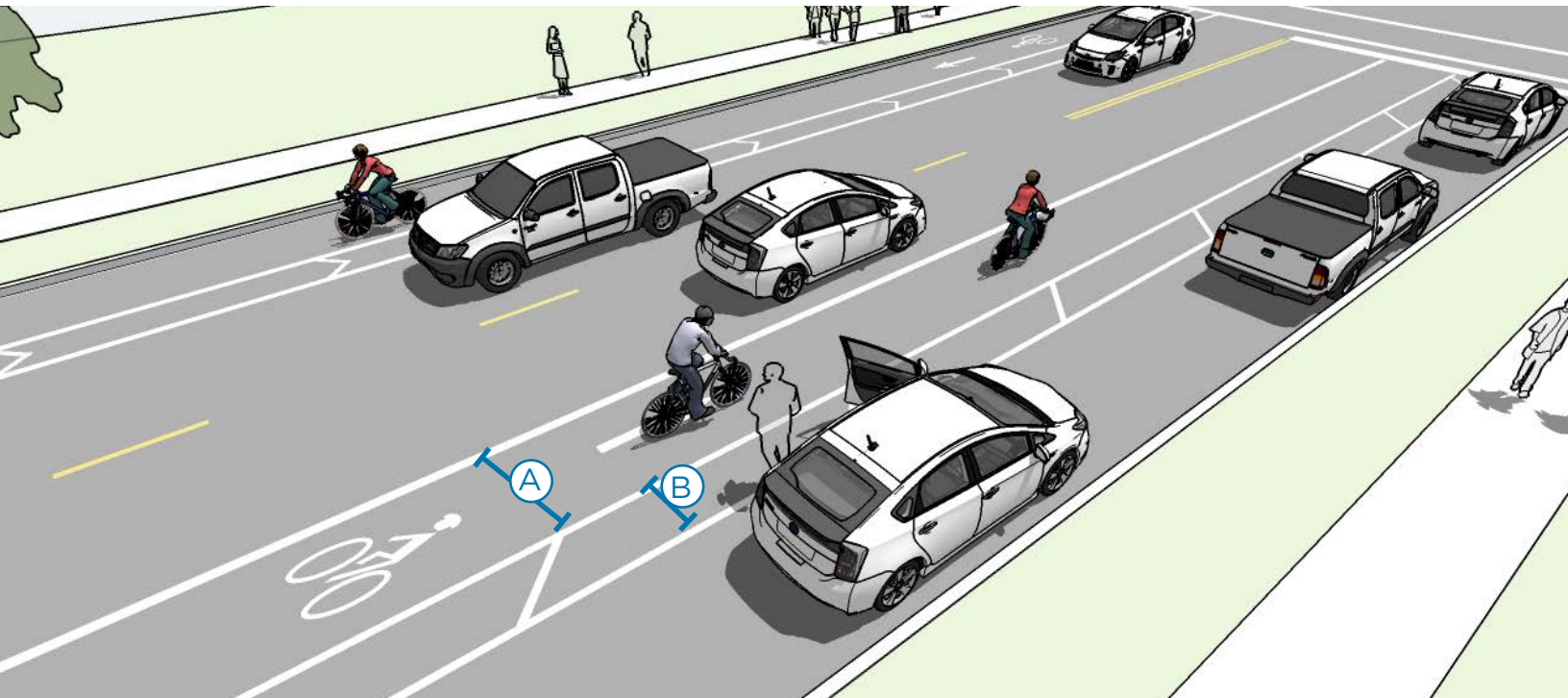
## CONSTRUCTION COSTS

The cost for installing bicycle lanes will depend on the implementation approach. Typical costs are \$16,000 per mile for restriping.



## BUFFERED BICYCLE LANES

Buffered bike lanes are conventional bicycle lanes paired with a designated buffer space, separating the bicycle lane from the adjacent motor vehicle travel lane and/or parking lane.



### TYPICAL APPLICATION

- Anywhere a conventional bike lane is being considered.
- On streets with high speeds and high volumes or high truck volumes.
- On streets with extra lanes or lane width.
- Appropriate for skilled adult riders on most streets.

### DESIGN FEATURES

- A** The minimum bicycle travel area (not including buffer) is 5 ft wide.
- B** Buffers should be at least 2 ft wide. If buffer area is 4 ft or wider, white chevron or diagonal markings should be used.
- For clarity at driveways or minor street crossings, consider a dotted line.
- There is no standard for whether the buffer is configured on the parking side, the travel side, or a combination of both.



### Buffered Bicycle Lane



*The use of pavement markings delineates space for cyclists to ride in a comfortable facility.*

### Buffered Bicycle Lane



*The use of pavement markings delineates space for cyclists to ride in a comfortable facility.*

## FURTHER CONSIDERATIONS

- Color may be used within the lane to discourage motorists from entering the buffered lane.
- A study of buffered bicycle lanes found that, in order to make the facilities successful, there needs to also be driver education, improved signage and proper pavement markings.<sup>1</sup>
- On multi-lane streets with high vehicles speeds, the most appropriate bicycle facility to provide for user comfort may be physically separated bike lanes.
- NCHRP Report #766 recommends, when space is limited, installing a buffer space between the parking lane and bicycle lane where on-street parking is permitted rather than between the bicycle lane and vehicle travel lane.<sup>2</sup>

<sup>1</sup> Monsere, C.; McNeil, N.; and Dill, J., "Evaluation of Innovative Bicycle Facilities: SW Broadway Cycle Track and SW Stark/Oak Street Buffered Bike Lanes. Final Report" (2011). Urban Studies and Planning Faculty Publications and Presentations.

<sup>2</sup> National Cooperative Highway Research Program. Report #766: Recommended Bicycle Lane Widths for Various Roadway Characteristics.

## CRASH REDUCTION

A before and after study of buffered bicycle lane installation in Portland, OR found an overwhelmingly positive response from bicyclists, with 89 percent of bicyclists feeling safer riding after installation and 91 percent expressing that the facility made bicycling easier.<sup>3</sup>

<sup>3</sup> National Cooperative Highway Research Program. Report #766: Recommended Bicycle Lane Widths for Various Roadway Characteristics.

## CONSTRUCTION COSTS

The cost for installing buffered bicycle lanes will depend on the implementation approach. Typical costs are \$16,000 per mile for restriping. However, the cost of large-scale bicycle treatments will vary greatly due to differences in project specifications and the scale and length of the treatment.

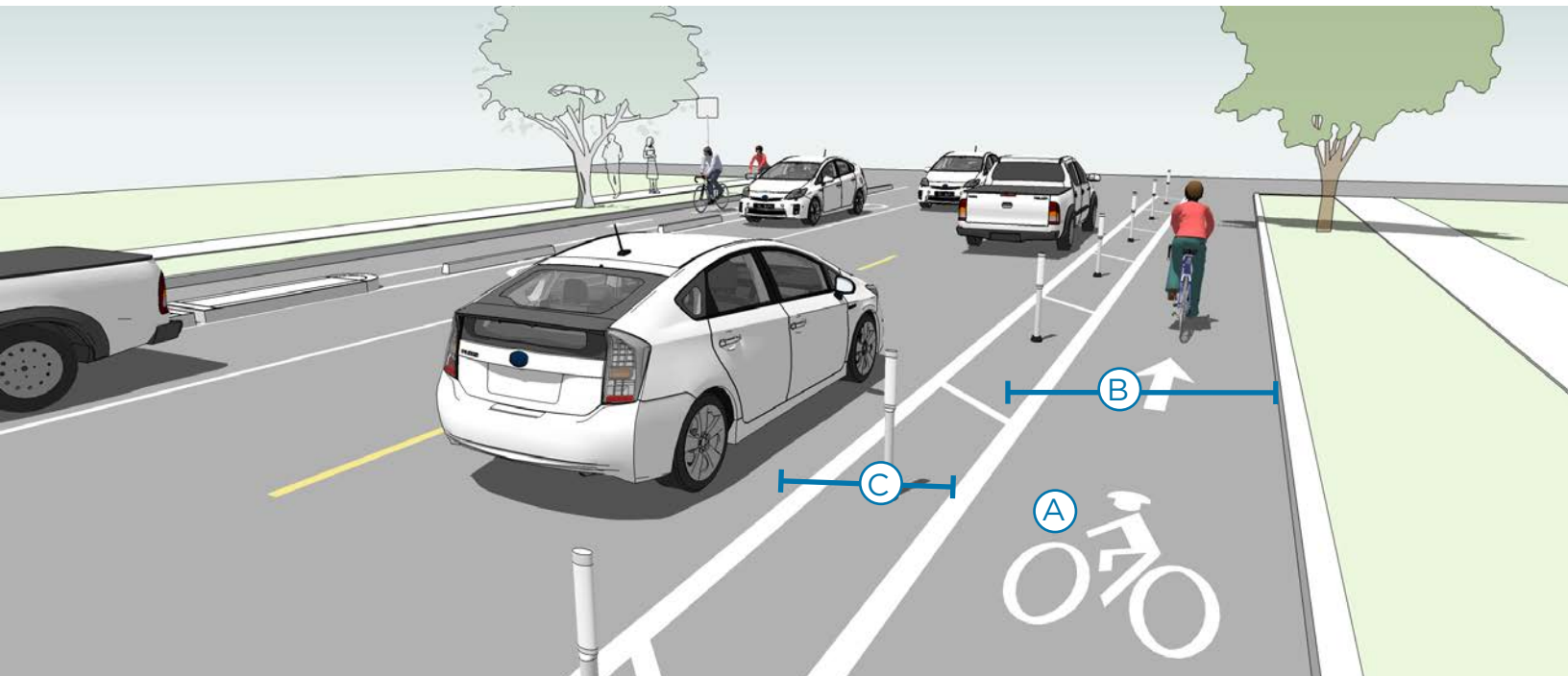




## PHYSICALLY SEPARATED BICYCLE LANES

### ONE-WAY SEPARATED BICYCLE LANES

When retrofitting separated bike lanes onto existing streets, a one-way street-level design may be most appropriate. This design provides protection through physical barriers and can include flexible delineators, curbs, on-street parking or other barriers. A street level separated bike lane shares the same elevation as adjacent travel lanes. A street level separated bike lane shares the same elevation as adjacent travel lanes.



#### TYPICAL APPLICATION

- Street retrofit projects with limited funds for relating curbs and drainage.
- Streets with high motor vehicle volumes and/or speeds and high bicycle volumes.
- Streets for which conflicts at intersections can be effectively mitigated using parking lane setbacks, bicycle markings through the intersection, and other signalized intersection treatments.
- Appropriate for most riders on most streets.

#### DESIGN FEATURES

- (A) Pavement markings, symbols and/or arrow markings must be placed at the beginning of the separated bike lane and at intervals along the facility (MUTCD 9C.04).
- (B) 7 ft width preferred (5 ft minimum).
- (C) 3 ft minimum buffer width adjacent to parking. 18 inch minimum adjacent to travel lanes (NACTO, 2012). Channelizing devices should be placed in the buffer area.
- If buffer area is 4 ft or wider, white chevron or diagonal markings should be used.



## Street Level Separated Bicycle Lanes



*Street Level Separated Bicycle Lanes can be separated from the street with parking, planters, bollards, or other design elements.*

## FURTHER CONSIDERATIONS

- Separated bike lane buffers and barriers are covered in the MUTCD as preferential lane markings (section 3D.01) and channelizing devices (section 3H.01). Curbs may be used as a channeling device, see the section on islands (section 3I.01).
- A retrofit separated bike lane has a relatively low implementation cost compared to road reconstruction by making use of existing pavement and drainage and by using parking lane as a barrier.
- Gutters, drainage outlets and utility covers should be designed and configured as not to impact bicycle travel.
- Special consideration should be given at transit stops to manage bicycle & pedestrian interactions.

## CRASH REDUCTION

A before and after study in Montreal of physically separated bicycle lanes shows that this type of facility can result in a crash reduction of 74 percent for collisions between bicyclists and vehicles. (CMF ID: 4097) In this study, there was a parking buffer between the bike facility and vehicle travel lanes. Other studies have found a range in crash reductions due to SBL, from 8 percent (CMF ID: 4094) to 94 percent (CMF ID: 4101).

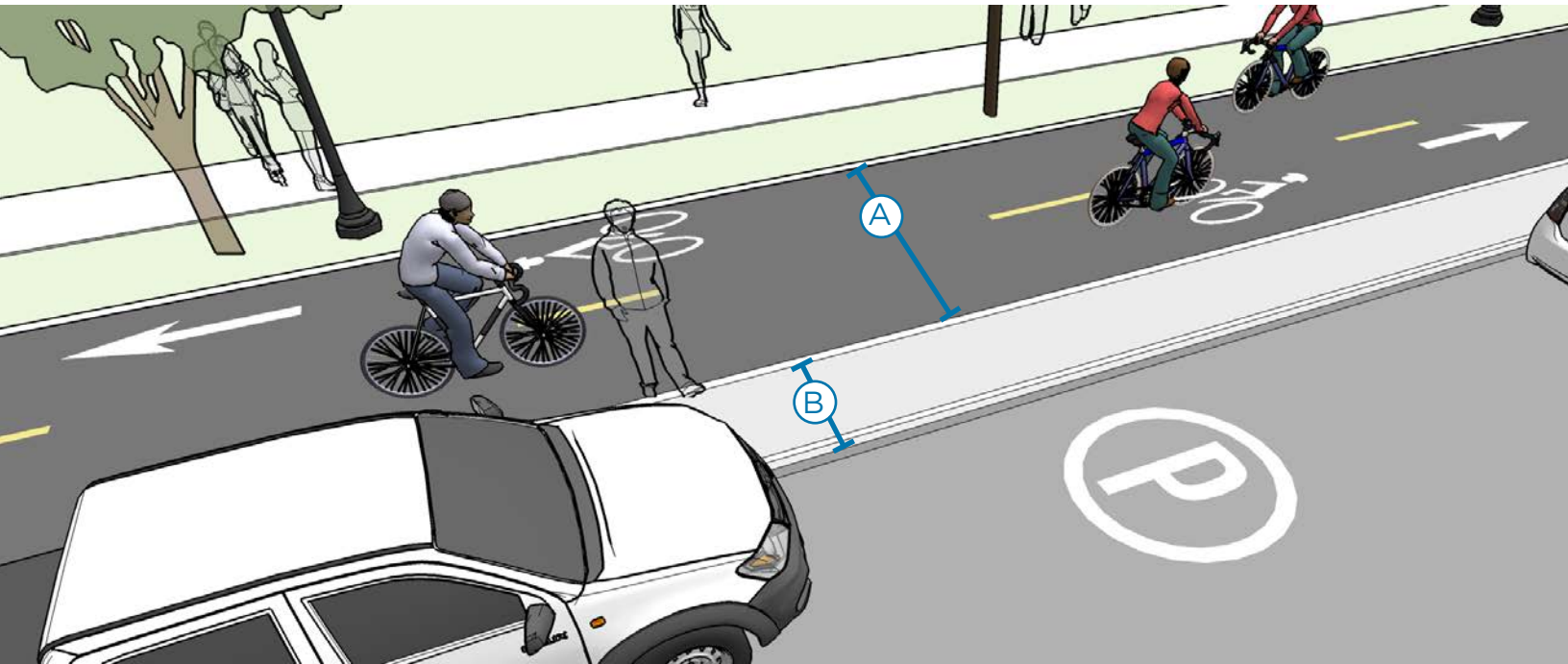
## CONSTRUCTION COSTS

The implementation cost is low if the project uses existing pavement and drainage, but the cost significantly increases if curb lines need to be moved. A parking lane is the low-cost option for providing a barrier. Other barriers might include concrete medians, bollards, tubular markers, or planters.



## TWO-WAY SEPARATED BICYCLE LANES

Two-Way Separated Bicycle Lanes are bicycle facilities that allow bicycle movement in both directions on one side of the road. Two-way separated bicycle lanes share some of the same design characteristics as one-way separated bicycle lanes, but may require additional considerations at driveway and side-street crossings.



### TYPICAL APPLICATION

- Works best on the left side of one-way streets.
- Streets with high motor vehicle volumes and/or speeds.
- Streets with high bicycle volumes.
- Streets with a high incidence of wrong-way bicycle riding.
- Streets with few conflicts such as driveways or cross-streets on one side of the street.
- Streets that connect to shared use paths.

### DESIGN FEATURES

- A** 12 ft operating width preferred (10 ft minimum) width for two-way facility.
- B** In constrained an 8 ft minimum operating width may be considered.
- Adjacent to on-street parking a 3 ft minimum width channelized buffer or island shall be provided to accommodate opening doors (NACTO, 2012) (MUTCD 3H.01, 3I.01).
- A separation narrower than 5 ft may be permitted if a physical barrier is present (AASHTO, 2013).
- Additional signalization and signs may be necessary to manage conflicts.



## Two-Way Separated Bicycle Lanes



*A two-way facility can accommodate cyclists in two directions of travel.*

## FURTHER CONSIDERATIONS

- On-street bike lane buffers and barriers are covered in the MUTCD as preferential lane markings (section 3D.01) and channelizing devices, including flexible delineators (section 3H.01). Curbs may be used as a channeling device, see the section on islands (section 3I.01).
- A two-way separated bike lane on one way street should be located on the left side.
- A two-way separated bike lane may be configured at street level or as a raised separated bicycle lane with vertical separation from the adjacent travel lane.
- Two-way separated bike lanes should ideally be placed along streets with long blocks and few driveways or mid-block access points for motor vehicles.

## CRASH REDUCTION

A study of bicyclists in two-way separated facilities found that accident probability decreased by 45 percent at intersections where the separated facility approach was detected between 2-5 meters from the side of the main road and when bicyclists had crossing priority at intersections. (CMF ID: 3034) Installation of a two-way separated bike lane 0-2 meters from the side of the main road resulted in an increase in collisions at intersections by 3 percent (CMF ID: 4033).

## CONSTRUCTION COSTS

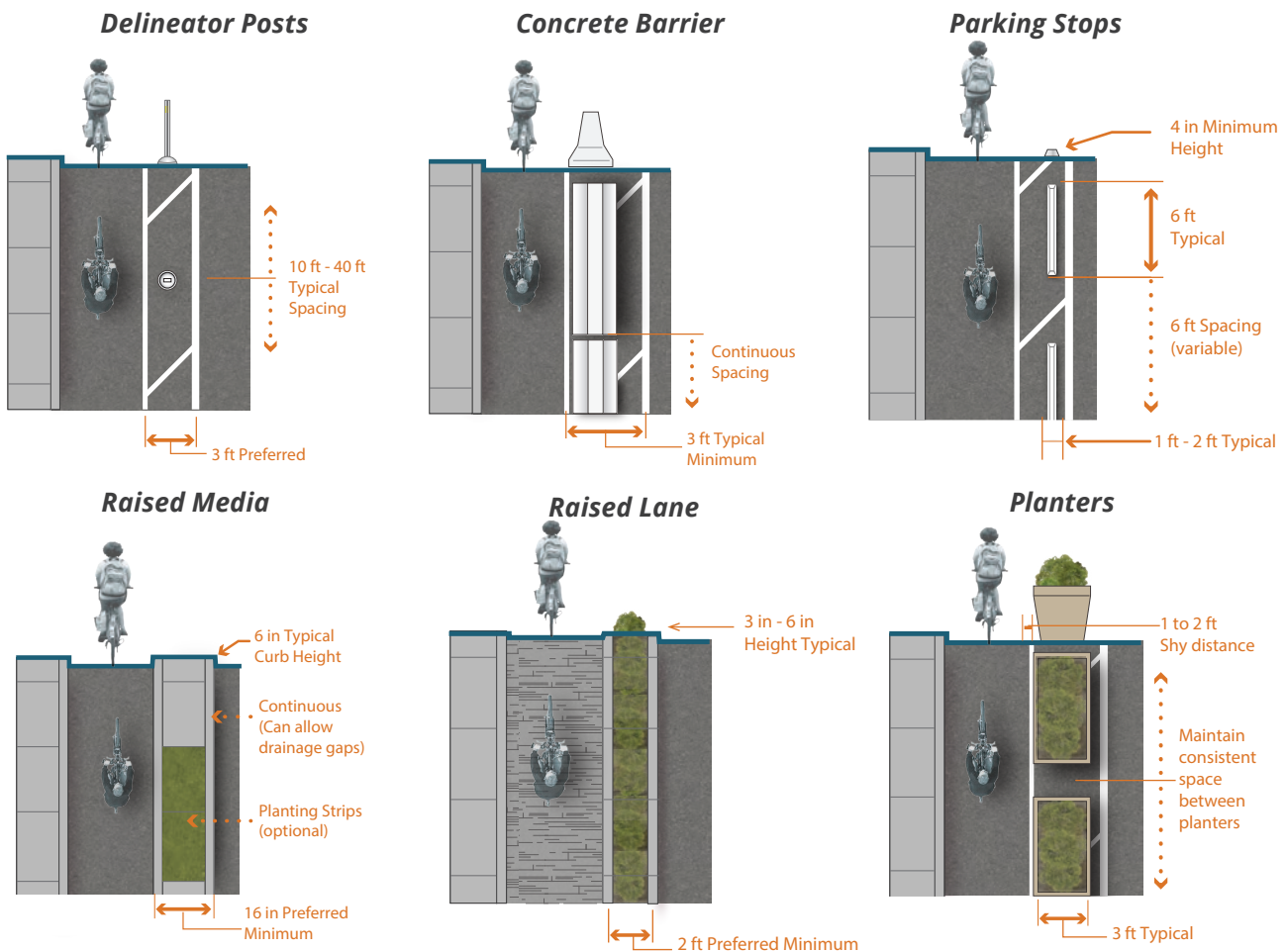
The implementation cost is low if the project uses existing pavement and drainage, but the cost significantly increases if curb lines need to be moved. A parking lane is the low-cost option for providing a barrier. Other barriers might include concrete medians, bollards, tubular markers, or planters.





