

Montgomery County Breezeway Network

Function and Purpose of Breezeway Network

The Breezeway Network is a subset of Montgomery County's low-stress bicycling system that will be particularly appealing to daily bicycle commuters and utilitarian bicyclists because it will provide minimal delays and detours. This network will enable faster and slower speed bicyclists to travel along the same corridor without compromising each other's travel speed, safety or comfort. The network will provide direct and efficient routes between major activity centers.

Similar networks have been in use for more than a decade in Europe, including the Cycle Superhighways of Denmark, the Netherlands, Dubai and London (see Figure 1). Providing the highest quality user experience on the Breezeway Network will encourage more bicycle riding and contribute to a higher non-auto driver mode share in Montgomery County.



Figure 1. Visualization of Cycle Superhighway in London (London Cycling Design Standards, 2014)

Network Characteristics and Route Selection

Breezeways are the arterials of the bicycle classification system in that they are envisioned to carry a high percentage of through traffic. They can include trails, sidepaths and separated bike lanes when designed with the criteria described below. Breezeways are used for longer, faster trips to central business districts (CBDs), transit stations, activity hubs and job centers. Local bikeways, including neighborhood greenways, sidepaths, bike lanes and low-volume / low-speed streets, will funnel local bicycle traffic to the Breezeways.

Breezeway routes in Montgomery County will include a combination of new routes and upgraded existing bike routes. The Bicycle Master Plan will identify a connected Breezeway Network envisioned for implementation over a 20-year timeline and will prioritize a small number of Breezeway routes for more immediate action.

Because Breezeways are intended to provide direct access to destinations for users, they can be located on main roads or on parallel alternative routes so long as these alternatives provide users *the same level of direct access* to destinations. In exurban areas, routes with fewer intersections/longer blocks (e.g., 0.25 miles between intersections or greater) that provide direct access to destinations may be optimal since there will be less delay for bicyclists. When Breezeways are routed along side streets, the number of required turns should be minimized in order to maintain bicyclist speed, legibility and convenience.

Montgomery County Breezeway Network

Facility Characteristics

The main purpose of the Breezeway Network is to deliver separation from motor vehicle traffic, separation from pedestrians in most cases, minimal intersection delay and a smooth bicycling surface. A Breezeway can comprise sidepaths, separated bike lanes, trails and neighborhood greenways that feature the highest quality design and construction, and similar branding. Breezeways safely and conveniently cross intersections and driveways.

Design Speed

The Breezeway Network will have a design speed of 20 miles per hour (mph) in low-activity / suburban areas and 12 mph in high-activity/urban areas.

Complete Separation from Traffic

Fixed, continuous separation from traffic (e.g., curbs or concrete barriers) is necessary to provide an adequate level of safety and comfort for Breezeway users. Sidepaths or trails that run parallel to a roadway should feature a minimum separation of 5 feet from curb lines or edges of shoulders in uncurbed areas, unless fixed, vertical separation is provided. However, along high-speed roadways with speed limits of 35 mph or greater, separation greater than 5 feet is desirable for bicyclist comfort.

Separation Between Bicycling and Walking

Breezeways should provide separation between pedestrians and bicyclists. On trails and sidepaths, separation can be provided using adequate width, signage and pavement markings. Shared-use segments of the Breezeway Network (i.e., those designed for pedestrians *and* bicyclists) should provide a minimum width of 12 feet for two-way bicycle travel plus a minimum width of 5 feet for pedestrians, although 8 feet is preferred in busy pedestrian areas.

Proposed widths should be specified based on anticipated bicyclist and pedestrian volumes. Ample width will allow for two-way bicycle and pedestrian travel, including both faster and slower bike riders, and a separate space for pedestrians. In urban areas where separation is provided using sidewalks and separated bike lanes, busy areas may need to provide more pedestrian space with widened waiting areas/pedestrian refuge islands at intersections, wider sidewalks and dedicated space for those waiting at bus stops. Breezeway routes (and all low-stress



Figure 2. Minneapolis' Midtown Greenway provides delineated spaces for bicyclists and pedestrians.

Montgomery County Breezeway Network

routes) should feature improved pedestrian crossings (and new crossings in some places) that facilitate safe, Americans with Disabilities Act (ADA)-accessible crossing of both the bicycle facility and general travel lanes. Because Breezeways provide adequate space for both fast and slow riders, speed limit signage and regulation on trails that are part of the network are not recommended.

Breezeways will feature adequate width for side-by-side bicyclist travel and passing, as well as adequate buffers from motor vehicle traffic.

- A shared use path that is part of a Breezeway should provide 12 feet for bicycle travel and 5 feet for pedestrian travel at a minimum. In areas with high pedestrian demand, 8 feet is the preferred pedestrian travelway width.
- A two-way separated bike lane that is part of a Breezeway should provide 12 feet for bicycle travel, at a minimum, excluding the gutter pan.
- A one-way separated bike lane that is part of a Breezeway should be 8 feet wide at a minimum.

Minimal Intersection Delay

Breezeways should feature intuitive and safe intersection and driveway crossings that minimize bicyclist delay. The crossings should be developed to prioritize bicyclists by making it easier and safer for them to move through the intersections. Breezeway crossings will include elements that both separate bicycle movements from motor vehicles and make bicyclists more visible to other road users. Crossings of Breezeways should:

- 1) Slow motor vehicle traffic at crossings.
- 2) Improve bicyclist visibility.
- 3) Reduce bicyclist exposure.
- 4) Reduce/eliminate conflicts.

Treatments to facilitate these crossings may include:

- *Fully-protected intersection treatments* to reduce the number of potential conflict points between bicyclists and motor vehicles, making these conflicts easier to mitigate.
- *Colored pavement through intersections* that delineates bicyclist right-of-way and improves bicyclist visibility.
- *Bike signals* that reduce conflicts by allowing bicycle and motor vehicle intersection movements to be separated. These signals have interim approval from the Federal Highway Administration (FHWA).
- *Leading bicycle intervals* at traffic signals (i.e., early start for bicyclists) to reduce conflicts by allowing bicyclists to enter the intersection ahead of right-turning vehicles, establishing right-of-way and improving motor vehicle yielding.
- *Two-stage turn boxes* to reduce conflicts and improve bicyclist visibility. These boxes provide bicyclists a way to make left turns in two steps at a multi-lane signalized intersection from a separated bike lane. Riders continue straight through the intersection and queue in front of traffic on the cross street, reorienting in the left turn direction. When the signal changes, riders proceed through the intersection on the cross street. This treatment is less preferable than a fully-protected intersection.

Montgomery County Breezeway Network

- *Grade separation* (undercrossings and bridges/overpasses) that eliminates potential conflicts with automobiles and minimizes bicyclist delay by allowing bicyclists to cross over or under motor vehicle traffic without stopping to negotiate an intersection.
- *Narrower curb radii* to improve bicyclist visibility by requiring motorists to slow down while turning, widening their field of vision and making it more likely they will see bicyclists proceeding straight through the intersection.
- *Driveway consolidation* that reduces conflicts between motor vehicles and bicyclists by limiting the number of conflict points a bicyclist must traverse.
- *Raised crosswalks* to slow driver speeds when crossing the Breezeway from a side street. Slower motorists have a wider field of vision and are more likely to see bicyclists.

Pavement Surface

Oftentimes, the reason a bicyclist may choose to ride in the roadway instead of on a parallel sidepath is to take advantage of the