## SEPARATION METHODS

Separated bikeways may use a variety of vertical elements to physically separate the bikeway from adjacent travel lanes. Barriers may be robust constructed elements such as curbs, or may be more interim in nature, such as flexible delineator posts.



## TYPICAL APPLICATION

### Appropriate barriers for retrofit projects:

- Parked Cars
- Flexible delineators
- Bollards
- Planters
- Parking stops

### Appropriate barriers for reconstruction projects:

- Curb separation
- Medians
- Landscaped Medians
- Raised separated bike lane with vertical or mountable curb
- Pedestrian Safety Islands



## BIKEWAY SEPARATION METHODS



*Raised separated bikeways are bicycle facilities that are vertically separated from motor vehicle traffic.*

### DESIGN FEATURES

- Maximize effective operating space by placing curbs or delineator posts as far from the through bikeway space as practicable.
- Allow for adequate shy distance of 1 to 2 ft from vertical elements to maximize useful space.
- When next to parking allow for 3 ft of space in the buffer space to allow for opening doors and passenger unloading.
- The presences of landscaping in medians, planters and safety islands increases comfort for users and enhances the streetscape environment.

### CRASH REDUCTION

A before and after study in Montreal of separated bikeways shows that this type of facility can result in a crash reduction of 74 percent for collisions between bicyclists and vehicles. (CMF ID: 4097) In this study, there was a parking buffer between the bike facility and vehicle travel lanes. Other studies have found a range in crash reductions due to SBL, from 8 percent (CMF ID: 4094) to 94 percent (CMF ID: 4101).

### FURTHER CONSIDERATIONS

- Separated bikeway buffers and barriers are covered in the MUTCD as preferential lane markings (section 3D.01) and channelizing devices (section 3H.01). Curbs may be used as a channeling device, see the section on islands (section 3I.01).
- With new roadway construction a raised separated bikeway can be less expensive to construct than a wide or buffered bicycle lane because of shallower trenching and sub base requirements.
- Parking should be prohibited within 30 ft of the intersection to improve visibility.

### CONSTRUCTION COSTS

Separated bikeway costs can vary greatly, depending on the type of material, the scale, and whether it is part of a broader construction project.



## BIKEWAY INTERSECTION TREATMENTS

### INTERSECTION CROSSING MARKINGS

Bicycle pavement markings through intersections guide bicyclists on a safe and direct path through the intersection and provide a clear boundary between the paths of through bicyclists and vehicles in the adjacent lane.



#### TYPICAL APPLICATION

- Streets with conventional, buffered, or separated bike lanes.
- At direct paths through intersections.
- Streets with high volumes of adjacent traffic.
- Where potential conflicts exist between through bicyclist and adjacent traffic.

#### DESIGN FEATURES

- Intersection markings should be the same width and in line with leading bike lane.
- Ⓐ Dotted lines should be a minimum of 6 inches wide and 4 ft long, spaced every 12 ft.
- All markings should be white, skid resistant and retro reflective (MUTCD 9C.02.02).
- Ⓑ Green pavement markings may also be used.



## Intersection Crossing Markings



Intersection crossing markings can be used at signalized intersections or high volume minor street and driveway crossings, as illustrated above.

## FURTHER CONSIDERATIONS

The National Committee on Uniform Traffic Control Devices has submitted a request to include additional options bicycle lanes extensions through intersections as a part of future MUTCD updates<sup>1</sup>. Their proposal includes the following options for striping elements within the crossing:

- Bicycle lane markings
- Double chevron markings, indicating the direction of travel.
- Green colored pavement.

<sup>1</sup> Letter to FHWA from the Bicycle Technical Committee for the MUTCD. Bicycle Lane Extensions through Intersections. June 2014.

## CRASH REDUCTION

A study on the safety effects of intersection crossing markings found a reduction in accidents by 10 percent and injuries by 19 percent.<sup>2</sup>

A study in Portland, OR found that significantly more motorists yielded to bicyclists after the colored pavement had been installed (92 percent in the after period versus 72 percent in the before period).<sup>3</sup>

<sup>2</sup> Jensen, S.U. (2008). Safety effects of blue cycle crossings: A before-after study. *Accident Analysis & Prevention*, 40(2), 742-750.

<sup>3</sup> Hunter, W.W. et al. (2000). Evaluation of Blue Bike-Lane Treatment in Portland, Oregon. *Transportation Research Record*, 1705, 107-115.

## CONSTRUCTION COSTS

The cost for installing intersection crossing markings will depend on the implementation approach. On roadways with adequate width for reconfiguration or restriping, costs may be negligible when provided as part of routine overlay or repaving projects.

Typical shared lane markings cost \$180 each.







## Bike Box



*A bike box allows for cyclists to wait in front of queuing traffic, providing high visibility, and a head start over motor vehicle traffic.*

## FURTHER CONSIDERATIONS

- This treatment positions bicycles together and on a green signal, all bicyclists can quickly clear the intersection, minimizing conflict and delay to transit or other traffic.
- Pedestrians also benefit from bike boxes, as they experience reduced vehicle encroachment into the crosswalk.

## CRASH REDUCTION

A study of motorist/bicyclist conflicts at bike boxes indicate a 35 percent decrease in conflicts (CMF ID: 1718). A study done in Portland in 2010 found that 77 percent of bicyclists felt bicycling through intersections was safer with the bike boxes.<sup>1</sup>

<sup>1</sup> Monsere, C. & Dill, J. (2010). Evaluation of Bike Boxes at Signalized Intersections. Final Draft. Oregon Transportation Research and education Consortium.

## CONSTRUCTION COSTS

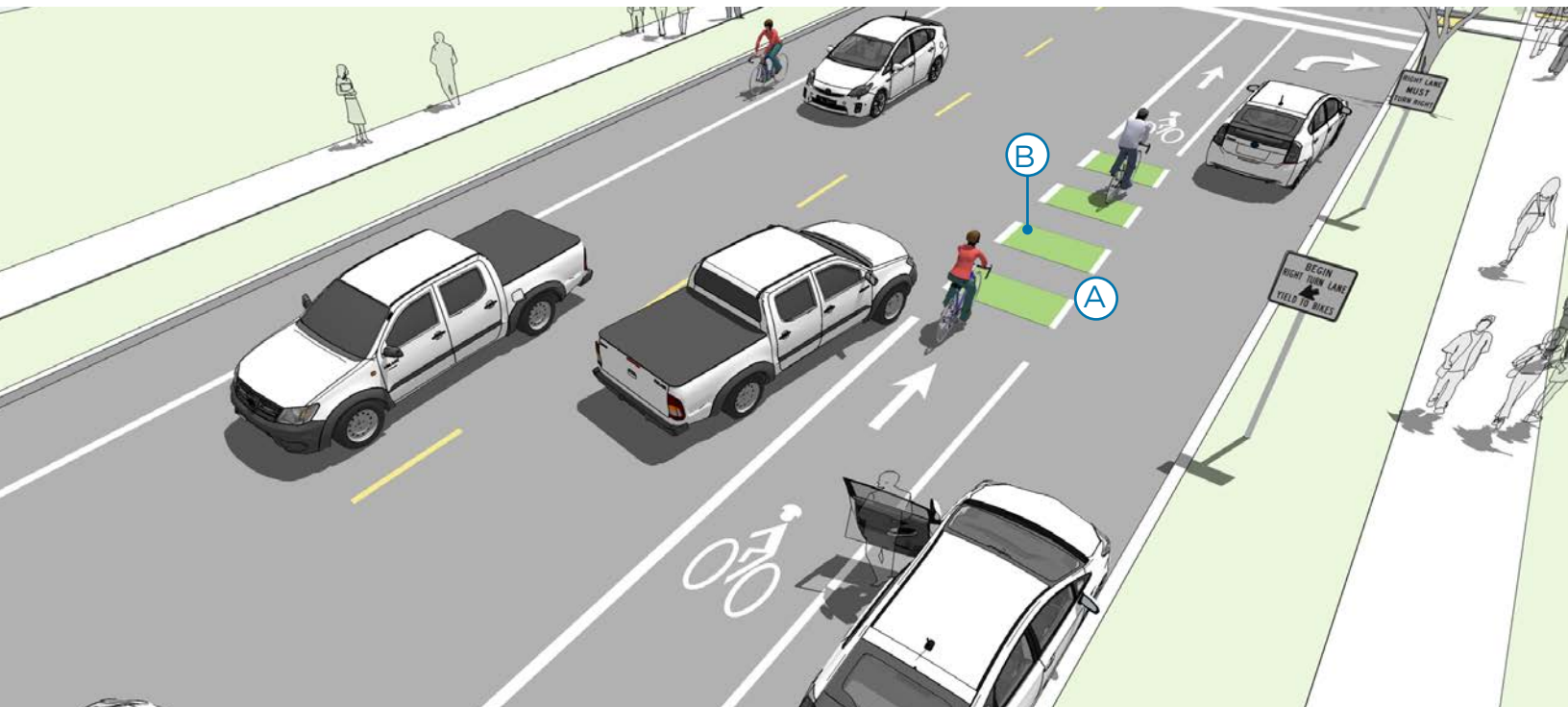
Costs will vary due to the type of paint used and the size of the bike box, as well as whether the treatment is added at the same time as other road treatments.

The typical cost for painting a bike box is \$11.50 per square ft.



## COLORED BICYCLE LANES

Colored pavement within a bicycle lane may be used to increase the visibility of the bicycle facility, raise awareness of the potential to encounter bicyclists and reinforce priority of bicyclists in conflict areas.



### TYPICAL APPLICATION

- Within a weaving or conflict area to identify the potential for bicyclist and motorist interactions and assert bicyclist priority.
- Across intersections, driveways and Stop or Yield-controlled cross-streets.

### DESIGN FEATURES

- (A) Typical white bike lanes (solid or dotted 6" stripe) are used to outline the green colored pavement.
- (B) In weaving or turning conflict areas, preferred striping is dashed, to match the bicycle lane line extensions.
- The colored surface should be skid resistant and retro-reflective (**MUTCD 9C.02.02**).
- In exclusive use areas, such as bike boxes, color application should be solid green.





## Colored Bicycle Lane



A colored bicycle lane on Laurel Street in Santa Cruz, CA alerts users to potential merging in advance of an intersection. Photo by Richard Masoner via Flickr (CC BY-SA 2.0).

## FURTHER CONSIDERATIONS

- Green colored pavement shall be used in compliance with FHWA Interim Approval (FHWA IA-14.10).<sup>1</sup>
- While other colors have been used (red, blue, yellow), green is the recommended color in the US.
- The application of green colored pavement within bicycle lanes is an emerging practice. The guidance recommended here is based on best practices in cities around the county.

<sup>1</sup> FHWA. Interim Approval for Optional Use of Green Colored Pavement for Bike Lanes (IA-14). 2011.

## CRASH REDUCTION

Before and after studies of colored bicycle lane installations have found a reduction in bicycle/vehicle collisions by 38 percent and a reduction in serious injuries and fatalities of bicyclists by 71 percent.<sup>2</sup> A study in Portland, OR found a 38 percent decrease in the rate of conflict between bicyclists and motorists after colored lanes were installed.<sup>3</sup>

<sup>2</sup> Jensen, S.U., et. al., "The Marking of Bicycle Crossings at Signalized Intersections," Nordic Road and Transport Research No. 1, 1997, pg. 27.

<sup>3</sup> Hunter, W. W., et. al., Evaluation of the Blue Bike-Lane Treatment Used in Bicycle/Motor Vehicle Conflict Areas in Portland, Oregon, McLean, VA: FHWA, 2000, pg. 25.

## CONSTRUCTION COSTS

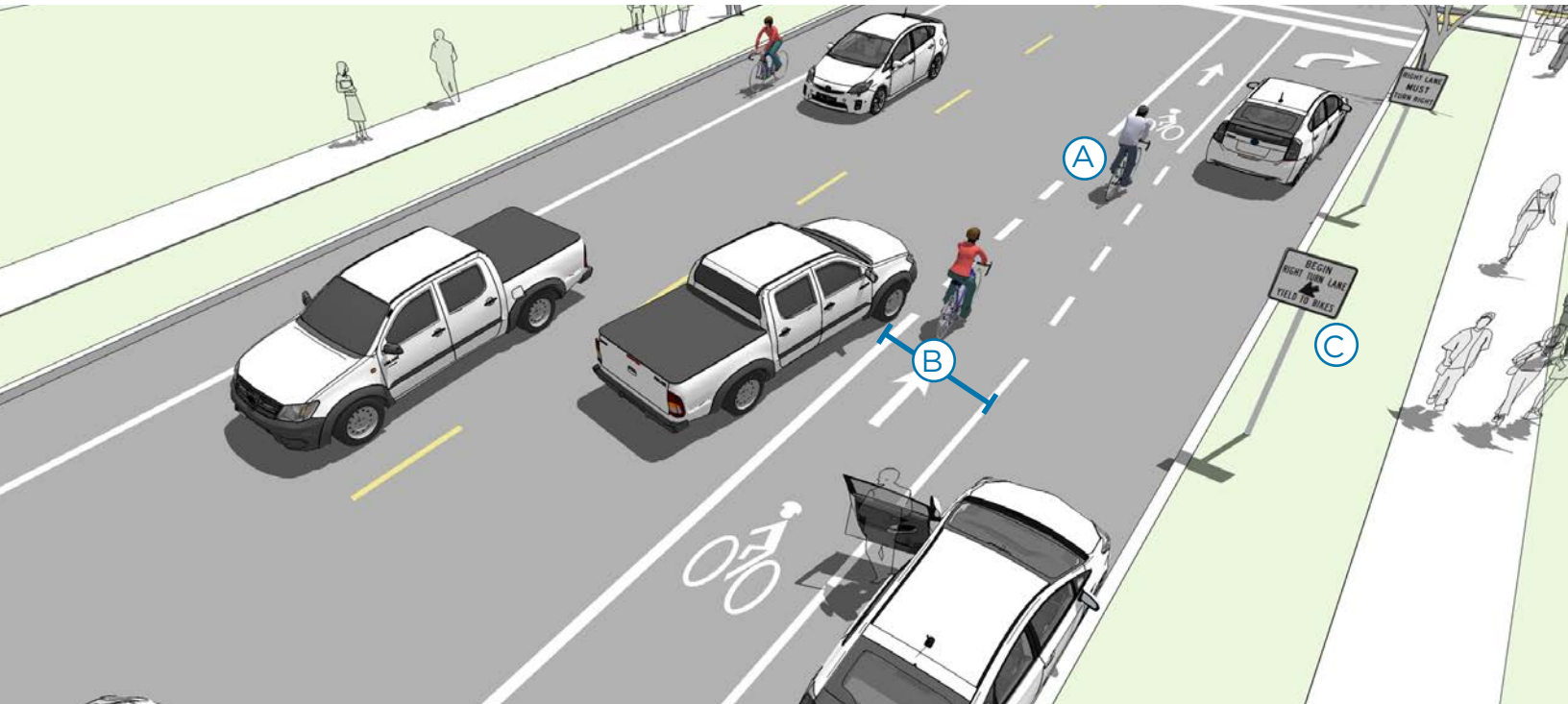
The cost for installing colored bicycle lanes will depend on the materials selected and implementation approach. Typical costs range from \$1.20/sq. ft installed for paint to \$14/sq. ft installed for Thermoplastic. Colored pavement is more expensive than standard asphalt installation, costing 30-50 percent more than non-colored asphalt.





## BIKE LANES AT ADDED RIGHT TURN LANES

The appropriate treatment at right turn only lanes is to introduce an added turn lane to the outside of the bicycle lane. The area where people driving must weave across the bicycle lane should be marked with dotted lines to identify the potential conflict areas. Signage should indicate that motorists must yield to bicyclists through the conflict area.



### TYPICAL APPLICATION

- Streets with right-turn lanes and right side bike lanes.
- Streets with left-turn lanes and left side bike lanes.

### DESIGN FEATURES

- Ⓐ Mark inside line with 6" stripe.
- Ⓑ Continue existing bike lane width; standard width of 5 to 6 ft (4 ft in constrained locations).
- Ⓒ A "Begin Right Turn Lane Yield To Bikes" (MUTCD R4-4) signs indicates that motorists should yield to bicyclists through the conflict area.
- Consider using colored in the conflict areas to promote visibility of the dashed weaving area.



### *Through Bicycle Lane to the Left of a Right Turn Only Lane*



*Drivers wishing to enter the right turn lane must transition across the bicycle lane in advance of the turn.*

## **FURTHER CONSIDERATIONS**

- The bicycle lane maintains a straight path, and drivers must weave across, providing clear right-of-way priority to bicyclists.
- Maintaining a straight bicycle path reinforces the priority of bicyclists over turning cars. Drivers must yield to bicyclists before crossing the bike lane to enter the turn only lane.
- Through lanes that become turn only lanes are difficult for bicyclists to navigate and should be avoided.
- The use of dual right-turn-only lanes should be avoided on streets with bike lanes (AASHTO, 2013). Where there are dual right-turn-only lanes, the bike lane should be placed to the left of both right-turn lanes, in the same manner as where there is just one right-turn-only lane.

## **CRASH REDUCTION**

Studies have shown a 3 percent decrease in crashes at signalized intersections with exclusive right turn lanes when compared to sharing the roadway with motor vehicles (CMF ID: 3257).

## **CONSTRUCTION COSTS**

The cost for installing bicycle lanes will depend on the implementation approach. On roadways with adequate width for reconfiguration or restriping, costs may be negligible when provided as part of routine overlay or repaving projects.

Typical costs are \$16,000 per mile for restriping.



## COMBINED BIKE LANE/TURN LANE

Where there isn't room for a conventional bicycle lane and turn lane a combined bike lane/turn lane creates a shared lane where bicyclists can ride and turning motor vehicles yield to through traveling bicyclists. The combined bicycle lane/turn lane places shared lane markings within a right turn only lane.



### TYPICAL APPLICATION

- Most appropriate in areas with lower posted speeds (30 MPH or less) and with lower traffic volumes (10,000 ADT or less).
- May not be appropriate for high speed arterials or intersections with long right turn lanes.
- May not be appropriate for intersections with large percentages of right-turning heavy vehicles.

### DESIGN FEATURES

- (A) Maximum shared turn lane width is 13 ft; narrower is preferable (NACTO, 2012).
- (B) Shared Lane Markings should indicate preferred positioning of bicyclists within the combine lane.
- (C) A "Right Lane Must Turn Right" (MUTCD R3-7R) sign with an "EXCEPT BIKES" plaque may be needed to permit through bicyclists to use a right turn lane.
- (D) Use "Begin Right Turn Lane Yield To Bikes" signage (MUTCD R4-4) to indicate that motorists should yield to bicyclists through the conflict area.





### ***Combined Bike Lane/Turn Lane (Billings, MT)***



*Shared lane markings and signs indicate that bicyclists should right in the left side of this right turn only lane.*

## **FURTHER CONSIDERATIONS**

- This treatment is recommended at intersections lacking sufficient space to accommodate both a standard through bike lane and right turn lane.
- Not recommended at intersections with high peak motor vehicle right turn movements.
- Combined bike lane/turn lane creates safety and comfort benefits by negotiating conflicts upstream of the intersection area.

## **CRASH REDUCTION**

A survey in Eugene, OR found that more than 17 percent of the surveyed bicyclists using the combined turn lane felt that it was safer than the comparison location with a standard-width right-turn lane, and another 55 percent felt that the combined-lane site was no different safety-wise than the standard-width location.<sup>1</sup>

<sup>1</sup> Hunter, W.W. (2000). Evaluation of a Combined Bicycle Lane/Right-Turn Lane in Eugene, Oregon. Publication No. FHWA-RD-00-151, Federal Highway Administration, Washington, DC.

## **CONSTRUCTION COSTS**

The cost for installing a combined turn lane will depend on the implementation approach. On roadways with adequate width for reconfiguration or restriping, costs may be negligible when provided as part of routine overlay or repaving projects.

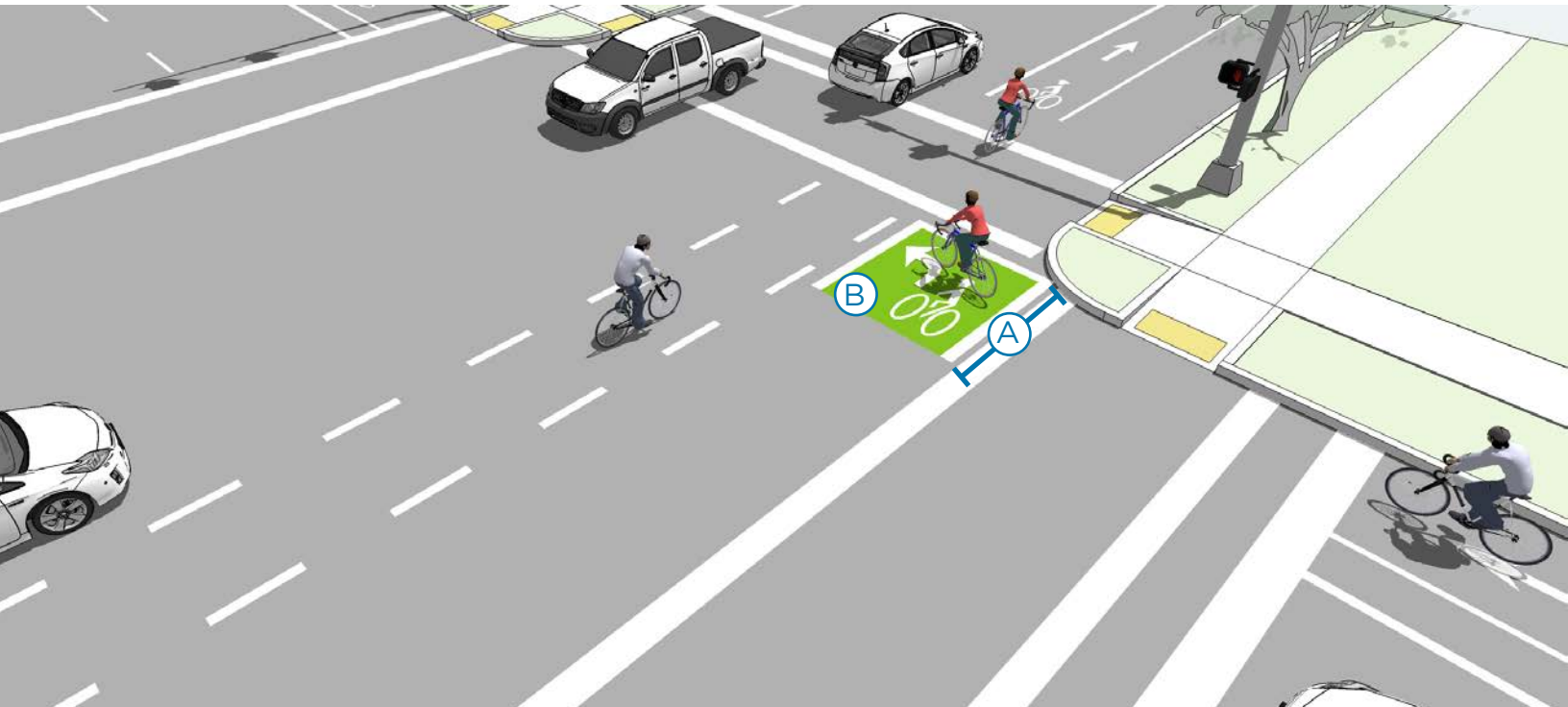
Typical costs are \$16,000 per mile for restriping. Typical yield lines cost \$10 per square ft or \$320 each. Typical shared lane markings cost \$180 each.





## TWO-STAGE TURN BOXES

Two-stage turn boxes offer bicyclists a safe way to make turns at multi-lane signalized intersections from a physically separated or conventional bike lane. On physically separated bike lanes, bicyclists are often unable to merge into traffic to turn due to physical separation, making the provision of two-stage turn boxes critical.



### TYPICAL APPLICATION

- Streets with high vehicle speeds and/or traffic volumes.
- At intersections locations of multi-lane roads with signalized intersections.
- At signalized intersections with a high number of bicyclists making a left turn from a right side facility.

### DESIGN FEATURES

- The two-stage turn box shall be placed in a protected area. Typically this is within the shadow of an on-street parking lane or separated bike lane buffer area and should be placed in front of the crosswalk to avoid conflict with pedestrians.

**(A)** 8 ft x 6 ft preferred depth of bicycle storage area (6 ft x 3 ft minimum).

**(B)** Bicycle stencil and turn arrow pavement markings shall be used to indicate proper bicycle direction and positioning (NACTO, 2012).



### Jughandle Turn Box



*This MUTCD compliant design carves a jughandle out of the sidewalk to provide space for waiting bicyclists.*

### Separated Bike Lane Turn Box



*On separated bike lanes, the two-stage turn box can be located in the protected buffer/parking area.*

## FURTHER CONSIDERATIONS

- Consider providing a “No Turn on Red” (MUTCD R10-11) on the cross street to prevent motor vehicles from entering the turn box.
- This design formalizes a maneuver called a “box turn” or “pedestrian style turn.”
- Some two-stage turn box designs are considered experimental by FHWA.
- Design guidance for two-stage turns apply to both bike lanes and separated bike lanes.
- Two-stage turn boxes reduce conflicts in multiple ways; from keeping bicyclists from queuing in a bike lane or crosswalk and by separating turning bicyclists from through bicyclists.
- Bicyclist capacity of a two-stage turn box is influenced by physical dimension (how many bicyclists it can contain) and signal phasing (how frequently the box clears).

## CRASH REDUCTION

There are no Crash Modification Factors (CMFs) available for this treatment.

## CONSTRUCTION COSTS

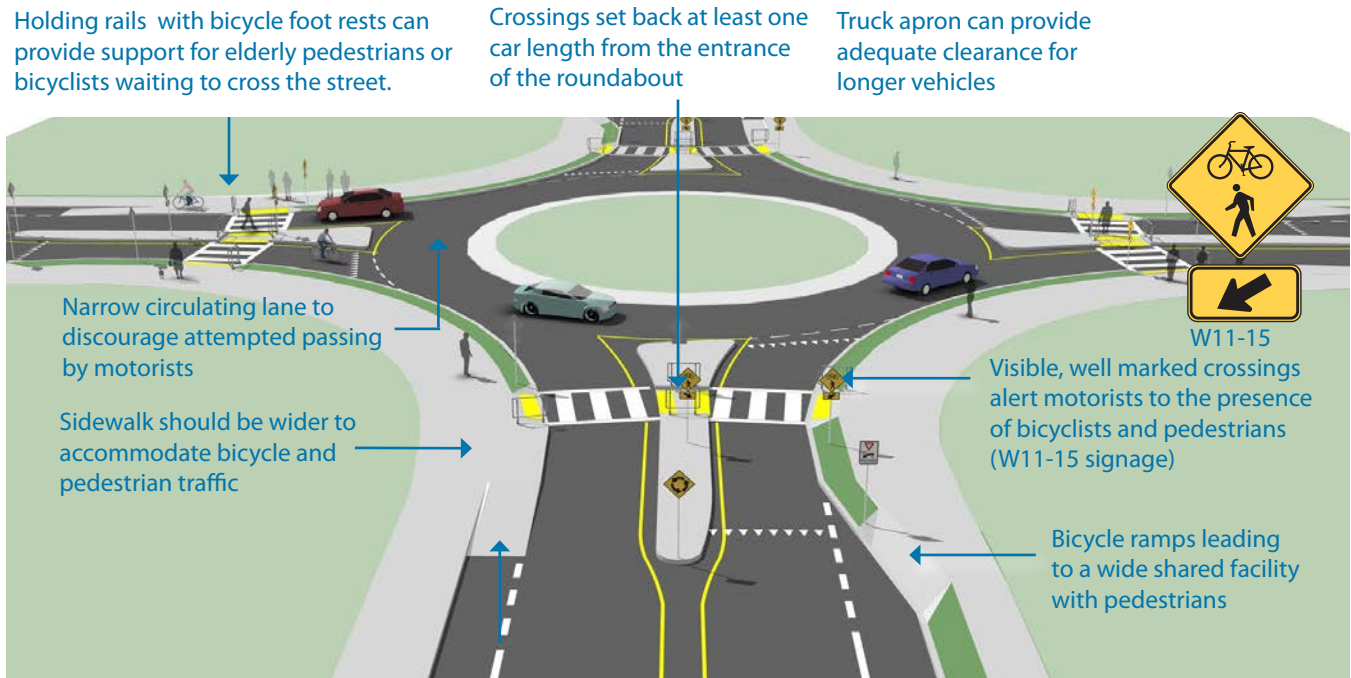
Costs will vary due to the type of paint used and the size of the two-stage turn box, as well as whether the treatment is added at the same time as other road treatments.

The typical cost for painting a two-stage turn box is \$11.50 per square ft.



## BICYCLISTS AT SINGLE LANE ROUNDABOUTS

Roundabouts are circular intersection designed with yield control for all entering traffic, channelized approaches and geometry to induce desirable speeds. They are used as an alternative to intersection signalization.



### TYPICAL APPLICATION

- On bicycle routes a roundabout or neighborhood traffic circle is preferable to stop control as bicyclists do not like to lose their momentum due to physical effort required. At intersections of multi-use paths, pedestrian and bicycle only roundabouts are an excellent form of non-motorized user traffic control.

### DESIGN FEATURES

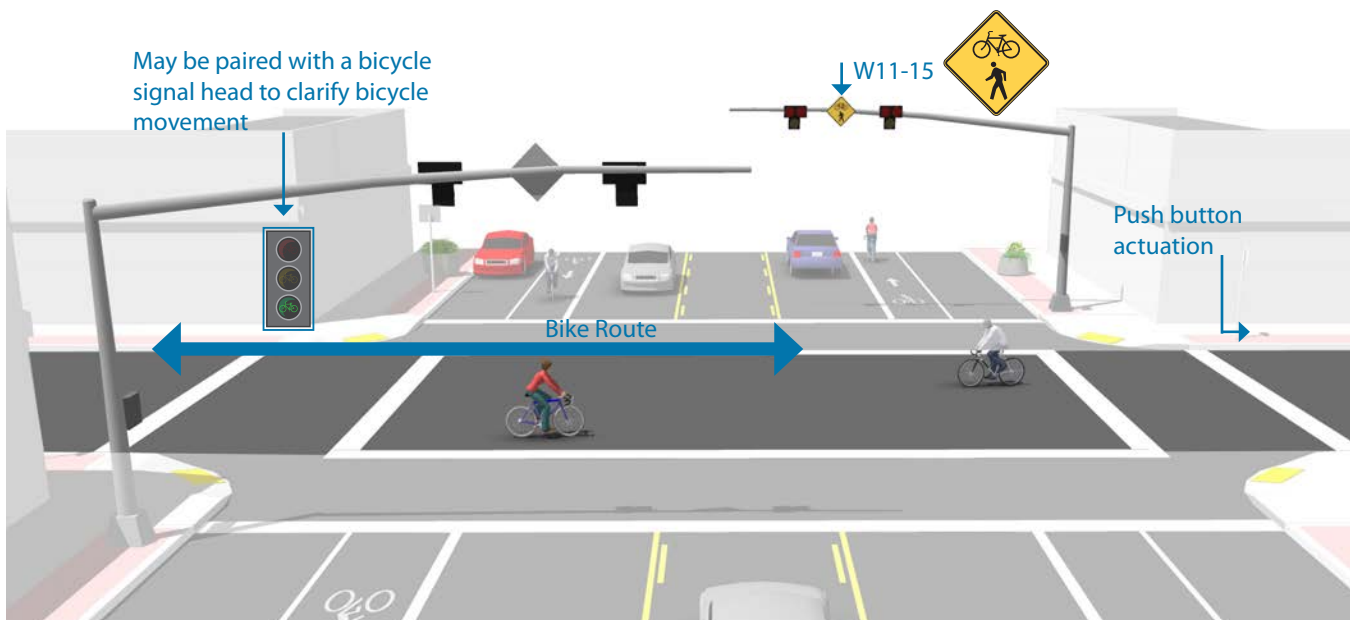
It is important to indicate to motorists, bicyclists and pedestrians the right-of-way rules and correct way for them to circulate, using appropriately designed signage, pavement markings, and geometric design elements.

- 25 mph maximum circulating design speed.
- Design approaches/exits to the lowest speeds possible.
- Encourage bicyclists navigating the roundabout like motor vehicles to “take the lane.”
- Maximize yielding rate of motorists to pedestrians and bicyclists at crosswalks.
- Provide separated facilities for bicyclists who prefer not to navigate the roundabout on the roadway.



## HYBRID BEACON FOR BICYCLE ROUTE CROSSING

A hybrid beacon, previously known as a High-intensity Activated Crosswalk (HAWK), consists of a signal-head with two red lenses over a single yellow lens on the major street, and pedestrian and/or bicycle signal heads for the minor street. There are no signal indications for motor vehicles on the minor street approaches.



### TYPICAL APPLICATION

- Hybrid beacons are used to improve non-motorized crossings of major streets in locations where side-street volumes do not support installation of a conventional traffic signal (or where there are concerns that a conventional signal will encourage additional motor vehicle traffic on the minor street).
- Hybrid beacons may also be used at mid-block crossing locations.
- Each crossing, regardless of traffic speed or volume, requires additional review by a registered engineer to identify sight lines, potential impacts on traffic progression, timing with adjacent signals, capacity, and safety.

### DESIGN FEATURES

Hybrid beacons may be installed without meeting traffic signal control warrants if roadway speed and volumes are excessive for comfortable user crossing.

- If installed within a signal system, signal engineers should evaluate the need for the hybrid signal to be coordinated with other signals.
- Parking and other sight obstructions should be prohibited for at least 100 feet in advance of and at least 20 feet beyond the marked crosswalk to provide adequate sight distance.





## BIKEWAY AMENITIES

### WAYFINDING SIGN TYPES

The ability to navigate through a city is informed by landmarks, natural features, and other visual cues. Signs throughout the city should indicate to bicyclists the direction of travel, the locations of destinations and the travel time/distance to those destinations. A bicycle wayfinding system consists of comprehensive signing and/or pavement markings to guide bicyclists to their destinations along preferred bicycle routes.



D11-1c



D1-1



D11-1/D1-3a

### TYPICAL APPLICATION

- Wayfinding signs will increase users' comfort and accessibility to the bicycle network.
- Signage can serve both wayfinding and safety purposes including:
  - Helping to familiarize users with the bicycle network
  - Helping users identify the best routes to destinations
  - Helping to address misperceptions about time and distance
  - Helping overcome a "barrier to entry" for people who are not frequent bicyclists (e.g., "interested but concerned" bicyclists)

### DESIGN FEATURES

- Confirmation signs indicate to bicyclists that they are on a designated bikeway. Make motorists aware of the bicycle route. Can include destinations and distance/time but do not include arrows.
  - (A)
- Turn signs indicate where a bikeway turns from one street onto another street. These can be used with pavement markings and include destinations and arrows.
  - (B)
- Decisions signs indicate the junction of two or more bikeways and inform bicyclists of the designated bike route to access key destinations. These include destinations, arrows and distances. Travel times are optional but recommended.
  - (C)



### Community Logos on Signs



Wayfinding signs can include a local community identification logo, as this example from Oakland, CA.

### Custom Street Signs (Berkeley, CA)



Custom street signs can also act as a type of confirmation sign, to let all users know the street is prioritized for bicyclists.

## FURTHER CONSIDERATIONS

- Bicycle wayfinding signs also visually cue motorists that they are driving along a bicycle route and should use caution. Signs are typically placed at key locations leading to and along bicycle routes, including the intersection of multiple routes.
- Too many road signs tend to clutter the right-of-way, and it is recommended that these signs be posted at a level most visible to bicyclists rather than per vehicle signage standards.
- A community-wide bicycle wayfinding signage plan would identify:
  - Sign locations
  - Sign type – what information should be included and design features
  - Destinations to be highlighted on each sign – key destinations for bicyclists
  - Approximate distance and travel time to each destination
- Green is the color used for directional guidance and is the most common color of bicycle wayfinding signage in the US, including those in the MUTCD.
- Check wayfinding signage along bikeways for signs of vandalism, graffiti, or normal wear and replace signage along the bikeway network as-needed.

## CRASH REDUCTION

There is no evidence that wayfinding signs have any impact on crash reduction or user safety.

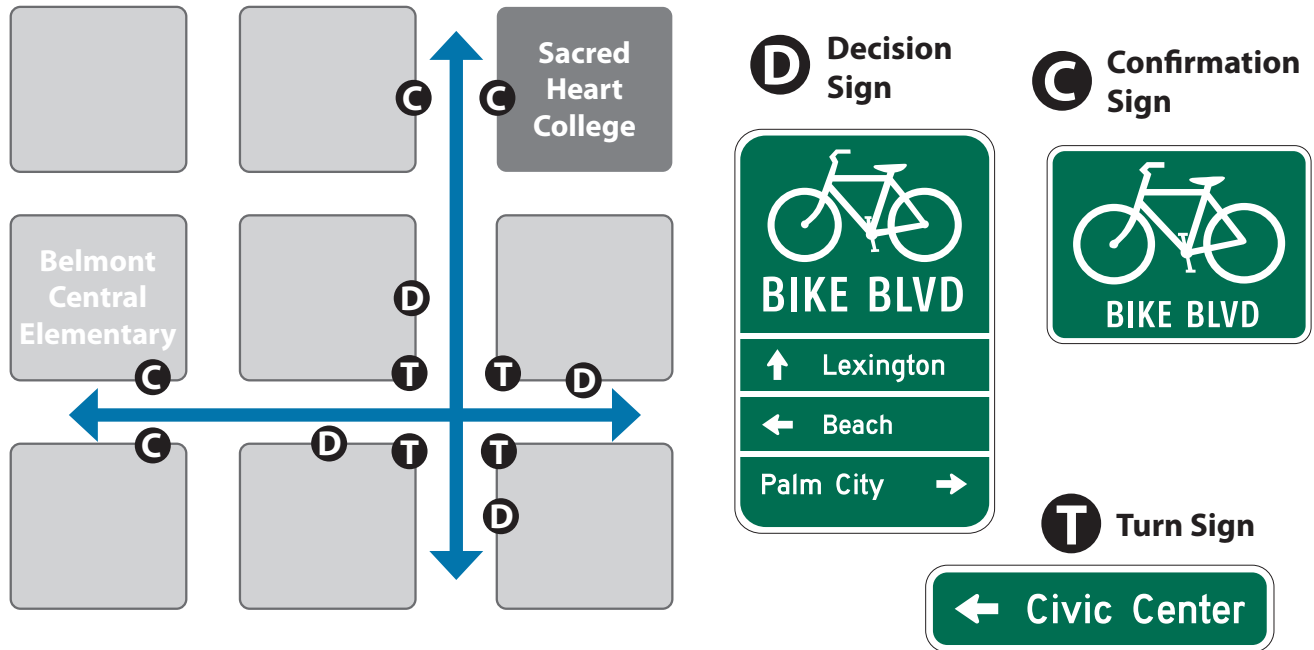
## CONSTRUCTION COSTS

Wayfinding signs range from \$150 to \$500.



## WAYFINDING SIGN PLACEMENT

Signs are placed at decision points along bicycle routes – typically at the intersection of two or more bikeways and at other key locations leading to and along bicycle routes.



### TYPICAL APPLICATION

#### Confirmation Signs

- Placed every  $\frac{1}{4}$  to  $\frac{1}{2}$  mile on off-street facilities and every 2 to 3 blocks along on-street bicycle facilities, unless another type of sign is used (e.g., within 150 ft of a turn or decision sign).
- Should be placed soon after turns to confirm destination(s). Pavement markings can also act as confirmation that a bicyclist is on a preferred route.

#### Turn Signs

- Near-side of intersections where bike routes turn (e.g., where the street ceases to be a bicycle route or does not go through).
- Pavement markings can also indicate the need to turn to the bicyclist.

#### Decision Signs

- Near-side of intersections in advance of a junction with another bicycle route.
- Along a route to indicate a nearby destination.

### DESIGN FEATURES

- MUTCD guidelines should be followed for wayfinding sign placement, which includes mounting height and lateral placement from edge of path or roadway.
- Pavement markings can be used to reinforce routes and directional signage.



## Wayfinding Pavement Markings



*Some cities use pavement markings to indicate required turns or jogs along the bicycle route.*

## FURTHER CONSIDERATIONS

It can be useful to classify a list of destinations for inclusion on the signs based on their relative importance to users throughout the area. A particular destination's ranking in the hierarchy can be used to determine the physical distance from which the locations are signed. For example, primary destinations (such as the downtown area) may be included on signage up to 5 miles away. Secondary destinations (such as a transit station) may be included on signage up to two miles away. Tertiary destinations (such as a park) may be included on signage up to one mile away.

## CRASH REDUCTION

There is no evidence that wayfinding signs have any impact on crash reduction or user safety.

## CONSTRUCTION COSTS

The cost of a wayfinding sign placement plan depends on the scale and scope of the approach. Trail wayfinding signage range from \$500-\$2000.





## BIKE PARKING

Bicyclists expect a safe, convenient place to secure their bicycle when they reach their destination. This may be short-term parking of two hours or less, or long-term parking for employees, students, residents, and commuters.



### TYPICAL APPLICATION

- Bicycle parking facilities shall be located in highly visible well-lighted areas. In order to maximize security, whenever possible short-term bicycle parking facilities shall be located in areas highly visible from the street and from the interior of the building they serve (i.e., placed adjacent to windows).
- Bike racks provide short-term bicycle parking and is meant to accommodate visitors, customers, and others expected to depart within two hours. It should be an approved standard rack, appropriate location and placement, and weather protection.
- On-street bike corrals (also known as on-street bicycle parking) consist of bicycle racks grouped together in a common area within the street traditionally used for automobile parking. Bicycle corrals are reserved exclusively for bicycle parking and provide a relatively inexpensive solution to providing high-volume bicycle parking. Bicycle corrals can be implemented by converting one or two on-street motor vehicle parking spaces into on-street bicycle parking. Each motor vehicle parking space can be replaced with approximately 6-10 bicycle parking spaces.



## DESIGN FEATURES

- All bicycle facilities shall provide a minimum 4 ft aisle to allow for unobstructed access to the designated bicycle parking area.
- Bicycle parking facilities within auto parking facilities shall be protected from damage by cars by a physical barrier such as curbs, wheel stops, poles, bollards, or other similar features capable of preventing automobiles from entering the designated bicycle parking area.
- Bicycle parking facilities should be securely anchored so they cannot be easily removed and shall be of sufficient strength and design to resist vandalism and theft.

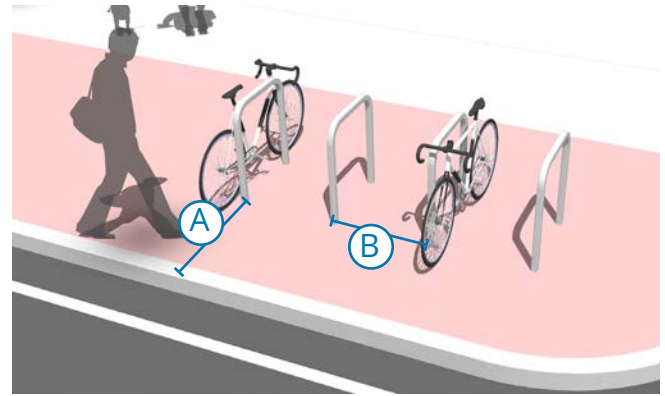
### Bike Racks

- Ⓐ 2 ft minimum from the curb face to avoid 'dooring.'
- Ⓑ 4 ft between racks to provide maneuvering room.
- Locate close to destinations; 50 ft maximum distance from main building entrance.
- Minimum clear distance of 6 ft should be provided between the bicycle rack and the property line.

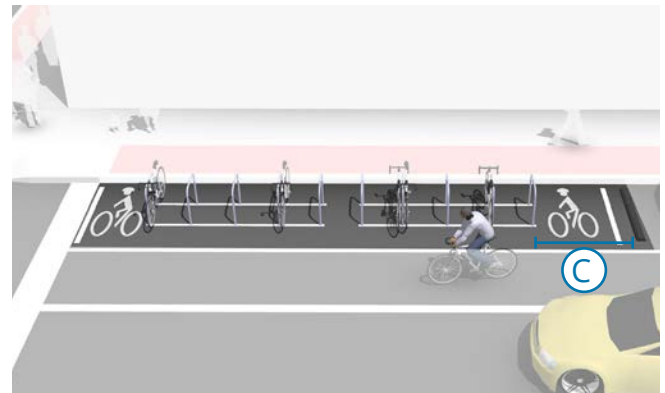
### Bike Corrals

- Ⓒ Bicyclists should have an entrance width from the roadway of 5-6 ft for on-street corrals.
- Can be used with parallel or angled parking.
- Parking stalls adjacent to curb extensions are good candidates for on-street bicycle corrals since the concrete extension serves as delimitation on one side.
- Off-street bike corrals are appropriate where there is a wide sidewalk furnishing zone (7 ft or greater), or as part of a curb extension.

### Perpendicular Bike Racks



### Bike Corral



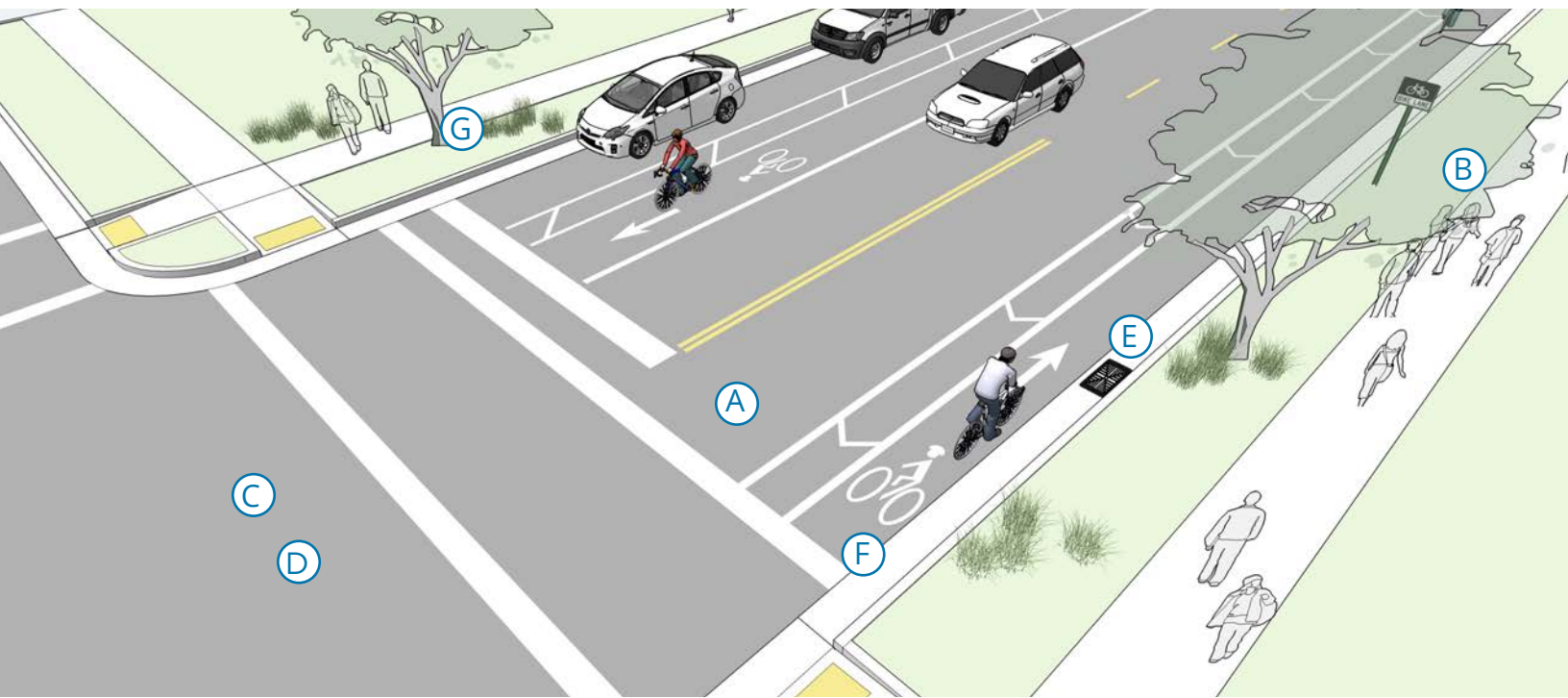
## CONSTRUCTION COSTS

Costs can vary based on the design and materials used. Bicycle rack costs can range from approximately \$60 to \$3,600, depending on design and materials used. On average the cost is approximately \$660. Bicycle lockers costs range from \$1,280 to \$2,680.



## BIKEWAY MAINTENANCE

Regular bicycle facility maintenance includes sweeping, maintaining a smooth roadway, ensuring that the gutter-to-pavement transition remains relatively flush, and installing bicycle-friendly drainage grates. Pavement overlays are a good opportunity to improve bicycle facilities. The following recommendations provide a menu of options to consider to enhance a maintenance regimen.



### MAINTENANCE

#### A Sweeping

- Establish a seasonal sweeping schedule that prioritizes roadways with major bicycle routes.
- Sweep walkways and bikeways whenever there is an accumulation of debris on the facility.
- In curbed sections, sweepers should pick up debris; on open shoulders, debris can be swept onto gravel shoulders.

#### B Signage

- Check regulatory and wayfinding signage along bikeways for signs of vandalism, graffiti, or normal wear.
- Replace signage along the bikeway network as-needed.
- Perform a regularly-scheduled check on the status of signage with follow-up as necessary.
- Create a Maintenance Management Plan.





### C Roadway Surface

- Maintain a smooth pothole-free surface.
- Ensure that on new roadway construction, the finished surface on bikeways does not vary more than ¼".
- Maintain pavement so ridge buildup does not occur at the gutter-to-pavement transition or adjacent to railway crossings.
- Inspect the pavement 2 to 4 months after trenching construction activities are completed to ensure that excessive settlement has not occurred.

### D Pavement Overlays

- Extend the overlay over the entire roadway surface to avoid leaving an abrupt edge.
- If the shoulder or bike lane pavement is of good quality, it may be appropriate to end the overlay at the shoulder or bike lane stripe provided no abrupt ridge remains.
- Ensure that inlet grates, manhole and valve covers are within ¼ inch of the finished pavement surface and are made or treated with slip resistant materials.

### E Drainage Grates

- Require all new drainage grates be bicycle-friendly, including grates that have horizontal slats on them so that bicycle tires and assistive devices do not fall through the vertical slats.
- Create a program to inventory all existing drainage grates, and replace hazardous grates as necessary – temporary modifications such as installing rebar horizontally across the grate should not be an acceptable alternative to replacement.

### F Gutter to Pavement Transition

- Ensure that gutter-to-pavement transitions have no more than a ¼" vertical transition.
- Examine pavement transitions during every roadway project for new construction, maintenance activities, and construction project activities that occur in streets.

### G Landscaping

- Ensure that shoulder plants do not hang into or impede passage along bikeways
- After major damage incidents, remove fallen trees or other debris from bikeways as quickly as possible

#### Maintenance Management Plan

- Provide fire and police departments with map of system, along with access points to gates/ bollards
- Enforce speed limits and other rules of the road
- Enforce all trespassing laws for people attempting to enter adjacent private properties

#### Recommended Walkway and Bikeway Maintenance Activities

Maintenance Activity	Frequency
Inspections	Seasonal – at beginning and end of Summer
Pavement sweeping/ blowing	As needed, with higher frequency in the early Spring and Fall
Pavement sealing	5 - 15 years
Pothole repair	1 week – 1 month after report
Culvert and drainage grate inspection	Before Winter and after major storms
Pavement markings re-placement	As needed
Signage replacement	As needed
Shoulder plant trimming (weeds, trees, brambles)	Twice a year; middle of growing season and early Fall
Tree and shrub plantings, trimming	1 – 3 years
Major damage response (washouts, fallen trees, flooding)	As soon as possible





## BICYCLE ACCESS TO TRANSIT

Safe and easy access to transit stations and secure bicycle parking facilities is necessary to encourage commuters to access transit via bicycle. Bicycling to transit reduces the need to provide expensive and space consuming car parking spaces.

### DESIGN FEATURES

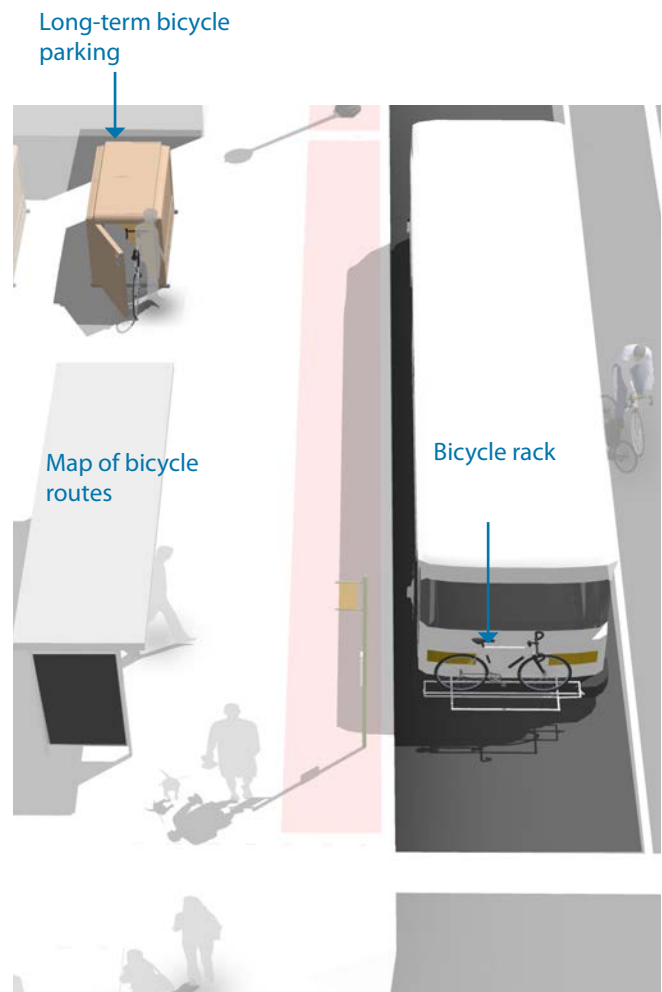
Many people who ride to a transit stop will want to bring their bicycle with them on the transit portion of their trip, so buses and other transit vehicles should be equipped accordingly.

#### Access

- Provide direct and convenient access to transit stations and stops from the bicycle and pedestrian networks.
- Provide maps at major stops and stations showing nearby bicycle routes.
- Provide wayfinding signage and pavement markings from the bicycle network to transit stations.
- Ensure that connecting bikeways offer proper bicycle actuation and detection.

#### Bicycle Parking

- The route from bicycle parking locations to station/stop platforms should be well-lit and visible.
- Signing should note the location of bicycle parking, rules for use, and instructions as needed.
- Provide safe and secure long-term parking such as bicycle lockers at transit hubs. Parking should be easy to use and well maintained.





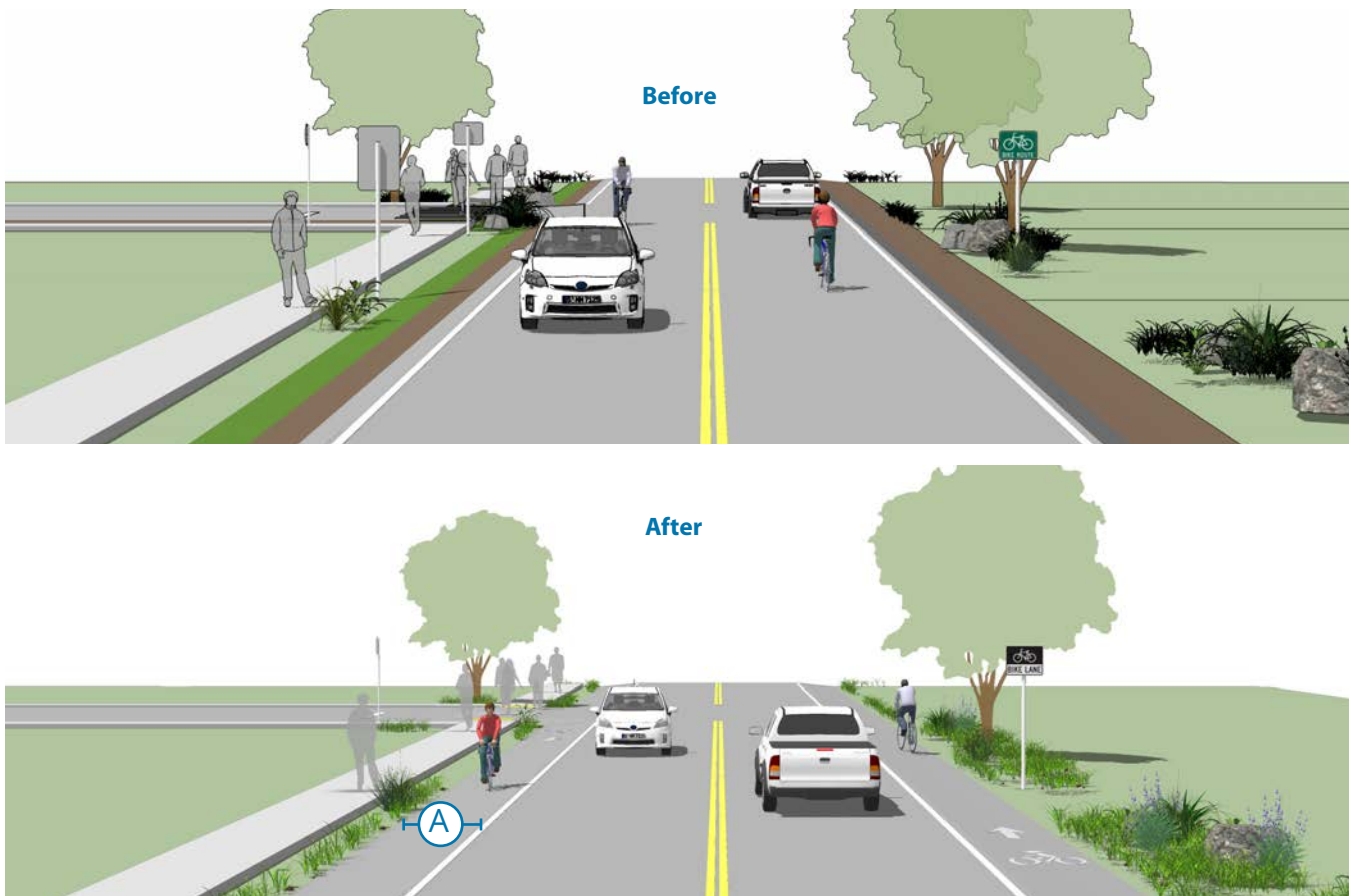
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## RETROFITTING STREETS

### ROADWAY WIDENING

Bike lanes can be accommodated on streets with excess right-of-way through shoulder widening. Although roadway widening incurs higher expenses compared with re-striping projects, bike lanes can be added to streets currently lacking curbs, gutters and sidewalks without the high costs of major infrastructure reconstruction.



#### TYPICAL APPLICATION

- Roadway widening is most appropriate on roads lacking curbs, gutters and sidewalks.
- If it is not possible to meet minimum bicycle lane dimensions, a reduced width paved shoulder can still improve conditions for bicyclists on constrained roadways. In these situations, a minimum of 3 feet of operating space should be provided.

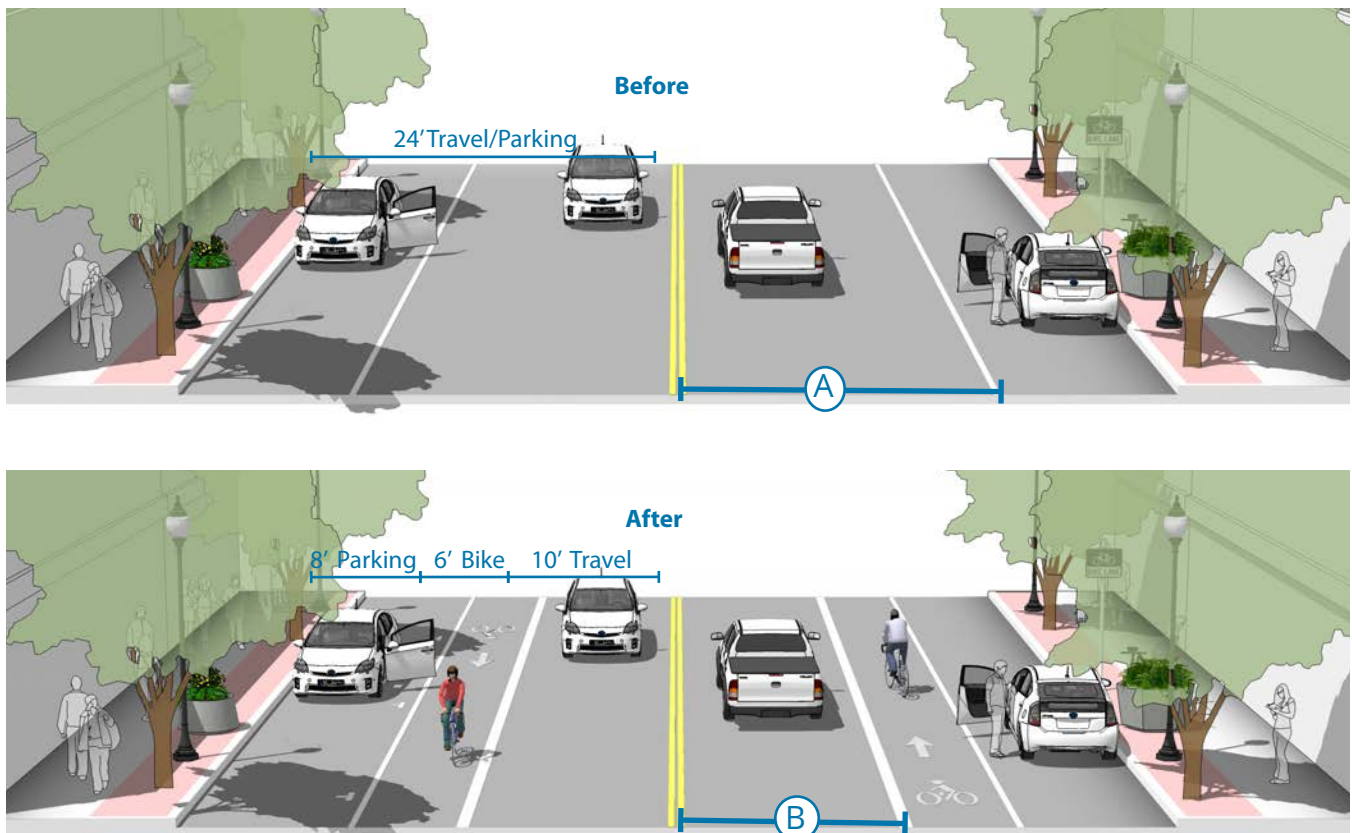
#### DESIGN FEATURES

- Guidance on bicycle lanes applies to this treatment.
- **A** 4 foot minimum width when no curb and gutter is present.
- 6 foot width preferred.



## LANE NARROWING

Lane narrowing utilizes roadway space that exceeds minimum standards to provide the needed space for bike lanes. Many roadways have existing travel lanes that are wider than those prescribed in local and national roadway design standards, or which are not marked.



### TYPICAL APPLICATION

- On roadways with wide lane widths. Most standards allow for the use of 11 foot and sometimes 10 foot wide travel lanes to create space for bike lanes.
- Special consideration should be given to the amount of heavy vehicle traffic and horizontal curvature before the decision is made to narrow travel lanes. Center turn lanes can also be narrowed in some situations to free up pavement space for bike lanes.

### DESIGN FEATURES

#### *Vehicle lane width:*

(A) Before: 10-15 feet

(B) After: 10-11 feet

#### *Bicycle lane width:*

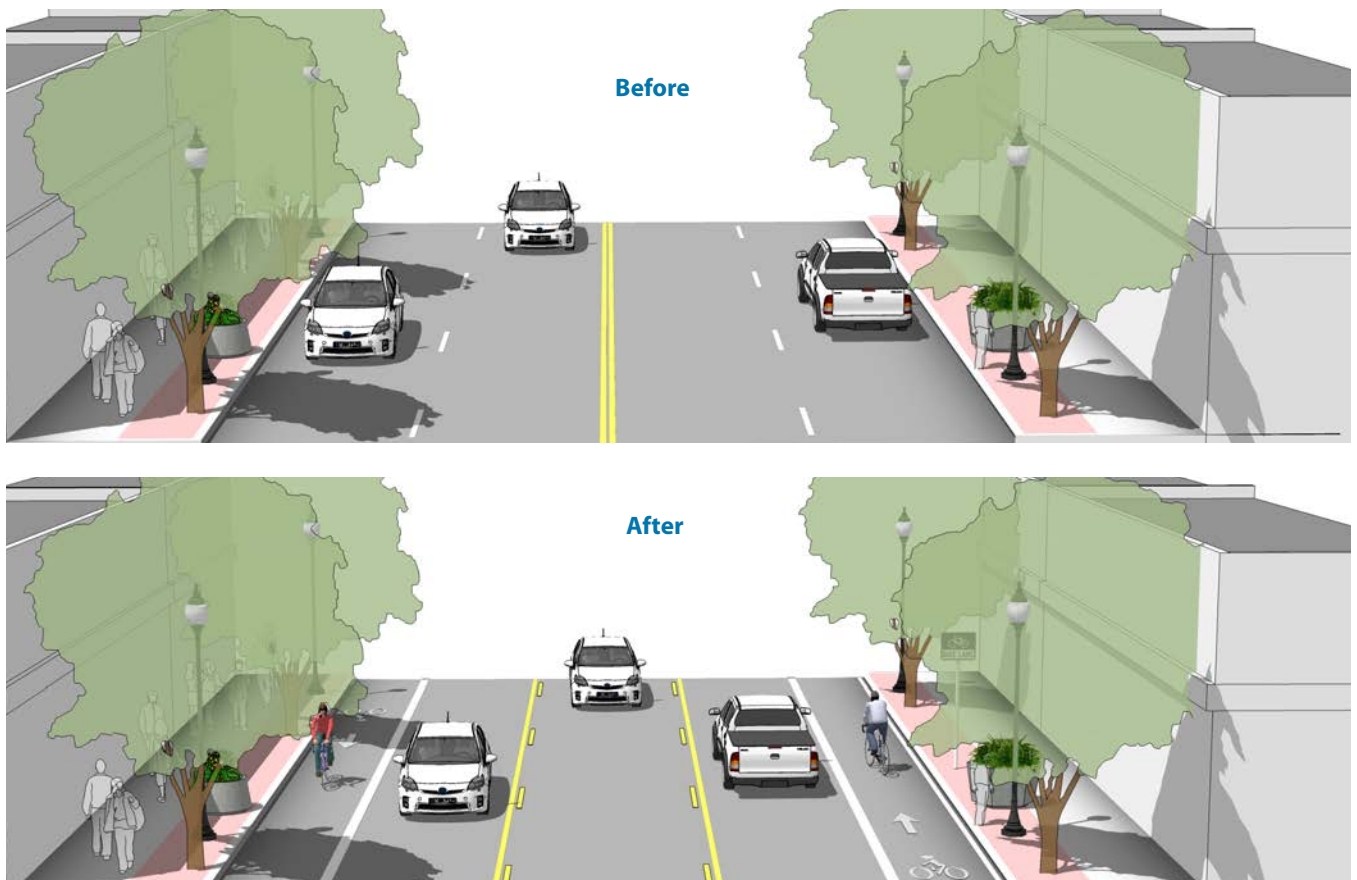
- Guidance on bicycle lanes applies to this treatment.





## LANE RECONFIGURATION

The removal of a single travel lane will generally provide sufficient space for bike lanes on both sides of a street. Streets with excess vehicle capacity provide opportunities for bike lane retrofit projects.



### TYPICAL APPLICATION

Depending on a street's existing configuration, traffic operations, user needs and safety concerns, various lane reduction configurations may apply. For instance, a four-lane street (with two travel lanes in each direction) could be modified to provide one travel lane in each direction, a center turn lane, and bike lanes. Prior to implementing this measure, a traffic analysis should identify potential impacts.

### DESIGN FEATURES

#### *Vehicle lane width:*

- Width depends on project. No narrowing may be needed if a lane is removed.

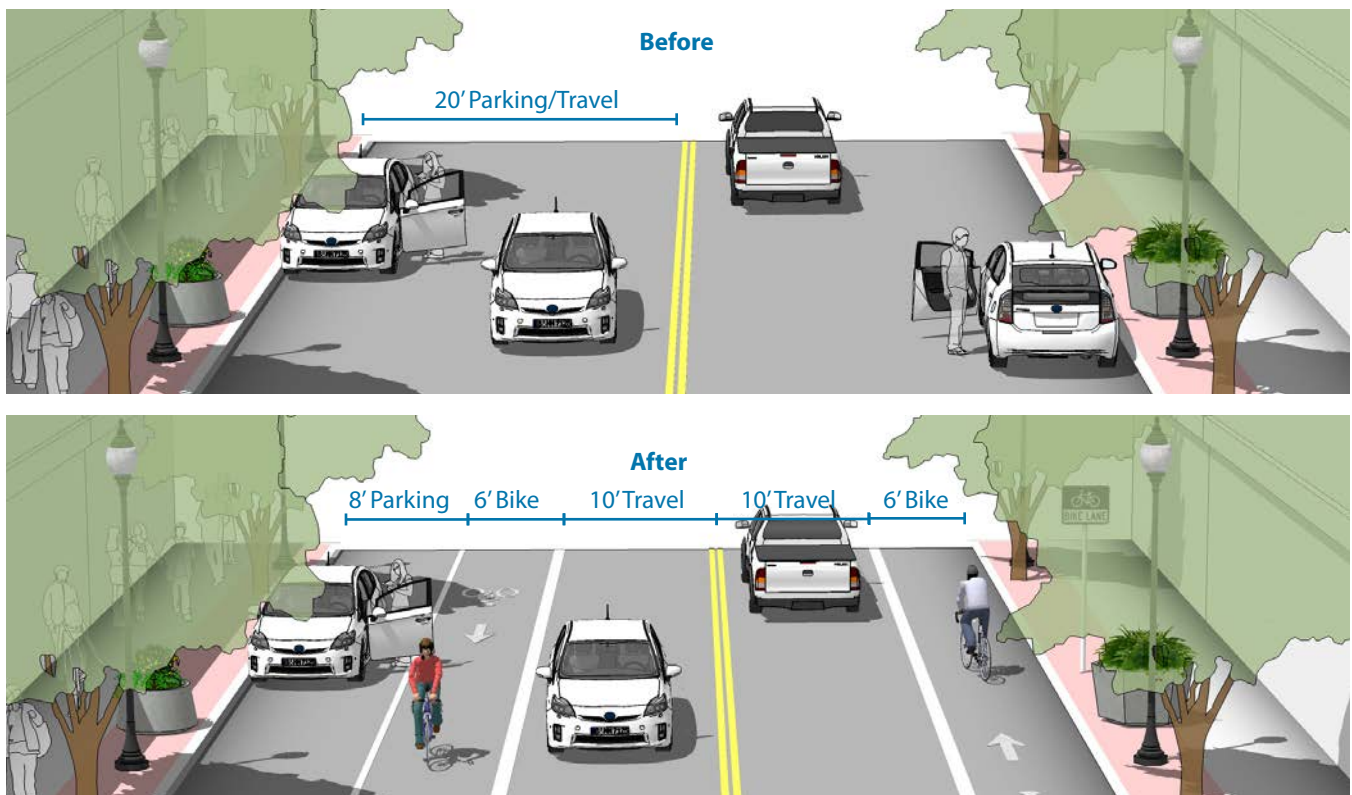
#### *Bicycle lane width:*

- Guidance on bicycle lanes applies to this treatment.



## PARKING REDUCTION

Bike lanes can replace one or more on-street parking lanes on streets where excess parking exists and/or the importance of bike lanes outweighs parking needs. For example, parking may be needed on only one side of a street. Eliminating or reducing on-street parking also improves sight distance for bicyclists in bike lanes and for motorists on approaching side streets and driveways.



### TYPICAL APPLICATION

Removing or reducing on-street parking to install bike lanes requires comprehensive outreach to the affected businesses and residents. Prior to reallocating on-street parking for other uses, a parking study should be performed to gauge demand and to evaluate impacts to people with disabilities.

### DESIGN FEATURES

#### *Vehicle lane width:*

- Parking lane width depends on project. No travel lane narrowing may be required depending on the width of the parking lanes.

#### *Bicycle lane width:*

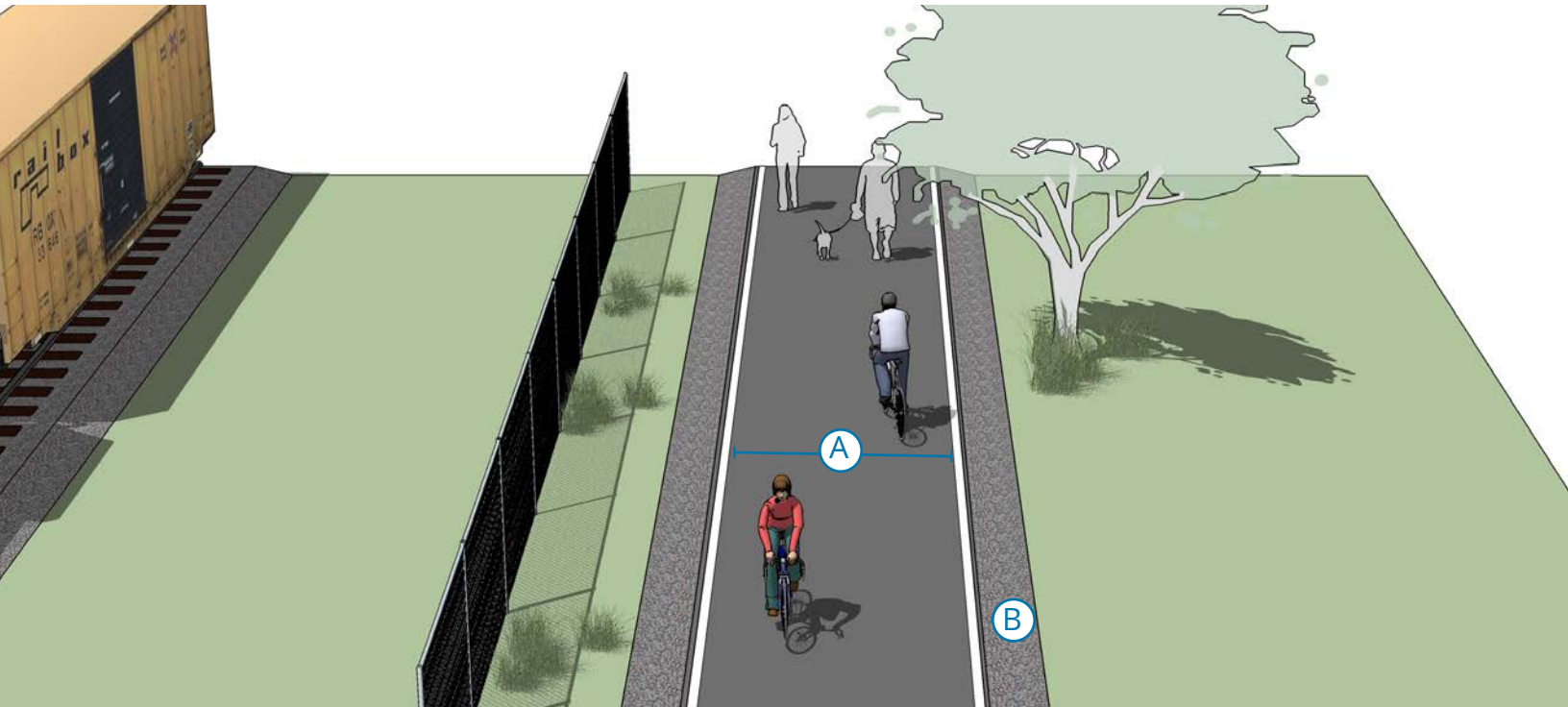
- Guidance on bicycle lanes applies to this treatment.



## OFF-STREET FACILITIES

### SHARED USE PATH

Shared use paths can provide a desirable facility, particularly for recreation, and users of all skill levels preferring separation from traffic. Bicycle paths should generally provide directional travel opportunities not provided by existing roadways.



### TYPICAL APPLICATION

- In abandoned rail corridors (commonly referred to as Rails-to-Trails or Rail-Trails.
- In active rail corridors, trails can be built adjacent to active railroads (referred to as Rails-with-Trails.
- In utility corridors, such as powerline and sewer corridors.
- In waterway corridors, such as along canals, drainage ditches, rives and beaches.
- Along roadways.



## DESIGN FEATURES

### Width

- Ⓐ 8 ft is the minimum allowed for a two-way bicycle path and is only recommended for low traffic situations.
- 10 ft is recommended in most situations and will be adequate for moderate to heavy use.
- 12 ft is recommended for heavy use situations with high concentrations of multiple users. A separate track (5' minimum) can be provided for pedestrian use.

### Lateral Clearance

- Ⓑ A 2 ft or greater shoulder on both sides of the path should be provided. An additional ft of lateral clearance (total of 3') is required by the MUTCD for the installation of signage or other furnishings.
- If bollards are used at intersections and access points, they should be colored brightly and/or supplemented with reflective materials to be visible at night.

### Overhead Clearance

- Clearance to overhead obstructions should be 8 ft minimum, with 10 ft recommended.

### Striping

- When striping is required, use a 4 inch dashed yellow centerline stripe with 4 inch solid white edge lines.
- Solid centerlines can be provided on tight or blind corners, and on the approaches to roadway crossings.

## FURTHER CONSIDERATIONS

The provision of a shared use path adjacent to a road is not a substitute for the provision of on-road accommodation such as paved shoulders or bike lanes, but may be considered in some locations in addition to on-road bicycle facilities.

To reduce potential conflicts in some situations, it may be better to place one-way sidepaths on both sides of the street.

### CRASH REDUCTION

Shared use paths reduce injury rates for cyclists, pedestrians, and other nonmotorized modes by 60 percent compared with on street facilities.<sup>1</sup>

### CONSTRUCTION COSTS

The cost of a shared use path can vary, but typical costs are between \$65,000 per mile to \$4 million per mile.

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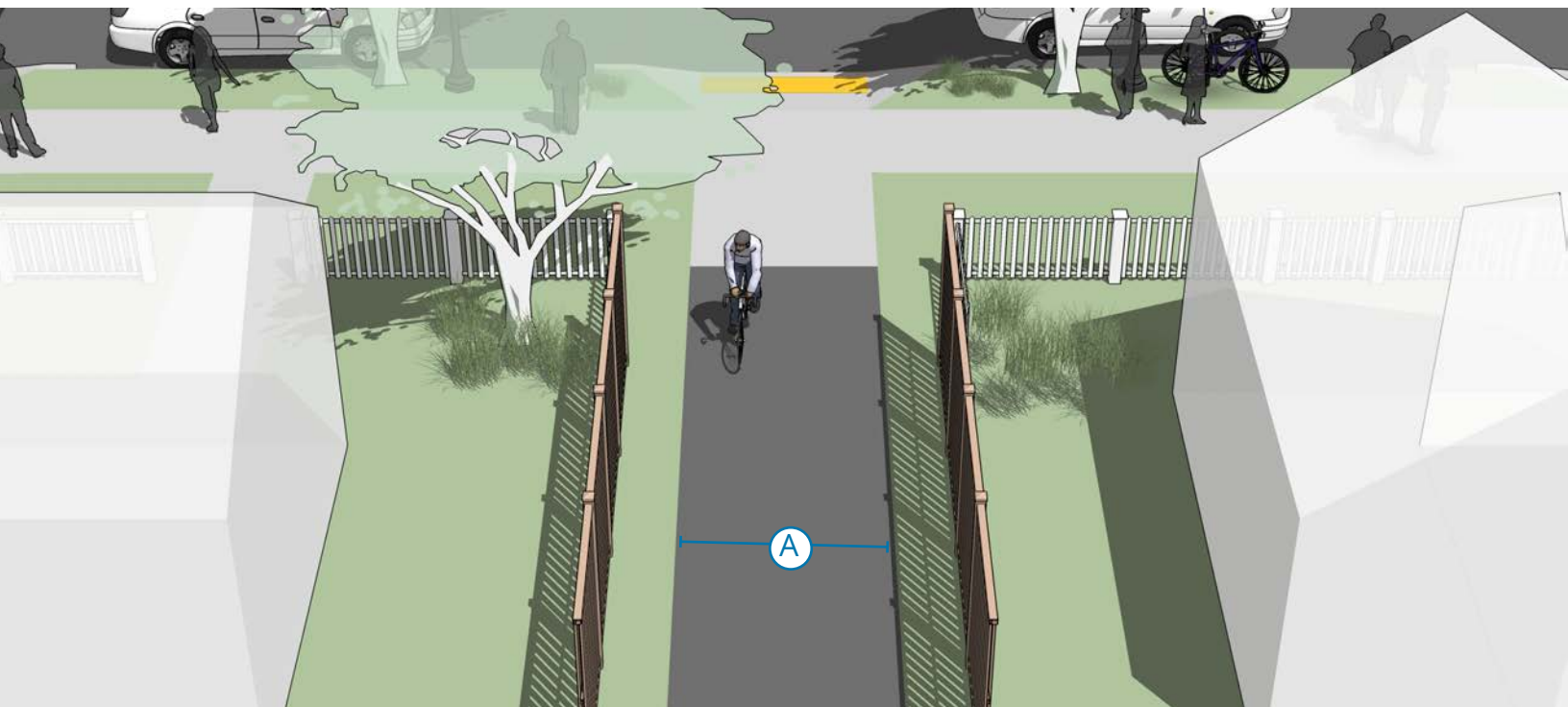
<sup>1</sup>Teschke, Kay. Route Infrastructure and the Risk of Injuries to Bicyclists. American Public Health Association. December 2012.





## LOCAL NEIGHBORHOOD ACCESSWAYS

Neighborhood accessways provide residential areas with direct bicycle and pedestrian access to parks, trails, greenspaces, and other recreational areas. They most often serve as small trail connections to and from the larger trail network, typically having their own rights-of-way and easements.



### TYPICAL APPLICATION

- Neighborhood accessways should be designed into new subdivisions at every opportunity and should be required by City/County subdivision regulations.
- For existing subdivisions, neighborhood and homeowner association groups are encouraged to identify locations where such connects would be desirable. Nearby residents and adjacent property owners should be invited to provide landscape design input.

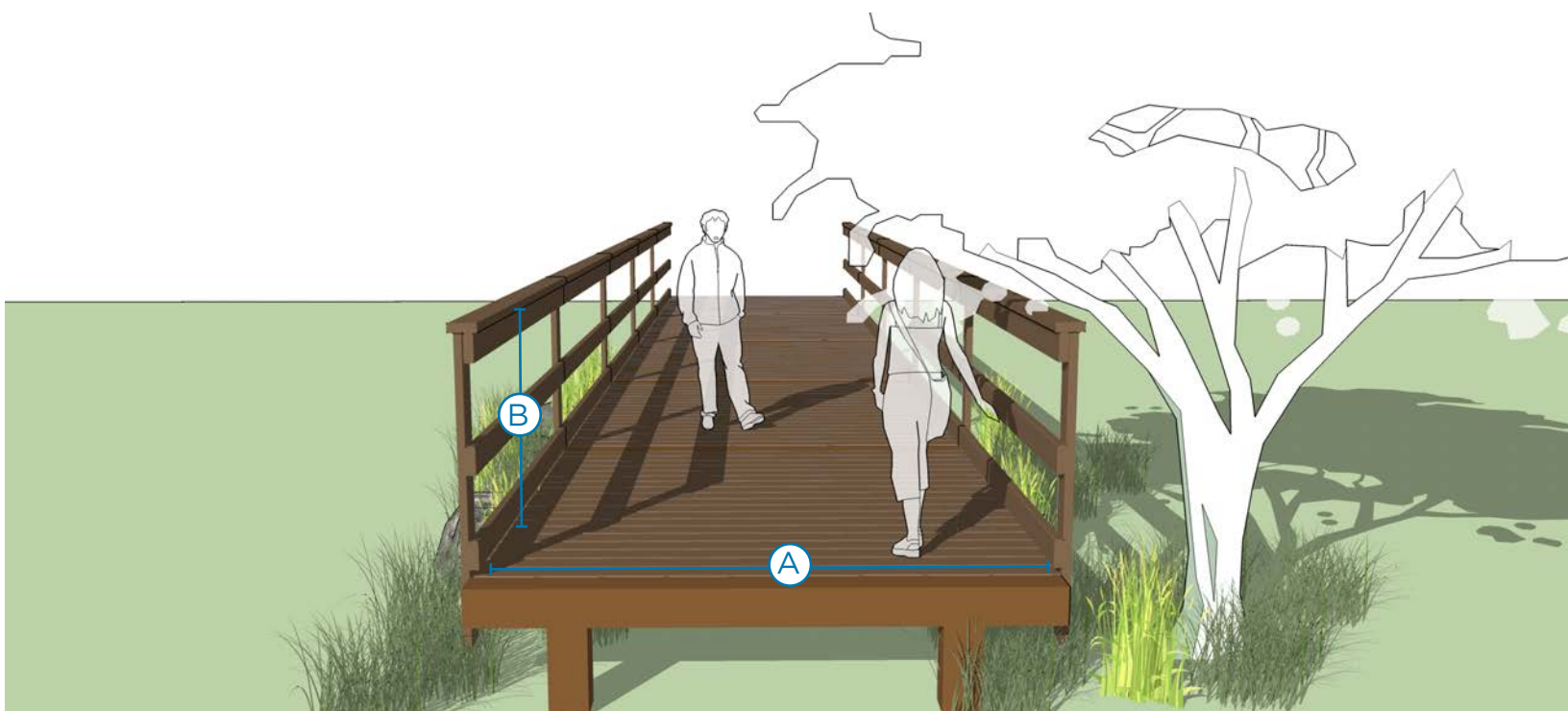
### DESIGN FEATURES

- Neighborhood accessways should remain open to the public.
- **A** Trail pavement shall be at least 8 ft wide to accommodate emergency and maintenance vehicles, meet ADA requirements and be considered suitable for multi-use.
- Trail widths should be designed to be less than 8 ft wide only when necessary to protect large mature native trees over 18" in caliper, wetlands or other ecologically sensitive areas.
- Access trails should slightly meander whenever possible.



## BOARDWALKS

Boardwalks are typically required when crossing wetlands or other sensitive natural areas. A number of low-impact support systems are also available that reduce the disturbance within wetland areas to the greatest extent possible.



### TYPICAL APPLICATION

- Boardwalks are usually constructed of wooden planks or recycled material planks that form the top layer of the boardwalk. The recycled material has gained popularity in recent years since it lasts much longer than wood, especially in wet conditions.
- In general, building in wetlands is subject to regulations and should be avoided.

### DESIGN FEATURES

- Ⓐ A boardwalk width should be a minimum of 10 ft when no rail is used. A 12 ft width is preferred in areas with average anticipated use and whenever rails are used.
- Ⓑ When the height of a boardwalk exceeds 30", railings are required.
- If access by vehicles is desired, boardwalks should be designed to structurally support the weight of a small truck or a light-weight vehicle.



## TRAIL INTERSECTION TREATMENTS

### MARKED CROSSING

A marked/unsignalized crossing typically consists of a marked crossing area, signage, and other markings to slow or stop traffic. The approach to designing crossings at mid-block locations depends on an evaluation of vehicular traffic, line of sight, pathway traffic, use patterns, vehicle speed, road type, road width, and other safety issues such as proximity to major attractions.



#### TYPICAL APPLICATION

- Maximum Traffic Volumes
  - ≤9,000-12,000 Average Daily Traffic (ADT) volume
- Maximum travel speed of 35 MPH
- Minimum Sight Lines
  - 25 MPH zone: 155 ft
  - 35 MPH zone: 250 ft
  - 45 MPH zone: 360 ft

#### DESIGN FEATURES

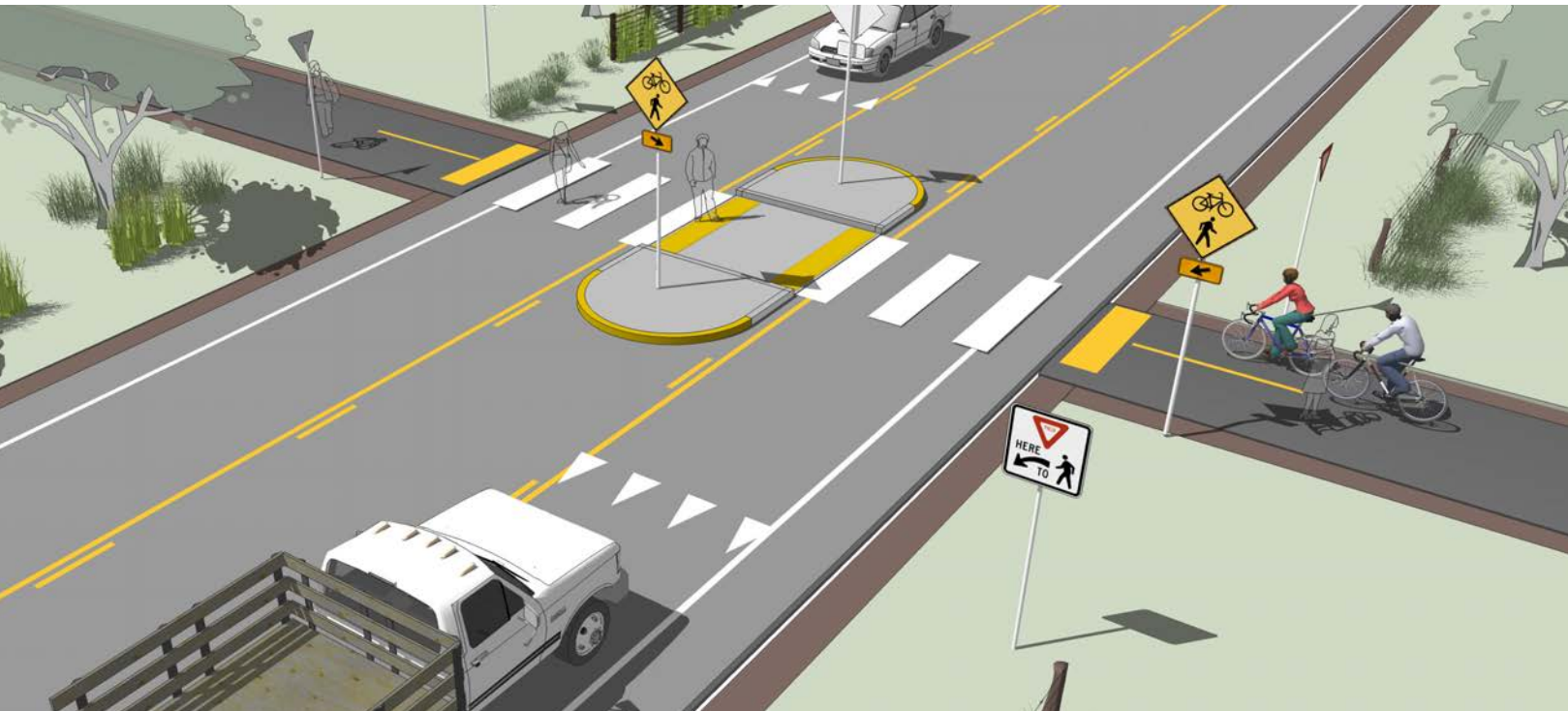
- On roadways with low to moderate traffic volumes (<12,000 ADT) and a need to control traffic speeds, a raised crosswalk may be the most appropriate crossing design to improve pedestrian visibility and safety.





## MEDIAN CROSSING

On roadways with higher volumes, higher speeds and multi-lanes of vehicular traffic, a median crossing is preferred. A median refuge island can improve user safety by providing pedestrians and bicyclists space to perform the safe crossing of one side of the street at a time.



### TYPICAL APPLICATION

- Maximum Traffic Volumes
  - Up to 15,000 ADT on two-lane roads, preferably with a median
  - Up to 12,000 ADT on four-lane roads with median

### DESIGN FEATURES

- Unsignalized crossings of multi-lane arterials over 15,000 ADT may be possible with features such as sufficient crossing gaps (more than 60 per hour), median refuges, and/or active warning devices like rectangular rapid flash beacons or in-pavement flashers, and excellent sight distance. For more information see the discussion of active warning beacons.





## ACTIVE ENHANCED CROSSING

Active enhanced crossings are unsignalized crossings with additional treatments designed to increase motor vehicle yielding compliance on multi-lane or high volume roadways. These enhancements include pathway user or sensor actuated warning beacons, Rectangular Rapid Flash Beacons (RRFB) shown below, or Pedestrian Hybrid Beacons.



### TYPICAL APPLICATION

- Guidance for marked/unsignalized crossings applies.
- Warning beacons shall not be used at crosswalks controlled by YIELD signs, STOP signs, or traffic control signals.
- Warning beacons shall initiate operation based on user actuation and shall cease operation at a predetermined time after the user actuation or, with passive detection, after the user clears the crosswalk.

### DESIGN FEATURES

- **A** RRFBs are user actuated lights that supplement warning signs at unsignalized intersections or mid-block crossings.
- Pedestrian hybrid beacons provide a high level of comfort for crossing users through the use of a red-signal indication to stop conflicting motor vehicle traffic. Hybrid beacon installation faces only cross motor vehicle traffic, stays dark when inactive, and uses a unique 'wig-wag' signal phase to indicate activation. Vehicles have the option to proceed after stopping during the final flashing red phase, which can reduce motor vehicle delay when compared to a full signal installation.



## ROUTE USERS TO SIGNALIZED CROSSING

Path crossings within approximately 400 ft of an existing signalized intersection with pedestrian crosswalks are typically diverted to the signalized intersection to avoid traffic operation problems when located so close to an existing signal.



### TYPICAL APPLICATION

- For this restriction to be effective, barriers and signing may be needed to direct path users to the signalized crossing. If no pedestrian crossing exists at the signal, modifications should be made.
- Path crossings should not be provided within approximately 400 ft of an existing signalized intersection. If possible, route path directly to the signal.

### DESIGN FEATURES

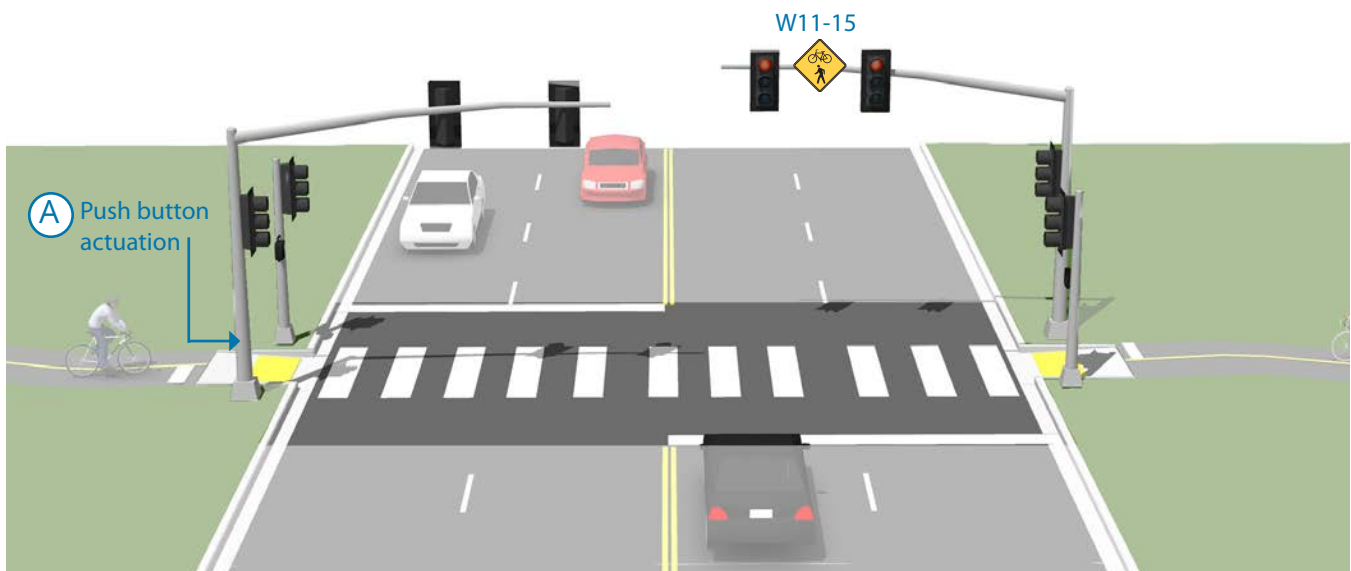
- In the US, the minimum distance a marked crossing can be from an existing signalized intersection varies from approximately 250 to 660 ft.
- Engineering judgment and the context of the location should be taken into account when choosing the appropriate allowable setback. Pedestrians are particularly sensitive to out of direction travel and undesired mid-block crossing may become prevalent if the distance is too great.



## FULL TRAFFIC SIGNAL CROSSINGS

Signalized crossings provide the most protection for crossing path users through the use of a red-signal indication to stop conflicting motor vehicle traffic.

A full traffic signal installation treats the path crossing as a conventional 4-way intersection and provides standard red-yellow-green traffic signal heads for all legs of the intersection.



### TYPICAL APPLICATION

Full traffic signal installations must meet MUTCD pedestrian, school or modified warrants. Additional guidance for signalized crossings:

- Located more than 300 feet from an existing signalized intersection
- Roadway travel speeds of 40 MPH and above
- Roadway ADT exceeds 15,000 vehicles

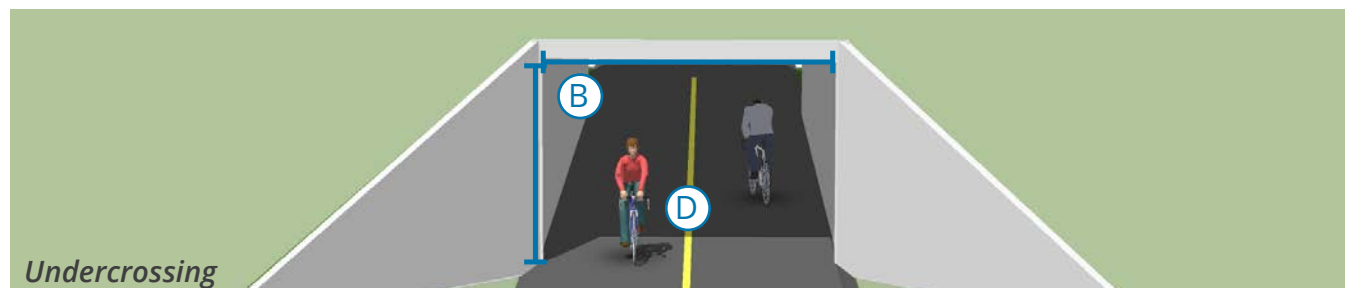
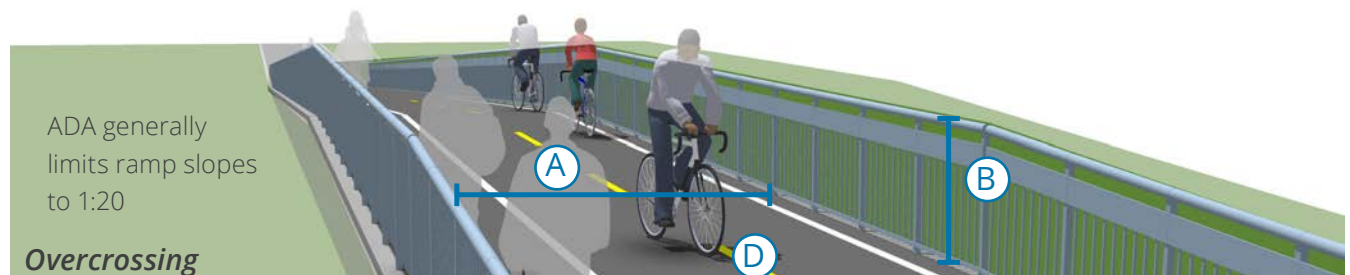
### DESIGN FEATURES

- A** Shared use path signals are normally activated by push buttons but may also be triggered by embedded loop, infrared, microwave or video detectors. The maximum delay for activation of the signal should be two minutes, with minimum crossing times determined by the width of the street.
- Each crossing, regardless of traffic speed or volume, requires additional review by a registered engineer to identify sight lines, potential impacts on traffic progression, timing with adjacent signals, capacity and safety.



## GRADE-SEPARATED CROSSINGS

Grade-separated crossings provide critical non-motorized system links by joining areas separated by barriers such as railroads, waterways, and highway corridors. In most cases, these structures are built in response to user demand for safe crossings where they previously did not exist. There are no minimum roadway characteristics for considering grade separation.



### TYPICAL APPLICATION

- Where shared-use paths cross high-speed and high-volume roadways where an at-grade signalized crossing is not feasible or desired, or where crossing railways or waterways.
- Depending on the type of facility or the desired user group, grade separation may be considered in many types of projects.

### DESIGN FEATURES

- Ⓐ Overcrossings should be at least 8 ft wide with 14 ft preferred and additional width provided at scenic viewpoints.
- Ⓑ Railing height must be a minimum of 42 inches for overcrossings.
- Ⓒ Undercrossings should be designed at minimum 10 ft height and 14 ft width, with greater widths preferred for lengths over 60 ft.
- Centerline stripe is recommended for grade-separated facility.



A teal-colored bicycle is parked on a concrete sidewalk next to a store. The store has large glass windows and a brick pillar. A white bicycle helmet is hanging from the handlebars. The scene is outdoors with trees and foliage in the background.

# B

## *Funding Resources*

*"I do not live in the Cape Fear area today but plan to retire there. It would be a wonderful benefit if there was a planned bicycle trail system that could take you to the scenic areas in the Cape Fear region."* - Public Comment, 2016

*This regional plan focuses on connecting regional nodes, such as downtown Burgaw, NC (bicycle parked next at a store in downtown Burgaw shown above).*





## OVERVIEW

Multiple approaches should be taken to support bicycle facility development and programming. It is important to secure the funding necessary to undertake priority projects but also to develop a long-term funding strategy to allow continued development of the overall system. Dedicated local funding sources will be important for the implementation of this plan.

Local government funds for bicycle facilities should be set aside every year, even if only for a small amount. Small amounts of local funding can be matched to outside funding sources. A variety of local, state, and federal options and sources exist and should be pursued.

The following section identifies federal, state, local and private/non-profit foundation sources of funding for planning, design, implementation

and maintenance of bicycle infrastructure. The descriptions are intended to provide an overview of available options and do not represent a comprehensive list. It should be noted that this section reflects the funding available at the time of writing. The funding amounts, fund cycles, and even the programs themselves are susceptible to change without notice.



*Trail oriented development at a recent development near the intersection of Eastwood Rd and Wrightsville Ave*



## FEDERAL FUNDING SOURCES

Federal funding is typically directed through state agencies to local governments either in the form of grants or direct appropriations. Federal funding typically requires a local match of five percent to 50 percent, but there are sometimes exceptions. The following is a list of possible Federal funding sources that could be used to support the construction of bicycle facilities.

### FIXING AMERICA'S SURFACE TRANSPORTATION (FAST ACT)

In December 2015, President Obama signed the FAST Act into law, which replaces the previous Moving Ahead for Progress in the Twenty-First Century (MAP-21). The Act provides a long-term funding source of \$305 billion for surface transportation and planning for FY 2016-2020. Overall, the FAST Act retains eligibility for larger programs - Transportation Investments Generating Economic Recovery (TIGER), Surface Transportation Program (STP), Congestion Mitigation and Air Quality (CMAQ), and Highway Safety Improvement Program (HSIP). The FAST Act maintains the federal government's focus on safety, preserves the established structure of various highway-related programs, streamlines project delivery, and provides a dedicated funding source for freight projects.

In North Carolina, federal monies are administered through the North Carolina Department of Transportation (NCDOT) and Metropolitan Planning Organizations (MPOs). Most, but not all, of these programs are focused on transportation rather than recreation, with an emphasis on reducing auto trips and providing intermodal connections. Federal funding is intended for capital improvements and safety and education programs, and projects must relate to the surface transportation system. Most FAST ACT funds are

available through the STI process.

For more information: <http://www.fhwa.dot.gov/fastact/summary.cfm>

### Transportation Alternatives (TA)

Transportation Alternatives (TA) is a funding source under the FAST Act that consolidates three formerly separate programs under SAFETEA-LU: Transportation Enhancements (TE), Safe Routes to School (SRTS), and the Recreational Trails Program (RTP). Funds are available through a competitive process. These funds may be used for a variety of pedestrian, bicycle, and streetscape projects. These include:

- SRTS programs - infrastructure and non-infrastructure programs
- Construction, planning, and design of on-road and off-road trail facilities for pedestrians, bicyclists, and other nonmotorized forms of transportation, including sidewalks, bikeways, pedestrian and bicycle signals, traffic calming techniques, and lighting and other safety-related infrastructure
- Construction, planning, and design of infrastructure-related projects and systems that will provide safe routes for non-drivers, including children, seniors, and individuals with disabilities
- Construction of rail-trails
- Recreational trails program

Eligible entities for TA funding include local governments, regional transportation authorities, transit agencies, natural resource or public land agencies, school districts or schools, tribal governments, and any other local or regional government entity with responsibility for oversight of transportation



or recreational trails that the State determines to be eligible.

The FAST Act provides \$84 million for the Recreational Trails Program. Funding is prorated among the 50 states and Washington D.C. in proportion to the relative amount of off-highway recreational fuel tax that its residents paid. To administer the funding, states hold a statewide competitive process. The legislation stipulates that funds must conform to the distribution formula of 30% for motorized projects, 30% for non-motorized projects, and 40% for mixed used projects. Each state governor is given the opportunity to “opt out” of the RTP.

For more information: <https://www.fhwa.dot.gov/fastact/factsheets/transportationalternativesfs.cfm>

### ***Surface Transportation Block Grant (STBG) Program***

The FAST Act converts the Surface Transportation Program into the Surface Transportation Block Grant (STBG) program. This program is among the most flexible eligibilities among all Federal-aid and highway programs. Funding for the STBG Program will increase from \$819 million per year to \$835 million in 2016 and 2017 and to \$850 million in 2018 through 2020.

The Surface Transportation Program (STP) provides states with flexible funds which may be used for a variety of highway, road, bridge, and transit projects. A wide variety of pedestrian improvements are eligible, including trails, sidewalks, crosswalks, pedestrian signals, and other ancillary facilities. Modification of sidewalks to comply with the requirements of the Americans with Disabilities Act (ADA) is also an eligible activity. Safe Routes

to School programs, congestion pricing projects and strategies, and recreational trails projects are other eligible activities. Under the FAST Act, a State may use STBG funds to create and operate a State office to help design, implement, and oversee public-private partnerships eligible to receive Federal highway or transit funding. In general, projects cannot be located on local roads or rural minor collectors. However, there are exceptions. These exceptions include recreational trails, pedestrian and bicycle projects, and Safe Routes to School programs.

For more information: <https://www.fhwa.dot.gov/fastact/factsheets/stbgfs.cfm>

### ***Highway Safety Improvement Program (HSIP)***

HSIP provides \$2.2 - \$2.4 billion nationally (FY 2016-2020) for projects and programs that help communities achieve significant reductions in traffic fatalities and serious injuries on all public roads, including non-state-owned public roads and roads on tribal lands. The HSIP requirements prior to the enactment of the FAST Act are still applicable, including the need for a comprehensive, data-driven State Highway Safety Plan (SHSP) that defines the State’s safety goals and describes strategies to improve safety.

HSIP funds must be used for safety projects that are consistent with the State’s SHSP and that correct or improve a hazardous road location or features to address a highway safety problem. Most eligible activities are infrastructure-related. Bicycle and pedestrian safety improvements, traffic calming projects, and crossing treatments for non-motorized users in school zones are eligible for these funds. Examples include pedestrian hybrid beacons, medians, and pedestrian crossing





islands. Workforce development, training, and education activities are other eligible uses of HSIP funds.

For more information: <http://www.fhwa.dot.gov/fastact/factsheets/hsipfs.cfm>

### ***Safe Routes to School (SRTS) Program***

SRTS enables and encourages children in grades K-8 to walk and bike to school. The program helps make walking and bicycling to school a safe and more appealing method of transportation for children. SRTS facilitates the planning, development, and implementation of projects and activities that will improve safety and reduce traffic, fuel consumption, and air pollution in the vicinity of schools. Funding is administered by State Departments of Transportation (DOTs). Eligible recipients are state, local, and regional agencies as well as nonprofit organizations. Project sponsors may be school or community based groups. Around 10-30% of each state's funding is to be spent on non-infrastructure activities, such as encouragement programs, additional law enforcement activities, and educational curricula.

Infrastructure-related projects improve the ability of students to walk or bike to and from school. Types of projects include sidewalk improvements, traffic calming and speed reduction improvements, pedestrian and bike crossing improvements, bicycle facilities, pedestrian facilities, and secure bike parking.

For more information: [http://www.fhwa.dot.gov/environment/safe\\_routes\\_to\\_school/guidance/#toc123542170](http://www.fhwa.dot.gov/environment/safe_routes_to_school/guidance/#toc123542170)

## **OTHER FEDERAL FUNDING SOURCES**

### ***TIGER Discretionary Grants***

The U.S. Department of Transportation's (DOT) Transportation Investment Generating Economic Recovery (TIGER) Discretionary Grants are intended to support multimodal projects, surface transportation projects, rail, transit, and port projects. Applicants must describe how their proposed project would achieve TIGER's five long-term outcomes - safety, economic competitiveness, state of good repair, quality of life, and environmental sustainability.

Eligible applicants for TIGER Discretionary Grants are State, local and tribal governments. This includes U.S. territories, transit agencies, port authorities, and metropolitan planning organizations (MPOs). Eligible projects are capital projects that include highway or bridge projects (including bicycle and pedestrian related projects), certain public transportation projects, passenger and freight rail transportation projects, and intermodal projects.

For more information: <https://www.transportation.gov/policy-initiatives/tiger/2016-tiger-applications-faqs>

### ***Federal Transit Administration Enhanced Mobility of Seniors and Individuals with Disabilities***

This program aims to improve mobility for seniors and individuals with disabilities by removing barriers to transportation service and expanding transportation mobility options. This program can be used for capital expenses that support transportation and non-emergency medical transportation to meet the special needs of older adults



and persons with disabilities, including providing access to an eligible public transportation facility when the transportation service provided is unavailable, insufficient, or inappropriate to meeting these needs. States and designated recipients are direct recipients. Eligible sub-recipients include nonprofit organizations, states or local governments, or operators of public transportation. Types of eligible projects include transit-related information technology systems, building an accessible path to a bus stop (curb cuts, sidewalks, accessible pedestrian signals), and improving signage.

For more information: <https://www.transit.dot.gov/funding/grants/enhanced-mobility-seniors-individuals-disabilities-section-5310>

### ***Economic Development Administration***

Under Economic Development Administration's (EDA) Public Works and Economic Adjustment Assistance programs, grant applications are accepted for projects that promote economic development. State and local entities may apply for funding for projects that address a wide range of economic challenges. Under this program, Implementation Grants support infrastructure improvements, including site acquisition, site preparation, construction, and rehabilitation of facilities. Selection criteria emphasize projects that are able to start quickly, create jobs faster, and that will enable the community or region to become more economically prosperous. Application deadlines are typically in March and June.

For more information: <https://www.eda.gov/funding-opportunities/index.htm>

### ***Federal Lands Transportation Program (FLTP)***

The FLTP funds projects that improve transportation infrastructure owned and maintained by the following Federal Lands Management Agencies: National Park Service (NPS), U.S. Fish and Wildlife Service (FWS), USDA Forest Service, Bureau of Land Management (BLM), U.S. Army Corps of Engineers, Bureau of Reclamation, and independent Federal agencies with land and natural resource management responsibilities. FLTP funds are available for program administration, transportation planning, research, engineering, rehabilitation, construction, and restoration of Federal Lands Transportation Facilities. Transportation projects that are on the public network that provide access to, adjacent to, or through Federal lands are also eligible for funding. Under the FAST Act, \$335 - \$375 million has been allocated to the program per fiscal year from 2016 - 2020.

For more information: <https://flh.fhwa.dot.gov/programs/fltp/documents/FAST%20FLTP%20fact%20sheet.pdf>

### ***Partnership for Sustainable Communities***

Founded in 2009, the Partnership for Sustainable Communities (PSC) is a joint project of the Environmental Protection Agency (EPA), the U.S. Department of Housing and Urban Development (HUD), and the U.S. Department of Transportation (USDOT). The partnership aims to "improve access to affordable housing, more transportation options, and lower transportation costs while protecting the environment in communities nationwide."

PSC is based on six livability principles, one of which explicitly addresses the need for alternative



transportation options. (“Provide more transportation choices: Develop safe, reliable, and economical transportation choices to decrease household transportation costs, reduce our nation’s dependence on foreign oil, improve air quality, reduce greenhouse gas emissions, and promote public health”). PSC is not a formal agency with a regular annual grant program. Nevertheless, it is an important effort that has already led to some new grant opportunities (including both TIGER I and TIGER II grants). North Carolina jurisdictions should track PSC communications and be prepared to respond proactively to announcements of new grant programs. Initiatives that speak to multiple livability goals are more likely to score well than initiatives that are narrow in scope. PSC livability principles include: provide more transportation choices, promote equitable, affordable housing, enhance economic competitiveness, support existing communities, coordinate and leverage federal policies and investment, and value communities and neighborhoods.

For more information:

**<http://www.sustainablecommunities.gov/>**

**<https://www.epa.gov/smartgrowth/hud-dot-epa-partnership-sustainable-communities>**

Resource for Rural Communities: **[http://www.sustainablecommunities.gov/sites/sustainablecommunities.gov/files/docs/federal\\_resources\\_rural.pdf](http://www.sustainablecommunities.gov/sites/sustainablecommunities.gov/files/docs/federal_resources_rural.pdf)**

## ***Federal Land and Water Conservation Fund***

The Land and Water Conservation Fund (LWCF) provides grants for planning and acquiring outdoor recreation areas and facilities, including trails. Funds can be used for right-of-way acquisition and construction. The program is administered by the Department of Environment and Natural Resources as a grant program for states and local governments. Maximum annual grant awards for county governments, incorporated municipalities, public authorities, and federally recognized Indian tribes are \$250,000. The local match may be provided with in-kind services or cash.

For more information: **<https://www.nps.gov/subjects/lwcf/stateside.htm>**

## ***Rivers, Trails, and Conservation Assistance Program***

The Rivers, Trails, and Conservation Assistance Program (RTCA) is a National Parks Service (NPS) program that provides technical assistance via direct NPS staff involvement to establish and restore greenways, rivers, trails, watersheds and open space. The RTCA program only provides planning assistance; there are no implementation funds available. Projects are prioritized for assistance based on criteria, including conserving significant community resources, fostering cooperation between agencies, serving a large number of users, encouraging public involvement in planning and implementation, and focusing on lasting accomplishments. Project applicants may be state and local agencies, tribes, nonprofit organizations, or citizen groups. National parks and other federal agencies may apply in partnership with other local organizations. This program may benefit trail development in North Carolina indirectly through technical assistance, particularly for community organizations, but is not a capital funding source.



Annual application deadline is August 1st.

For more information: <https://www.nps.gov/orgs/rtca/index.htm> or contact the Southeast Region RTCA Program Manager Deirdre Hewitt at (404) 507- 5691 or [deirdre\\_hewitt@nps.gov](mailto:deirdre_hewitt@nps.gov)

For more information: <https://flh.fhwa.dot.gov/programs/fltp/documents/FAST%20FLTP%20fact%20sheet.pdf>

### ***Environmental Contamination Cleanup Funding Sources***

EPA's Brownfields Program provides direct funding for brownfields assessment, cleanup, revolving loans, and environmental job training. EPA's Brownfields Program collaborates with other EPA programs, other federal partners, and state agencies to identify and leverage more resources for brownfields activities. The EPA provides assessment grants to recipients to characterize, assess, and conduct community involvement related to brownfields sites. They also provide Area-wide planning grants (AWP) which provides communities with funds to research, plan, and develop implementation strategies for areas affected by one or more brownfields.

For more information: <https://www.epa.gov/brownfields/types-brownfields-grant-funding>

### ***National Fish and Wildlife Foundation: Five Star & Urban Waters Restoration Grant Program***

The Five Star & Urban Waters Restoration Grant Program seeks to develop community capacity to sustain local natural resources for future generations by providing modest financial assistance to diverse local partnerships for wetland, riparian, forest and coastal habitat restoration, urban wildlife conservation, stormwater management as well as outreach, education and stewardship. Projects should focus on water quality, watersheds and the habitats they support. The program focuses on five priorities: on-the-ground restoration, community partnerships, environmental outreach, education, and training, measurable results, and sustainability. Eligible applicants include nonprofit organizations, state government agencies, local governments, municipal governments, tribes, and educational institutions. Projects are required to meet or exceed a 1:1 match to be competitive.

For more information: <http://www.nfwf.org/fivestar/Pages/home.aspx>





## STATE FUNDING SOURCES

There are multiple sources for state funding of bicycle and pedestrian transportation projects. However, beginning July 1, 2015, state transportation funds cannot be used to match federally funded transportation projects, according to a law passed by the North Carolina Legislature.

### *North Carolina Department of Transportation (NCDOT) Strategic Transportation Investments (STI)*

The NCDOT's State Transportation Improvement Program is based on the Strategic Transportation Investments Bill, signed into law in 2013. The Strategic Transportation Investments (STI) Initiative introduces the Strategic Mobility Formula, a new way to fund and prioritize transportation projects.

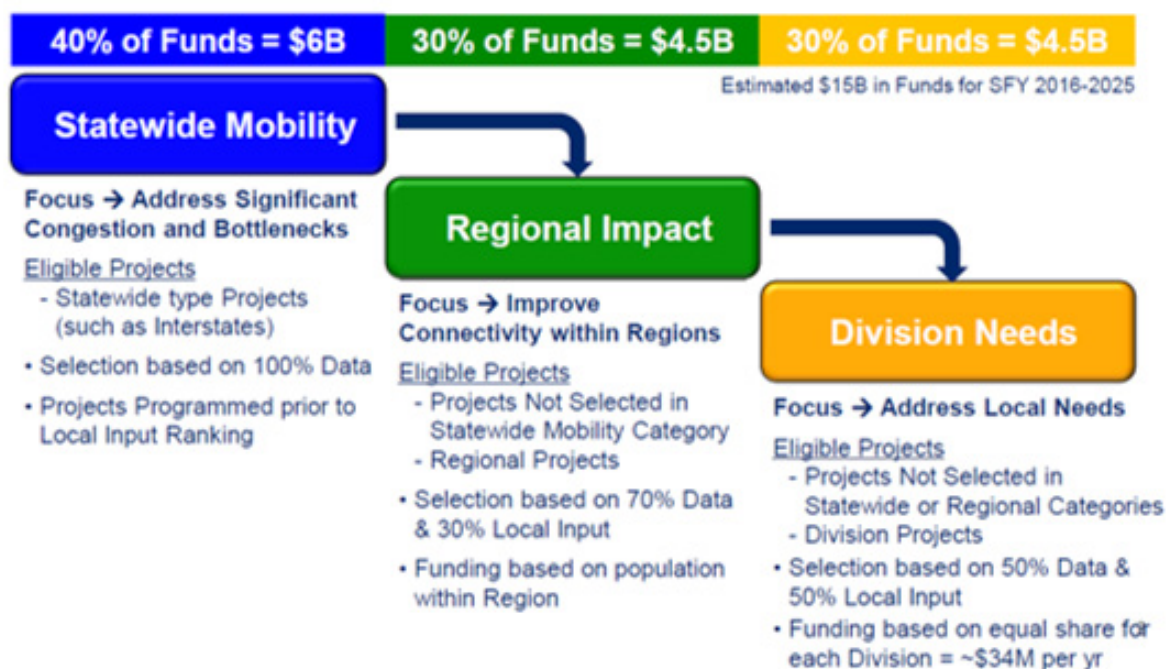
The new Strategic Transportation Investments Initiative is scheduled to be fully implemented by July 1, 2015. Projects slated for construction after that time will be ranked and programmed according

to the new formula. The new Strategic mobility formula assigns projects for all modes into one of three categories: 1) Statewide Mobility, 2) Regional Impact, and 3) Division Needs.

All independent bicycle and pedestrian projects are placed in the "Division Needs" category, and are currently ranked based on 50% data (safety, access, demand, connectivity, and cost effectiveness) and 50% local input, with a breakdown as follows:

#### **Safety 15%**

- Definition: Projects or improvements where bicycle or pedestrian accommodations are non-existent or inadequate for safety of users
- How it's measured: Crash history, posted speed limits, and estimated safety benefit
- Calculation:
  - Bicycle/pedestrian crashes along the corridor within last five years: 40% weight
  - Posted speed limits, with higher points for higher limits: 40% weight





- Project safety benefit, measured by each specific improvement: 20% weight

### **Access 10%**

- Definition: Destinations that draw or generate high volumes of bikes/pedestrians
- How it's measured: Type of and distance to destination

### **Demand 10%**

- Definition: Projects serving large resident or employee user groups
- How its measured: # of households and employees per square mile within 1 ½ mile bicycle or ½ mile pedestrian facility + factor for unoccupied housing units (second homes)

### **Connectivity 10%**

- Definition: Measure impact of project on reliability and quality of network
- How it's measured: Creates score per each SIT based on degree of bike/ped separation from roadway and connectivity to similar or better project type

### **Cost Effectiveness 5%**

- Definition: Ratio of calculated user benefit divided by NCDOT project cost
- How it's measured: Safety + Demand + Access + Connectivity)/Estimated Project Cost to NCDOT

### **Local Input 50%**

- Definition: Input from MPO/RPOs and NCDOT Divisions, which comes in the form points assigned to projects.
- How it is measured: Base points + points for population size. A given project is more likely to get funded if it is assigned base points from

both the MPO/RPO and the Division, making the need for communicating the importance of projects to these groups critical. Further, projects that have a local match will score higher.

### **Additional bicycle and pedestrian project requirements:**

- Federal funding typically requires a 20% non-federal match
- State law prohibits state match for bicycle and pedestrian projects (except for Powell Bill)
- Limited number of project submittals per MPO/RPO/Division
- Minimum project cost requirement is \$100,000
- Bike/Ped projects typically include: bicycle lanes, multi-use path/greenway, paved shoulders, sidewalks, pedestrian signals, SRTS infrastructure projects, and other streetscape/multi-site improvements (such as median refuge, signage, etc.)

These rankings largely determine which projects will be included in NCDOT's State Transportation Improvement Program (STIP). The STIP is a federally mandated transportation planning document that details transportation planning improvements prioritized by the stakeholders for inclusion in NCDOT's Work Program over the next 10 years. "More than 900 non-highway construction projects were prioritized for years 2015-2020, totaling an estimated \$9 billion. NCDOT will only have an estimated \$1.5 billion to spend during this time period." The STIP is updated every 2 years. The STIP contains funding information for various transportation divisions of NCDOT, including, highways, rail, bicycle and pedestrian, public transportation and aviation. A project does not have to be fully funded to be in the STIP.



For more information on STIP: [www.ncdot.gov/strategictransportationinvestments/](http://www.ncdot.gov/strategictransportationinvestments/)

To access the STIP: <https://connect.ncdot.gov/projects/planning/Pages/State-Transportation-Improvement-Program.aspx>

For more about the STI process: [http://www.ncdot.gov/download/performance/performance\\_TheProcess.pdf](http://www.ncdot.gov/download/performance/performance_TheProcess.pdf)

### *Incidental Projects*

Bicycle and Pedestrian accommodations such as; bike lanes, wide paved shoulders, sidewalks, intersection improvements, bicycle and pedestrian safe bridge design, etc. are frequently included as “incidental” features of larger highway/roadway projects. This is increasingly common with the adoption of NCDOT’s “Complete Streets” Policy.

In addition, bicycle safe drainage grates and hand-capped accessible sidewalk ramps are now a standard feature of all NCDOT highway construction. Most pedestrian safety accommodations built by NCDOT are included as part of scheduled highway improvement projects funded with a combination of federal and state roadway construction funds, and usually with a local match. On-road bicycle accommodations, if warranted, typically do not require a local match.

“Incidental Projects” are often constructed as part of a larger transportation project, when they are justified by local plans that show these improvements as part of a larger, multi-modal transportation system. Having a local bicycle or pedestrian plan is important, because it allows NCDOT to identify where bike and pedestrian improvements are needed, and can be included as part of highway or street improvement project. It also helps local government identify what their

priorities are and how they might be able to pay for these projects. Under “Complete Streets” local governments may be responsible for a portion of the costs for bicycle and pedestrian projects. The cost share breakdown is based on population size as follows:

- >100,000 = 50% local match
- 50,000 - 100,000 = 40% local match
- 10,000 - 50,000 = 30% local match
- <10,000 = 20% local match

For more information: <https://connect.ncdot.gov/projects/planning/RNAProjDocs/2014-06FinalReport.pdf>

### *SPOT Safety Program*

The Spot Safety Program is a state-funded public safety investment and improvement program that provides highly effective low-cost safety improvements for intersections and sections of North Carolina’s 79,000 miles of state main-tained roads in all 100 counties of North Carolina. The Spot Safety Program is used to develop smaller improvement projects to address safety, potential safety, and operational issues. The program is funded with state funds and currently receives approximately \$9 million per state fiscal year. Other monetary sources (such as Small Construction or Contingency funds) can assist in funding Spot Safety projects, however, the maximum allowable contribution of Spot Safety funds per project is \$250,000.

The Spot Safety Program targets hazardous locations for expedited low cost safety improvements such as traffic signals, turn lanes, improved shoulders, intersection upgrades, positive guidance enhancements (rumble strips, improved



channelization, raised pavement markers, long life highly visible pavement markings), improved warning and regulatory signing, roadside safety improvements, school safety improvements, and safety appurtenances (like guardrail and crash attenuators).

A Safety Oversight Committee (SOC) reviews and recommends Spot Safety projects to the Board of Transportation (BOT) for approval and funding. Criteria used by the SOC to select projects for recommendation to the BOT include, but are not limited to, the frequency of correctable crashes, severity of crashes, delay, congestion, number of signal warrants met, effect on pedestrians and schools, division and region priorities, and public interest.

For more information: <https://connect.ncdot.gov/resources/safety/Pages/NC-Highway-Safety-Program-and-Projects.aspx>

### ***Highway Hazard Elimination Program***

The Hazard Elimination Program is used to develop larger improvement projects to address safety and potential safety issues. The program is funded with 90 percent federal funds and 10 percent state funds. The cost of Hazard Elimination Program projects typically ranges between \$400,000 and \$1 million. A Safety Oversight Committee (SOC) reviews and recommends Hazard Elimination projects to the Board of Transportation (BOT) for approval and funding. These projects are prioritized for funding according to a safety benefit to cost (B/C) ratio, with the safety benefit being based on crash reduction. Once approved and funded by the BOT, these projects become part of the department's State Transportation Improvement Program (STIP).

For more information: <https://connect.ncdot.gov/resources/safety/Pages/NC-Highway-Safety-Program-and-Projects.aspx>

### ***Governor's Highway Safety Program***

The Governor's Highway Safety Program (GHSP) funds safety improvement projects on state highways throughout North Carolina. All funding is performance-based. Substantial progress in reducing crashes, injuries, and fatalities is required as a condition of continued funding. Permitted safety projects include checking station equipment, traffic safety equipment, and BikeSafe NC equipment. However, funding is not allowed for speed display signs. This funding source is considered to be "seed money" to get programs started. The grantee is expected to provide a portion of the project costs and is expected to continue the program after GHSP funding ends. Applications must include county level crash data. Local governments, including county governments and municipal governments, are eligible to apply.

For more information: <http://www.ncdot.org/programs/ghsp/>

### ***Safe Routes to School (SRTS)***

SRTS is managed by NCDOT, but is federally funded; See Federal Funding Sources above for more information.





### ***Community Development Block Grant Funds***

Community Development Block Grant (CDBG) funds are available to local municipal or county governments that qualify for community development projects that provide decent housing and suitable living environments and by expanding economic opportunities, principally for persons of low and moderate income. State CDBG funds are provided by the U.S. Department of Housing and Urban Development (HUD) to the state of North Carolina. Some urban counties and cities in North Carolina receive CDBG funding directly from HUD. Each year, CDBG provides funding to local governments for hundreds of critically-needed community improvement projects throughout the state. These community improvement projects are administered by the Division of Community Assistance and the Commerce Finance Center under eight grant categories. CDBG funds may be used for activities which include, but are not limited to: acquisition of real property, construction of public facilities and improvements, such as streets, neighborhood centers, and conversion of school buildings for eligible purposes, and activities related to energy conservation.

For more information: <https://www.hudexchange.info/programs/cdbg-entitlement/cdbg-entitlement-program-eligibility-requirements/>

### ***The North Carolina Division of Parks and Recreation – Recreational Trails and Adopt-a-Trail Grants***

The Adopt-a-Trail Grant Program (AAT) awards \$108,000 annually to government agencies, nonprofit organizations and private trail groups for trail projects. Funding from the federal

Recreational Trails Program (RTP), which is used for renovating or constructing trails and greenways, is allocated to states. The North Carolina Division of Parks and Recreation and the State Trails Program manages these funds with a goal of helping citizens, organizations and agencies plan, develop and manage all types of trails ranging from greenways and trails for hiking, biking, and horseback riding to river trails and off-highway vehicle trails. Grants are available to governmental agencies and nonprofit organizations. The maximum grant amount is \$100,000 and requires a 25% match of RTP funds received. Permissible uses include:

- New trail or greenway construction
- Trail or greenway renovation
- Approved trail or greenway facilities
- Trail head/ trail markers
- Purchase of tools to construct and/or renovate trails/greenways
- Land acquisition for trail purposes
- Planning, legal, environmental, and permitting costs - up to 10% of grant amount
- Combination of the above

Grant applications are typically due in May.

For more information: <http://www.ncparks.gov/more-about-us/grants/trail-grants/recreational-trails-program>

### ***NC Parks and Recreation Trust Fund (PARTF)***

The Parks and Recreation Trust Fund (PARTF) provides dollar-for-dollar matching grants to local governments for parks and recreational projects to serve the general public. Counties, incorporated



municipalities, and public authorities, as defined by G.S. 159-7, are eligible applicants. A local government can request a maximum of \$500,000 with each application. An applicant must match the grant dollar-for-dollar, 50 percent of the total cost of the project, and may contribute more than 50 percent. The appraised value of land to be donated to the applicant can be used as part of the match. The value of in-kind services, such as volunteer work, cannot be used as part of the match. Property acquired with PARTF funds must be dedicated for public recreational use.

For more information: <http://www.ncparks.gov/more-about-us/parks-recreation-trust-fund/eligibility>

### ***Clean Water Management Trust Fund***

The Clean Water Management Trust Fund (CWMTF) is available to any state agency, local government, or non-profit organization whose primary purpose is the conservation, preservation, and restoration of North Carolina's environmental and natural resources. Grant assistance is provided to conservation projects that:

- enhance or restore degraded waters;
- protect unpolluted waters, and/or
- contribute toward a network of riparian buffers and greenways for environmental, educational, and recreational benefits;
- provide buffers around military bases to protect the military mission;
- acquire land that represents the ecological diversity of North Carolina; and
- acquire land that contributes to the development of a balanced State program of historic properties.

For 2017, CWMTF expects to award over \$25 million to projects that protect natural and cultural resources.

For more information: <http://www.cwmtf.net/#appmain.htm>

### ***Duke Energy Water Resources Fund***

Duke Energy is investing \$10 million in a fund for projects that benefit waterways in the Carolinas. The fund supports science-based, research-supported projects and programs that provide direct benefit to at least one of the following focus areas:

- Improve water quality, quantity and conservation;
- Enhance fish and wildlife habitats;
- Expand public use and access to waterways; and
- Increase citizens' awareness about their roles in protecting these resources.

Applications are open to nonprofit organizations and local government agencies. Funding decisions are made twice a year. Local and regional government agencies could consider this resource for proposed greenways across the region such as the Browns Creek section of proposed greenway as part of Priority Project D in Elizabethtown.

For more information: <http://www.nccommunityfoundation.org/page/other-grant-opportunities/duke-energy-water-resource-fund-grants/applying-to-the-duke-energy-water-resources-fund>



### ***Urban and Community Forestry Grant***

The North Carolina Division of Forest Resources Urban and Community Forestry grant can provide funding for a variety of projects that will help plan and establish street trees as well as trees for urban open space. The goal is to improve public understanding of the benefits of preserving existing tree cover in communities and assist local governments with projects which will lead to more effective and efficient management of urban and community forests. Grant requests should range between \$1,000 and \$15,000 and must be matched equally with non-federal funds. Grant funds may be awarded to any unit of local or state government, public educational institutions, approved non-profit 501(c)(3) organizations, and other tax-exempt organizations. First time municipal applicant and municipalities seeking Tree City USA status are given priority for funding. Grant applications are due by March 31<sup>st</sup> of each year and recipients are notified by mid-July.

For more about Tree City USA status, including application instructions, visit: [http://ncforestservice.gov/Urban/urban\\_grant\\_overview.htm](http://ncforestservice.gov/Urban/urban_grant_overview.htm)

## **LOCAL GOVERNMENT FUNDING SOURCES**

Municipalities often plan for the funding of pedestrian and bicycle facilities or improvements through development of Capital Improvement Projects (CIP) or occasionally, through their annual Operating Budgets. In Raleigh, for example, the greenway system has been developed over many years through an annual dedicated source of funding that has ranged from \$100,000 to \$500,000 and administered through the Recreation and Parks Department. CIPs should include all types of capital improvements (water, sewer, buildings, streets, etc.) versus programs for single purposes. This allows municipal decision-makers to balance all capital needs. Typical capital funding mechanisms include the capital reserve fund, capital protection ordinances, municipal service district, tax increment financing, taxes, fees, and bonds. Each category is described below. A variety of possible funding options available to North Carolina jurisdictions for implementing pedestrian and bicycle projects are also described below. However, many will require specific local action as a means of establishing a program if it's not already in place.

### ***Powell Bill Funds***

Annually, State street-aid (Powell Bill) allocations are made to incorporated municipalities which establish their eligibility and qualify as outlined by G.S. 136-41.1 through 136-41.4. Powell Bill funds shall be expended only for the purposes of maintaining, repairing, constructing, reconstructing or widening of local streets that are the responsibility of the municipalities. It may also be used for planning, construction, and maintenance of bikeways or sidewalks within municipal limits or within the



area of a metropolitan planning organization or rural planning organization. Beginning July 1, 2015, under the Strategic Transportation Investments initiative, Powell Bill funds may no longer be used to provide a match for federal transportation funds such as Transportation Alternatives. Certified Statement, street listing, add/delete sheet and certified map from all municipalities are due between July 1st and July 21st of each year. Additional documentation is due shortly afterwards.

For more information: <https://connect.ncdot.gov/municipalities/State-Street-Aid/Pages/default.aspx>

### ***Capital Reserve Fund***

Municipalities have statutory authority to create capital reserve funds for any capital purpose, including pedestrian facilities. The reserve fund must be created through ordinance or resolution that states the purpose of the fund, the duration of the fund, the approximate amount of the fund, and the source of revenue for the fund. Sources of revenue can include general fund allocations, fund balance allocations, grants, and donations for the specified use.

### ***Capital Project Ordinances***

Municipalities can pass Capital Project Ordinances that are project specific. The ordinance identifies and makes appropriations for the project.

### ***Local Improvement District (LID)***

Local Improvement Districts (LIDs) are most often used by cities to construct localized projects such as streets, sidewalks, or bikeways. Through the LID process, the costs of local improvements are generally spread out among a group of property

owners within a specified area. The cost can be allocated based on property frontage or other methods such as traffic trip generation.

### ***Municipal Service District***

Municipalities have statutory authority to establish municipal service districts, to levy a property tax in the district additional to the town-wide property tax, and to use the proceeds to provide services in the district. Downtown revitalization projects are one of the eligible uses of service districts, and can include projects such as street, sidewalk, or bikeway improvements within the downtown taxing district.

### ***Tax Increment Financing***

Project Development Financing bonds, also known as Tax Increment Financing (TIF) is a relatively new tool in North Carolina, allowing localities to use future gains in taxes to finance the current improvements that will create those gains. When a public project (e.g., sidewalk improvements) is constructed, surrounding property values generally increase and encourage surrounding development or redevelopment. The increased tax revenues are then dedicated to finance the debt created by the original public improvement project. Streets, streetscapes, and sidewalk improvements are specifically authorized for TIF funding in North Carolina. Tax Increment Financing typically occurs within designated development financing districts that meet certain economic criteria that are approved by a local governing body. TIF funds are generally spent inside the boundaries of the TIF district, but they can also be spent outside the district if necessary to encourage development within it. Although larger cities use this type of financing more often, Woodfin, NC is an example of a small town that has used this type of financing.





### ***Municipal Vehicle Tax***

NCGS 20-97 allows municipalities to establish a vehicle fee/tax and a percentage of funding can be used for maintaining, repairing, constructing, reconstructing, widening, or improving public streets in the city or town that do not form a part of the State highway system.

### ***Other Local Funding Options***

- Bonds/Loans
- Taxes
- Impact fees
- Exactions
- Installment purchase financing
- In-lieu-of fees
- Partnerships

## **PRIVATE AND NONPROFIT FUNDING SOURCES**

Many communities have solicited greenway funding assistance from private foundations and other conservation-minded benefactors. Below are examples of private funding opportunities.

## **FUNDING FOR TRAIL DEVELOPMENT**

### ***Rails-to-Trails Conservancy***

RTC launched a new grant program in 2015 to support organizations and local governments that are implementing projects to build and improve rail-trails. Under the Doppelt Family Trail Development Fund, RTC will award a total of \$85,000 per year through a competitive process, which is then distributed among several qualifying projects. Eligible applicants include nonprofit organizations and state, regional, and local government agencies. Two types of grants are available - community support grants and project transformation grants. Around three to four community support grants are awarded each year, ranging from \$5,000-\$10,000 each. Community Support Grants support nonprofit organizations or "Friends of the Trail" groups that need funding to get trail development or trail improvement efforts off the ground. Each year, 1-2 Project Transformation Grants are awarded that range from \$15,000-\$50,000. The intention of these grants is to enable an organization to complete a significant trail development or improvement project. For both types of grants, applications for projects on rail-trails and rails-with-trails are given preference, but rail-trail designation is not a requirement. The trail must serve multiple user types, such as bicycling, walking, and hiking, and must be considered a trail, greenway, or shared-use path.



The fund was established with a \$80,000 grant from Jeff Doppelt of Great Neck, New York, a long-time supporter of RTC and development of rail-trails in the United States, and an additional \$20,000 donation from an anonymous donor. Applications are due January 31<sup>st</sup> of each year but applicants should check the website for grant application announcements.

For more information: <http://www.railstotrails.org/our-work/doppelt-family-trail-development-fund/>

### ***National Trails Fund***

American Hiking Society created the National Trails Fund in 1998, which is the only privately supported national grants program that provides funding to grassroots organizations working toward establishing, protecting, and maintaining foot trails in America. National Trails Fund grants help give local organizations the resources they need to secure access, volunteers, tools and materials to protect America's cherished public trails. To date, American Hiking has granted more than \$588,000 to 192 different trail projects across the U.S. for land acquisition, constituency building campaigns, and traditional trail work projects. Awards range from \$500 to \$3,000 per project. Only 501(c)3 non-profit organizations are eligible to apply. Applicants must be current members of American Hiking Society's Alliance of Hiking Organizations. Except for land acquisition projects, funded projects must be completed in a year. Multi-year projects may be considered if they are exceptional cases. Projects the American Hiking Society will consider include:

- Securing trail lands, including acquisition of trails and trail corridors, and the costs associated with acquiring conservation easements.
- Building and maintaining trails which will

result in visible and substantial ease of access, improved hiker safety, and/or avoidance of environmental damage.

- Constituency building surrounding specific trail projects - including volunteer recruitment and support.

For more information: <https://americanhiking.org/national-trails-fund/>

### ***American Greenways Eastman Kodak Awards***

The Conservation Fund's American Greenways Program has teamed with the Eastman Kodak Corporation and the National Geographic Society to award small grants (\$500 to \$2,500) to stimulate the planning, design, and development of greenways. These grants can be used for activities such as mapping, conducting ecological assessments, surveying land, holding conferences, developing brochures, producing interpretive displays, incorporating land trusts, planning bike paths, and building trails. Grants are primarily awarded to local, regional, or statewide nonprofit organizations. Public agencies may apply but preference is given to community organizations. Grants are awarded based on the importance of the project to local greenway development efforts, demonstrated community support, extent to which the grant will result in matching funds, likelihood of tangible results, and the capacity of the organization to complete the project. Applications can be submitted from March 1st through June 1st of each calendar year.

For more information: <http://www.rlch.org/funding/kodak-american-greenways-grants>



## FUNDING FOR CONSERVATION EFFORTS

### ***National Fish and Wildlife Foundation (NFWF)***

The National Fish and Wildlife Foundation (NFWF) is a private, nonprofit, tax-exempt organization chartered by Congress in 1984. The National Fish and Wildlife Foundation sustains, restores, and enhances the Nation's fish, wildlife, plants, and habitats. Through leadership conservation investments with public and private partners, the Foundation is dedicated to achieving maximum conservation impact by developing and applying best practices and innovative methods for measurable outcomes.

The Foundation provides grants through more than 70 diverse conservation grant programs. One of the most relevant programs for bicycle and pedestrian projects is Acres for America. Funding priorities include conservation of bird, fish, plants and wildlife habitats, providing access for people to enjoy outdoors, and connecting existing protected lands. Federal, state, and local government agencies, educational institutions, Native American tribes, and nonprofit organizations may apply twice annually for matching grants. Due to the competitive nature of grant funding for Acres for America, all awarded grants require a minimum 1:1 match.

For more information: <http://www.nfwf.org/whatwedo/grants/Pages/home.aspx>

### ***The Trust for Public Land***

Land conservation is central to the mission of the Trust for Public Land (TPL). Founded in 1972, the TPL is the only national non-profit working exclusively to protect land for human enjoyment and well-being. TPL helps acquire land and transfer it to

public agencies, land trusts, or other groups that intend to conserve land for recreation and spiritual nourishment and to improve the health and quality of life of American communities.

For more information: <http://www.tpl.org>

### ***Land for Tomorrow Campaign***

Land for Tomorrow is a diverse partnership of businesses, conservationists, farmers, environmental groups, health professionals, and community groups committed to securing support from the public and General Assembly for protecting land, water, and historic places. The campaign was successful in 2013 in asking the North Carolina General Assembly to continue to support conservation efforts in the state. The state budget bill includes about \$50 million in funds for key conservation efforts in North Carolina. Land for Tomorrow works to enable North Carolina to reach a goal of ensuring that working farms and forests, sanctuaries for wildlife, land bordering streams, parks, and greenways, land that helps strengthen communities and promotes job growth, and historic downtowns and neighborhoods will be there to enhance the quality of life for generations to come.

For more information: <http://www.land4tomorrow.org/>

### ***The Conservation Alliance***

The Conservation Alliance is a nonprofit organization of outdoor businesses whose collective annual membership dues support grassroots citizen-action groups and their efforts to protect wild and natural areas. Grants are typically about \$35,000 each. Since its inception in 1989, The Conservation Alliance has contributed \$4,775,059



to environmental groups across the nation, saving over 34 million acres of wild lands.

The Conservation Alliance Funding Criteria:

- The Project should be focused primarily on direct citizen action to protect and enhance our natural resources for recreation.
- The Alliance does not look for mainstream education or scientific research projects, but rather for active campaigns.
- All projects should be quantifiable, with specific goals, objectives, and action plans and should include a measure for evaluating success.
- The project should have a good chance for closure or significant measurable results over a fairly short term (within four years).

For more information: <http://www.conservationalliance.com/grants/?yearly=2016>

## FUNDING FOR ENVIRONMENTAL INITIATIVES

### *Blue Cross Blue Shield of North Carolina Foundation (BCBS)*

Blue Cross Blue Shield (BCBS) focuses on programs that use an outcome-based approach to improve the health and well-being of residents. The Healthy Places grant concentrates on increased physical activity and active play through support of improved built environments such as sidewalks and safe places to bike. Nonprofit organizations and government entities are eligible to apply. Eligible grant applicants must be located in North Carolina, be able to provide recent tax forms, and depending on the size of the non-profit,

provide an audit. BCBS does not have a traditional grant cycle and announces grant opportunities on a periodic basis. Grants can range from small-dollar equipment grants to large, multi-year partnerships.

For more information: <http://www.bcbsncfoundation.org/faqs>

### *Duke Energy Foundation*

Funded by Duke Energy shareholders, this foundation makes charitable grants to nonprofit organizations and government agencies. Grant applicants must serve communities that are also served by Duke Energy. The grant program has several investment priorities, one of which is environment, and this is the most applicable to bicycle and pedestrian projects. Duke Energy supports initiatives that help protect and restore wildlife and natural resources, with a special focus on water and air. The application period is typically from July 1<sup>st</sup> to August 31<sup>st</sup>.

For more information: <https://www.duke-energy.com/community/duke-energy-foundation>

## FUNDING FOR COMMUNITY DEVELOPMENT INITIATIVES

### *North Carolina Community Foundation*

The North Carolina Community Foundation, established in 1988, is a statewide foundation seeking gifts from individuals, corporations, and other foundations to build endowments and ensure financial security for non-profit organizations and institutions throughout the state. Based in Raleigh, the foundation also manages a number of community affiliates throughout North Carolina, that make





grants in the areas of human services, education, health, arts, religion, civic affairs, and the conservation and preservation of historical, cultural, and environmental resources. The foundation also manages various scholarship programs statewide. Nonprofit organizations and local government units, such as public schools, are eligible to apply. The foundation will only give consideration to applicants that serve counties within its affiliate network.

For more information: <http://www.nccommunityfoundation.org/grants-scholarships>

### ***Z. Smith Reynolds Foundation***

This Winston-Salem-based foundation has been assisting environmental projects in North Carolina for many years. Grant recipients include nonprofit organizations, colleges and universities, religious entities, and government agencies that have projects or programs that serve North Carolinians. The Foundation focuses its grant making on five focus areas: Community Economic Development; Environment; Public Education; Social Justice and Equity; and Strengthening Democracy. The “environment” focus area is the most applicable for bicycle and pedestrian projects. This focus area seeks to protect and restore ecosystems in the state’s mountains and coastal areas. The Z. Smith Reynolds Foundation is committed to accommodating the increasing growth demands in the state in environmentally sustainable ways, including through enhanced transportation options. Deadline to apply is typically in August.

For more information: <http://www.zsr.org/grants-programs>

### ***Bank of America Charitable Foundation***

The Bank of America Charitable Foundation is one of the largest in the nation. Its grantmaking activities are focused on 3 focus areas: workforce development and education, community development, and basic needs. The area of focus most relevant to increased recreational opportunities and trails is community development, which provides funding for projects that foster green communities and for transit oriented development projects. Only nonprofit organizations are eligible to apply for funding.

For more information: [www.bankofamerica.com/foundation](http://www.bankofamerica.com/foundation)

## **LOCAL TRAIL SPONSORS**

A sponsorship program for trail amenities allows smaller donations to be received from both individuals and businesses. Cash donations could be placed into a trust fund to be accessed for certain construction or acquisition projects associated with the greenways and open space system. Some recognition of the donors is appropriate and can be accomplished through the placement of a plaque, the naming of a trail segment, and/or special recognition at an opening ceremony. Types of gifts other than cash could include donations of services, equipment, labor, or reduced costs for supplies.



## CORPORATE DONATIONS

Corporate donations are often received in the form of liquid investments (i.e. cash, stock, bonds) and in the form of land. Municipalities typically create funds to facilitate and simplify a transaction from a corporation's donation to the given municipality. Donations are mainly received when a widely supported capital improvement program is implemented.

## PRIVATE INDIVIDUAL DONATIONS

Private individual donations can come in the form of liquid investments (i.e. cash, stock, bonds) or land. Municipalities typically create funds to facilitate and simplify a transaction from an individual's donation to the given municipality. Donations are mainly received when a widely supported capital improvement program is implemented.

## FUNDRAISING/CAMPAIGN DRIVES

Organizations and individuals can participate in a fundraiser or a campaign drive. It is essential to market the purpose of a fundraiser to rally support and financial backing. Often times fundraising satisfies the need for public awareness, public education, and financial support.

## VOLUNTEER WORK

It is expected that many citizens will be excited about the development of a greenway corridor. Individual volunteers from the community can be brought together with groups of volunteers from church groups, civic groups, scout troops and environmental groups to work on greenway development on special community workdays. Volunteers can also be used for fund-raising, maintenance, and programming needs.

## INNOVATIVE FUNDING OPTIONS

Crowdsourcing "is the process of obtaining needed services, ideas, or content by soliciting contributions from a large group of people, and especially from an online community, rather than from traditional employees or suppliers."

For some success stories and ideas for innovative fundraising techniques: <http://www.americantrails.org/resources/funding/TipsFund.html>





CAPE FEAR  
**REGIONAL BICYCLE PLAN**  
2017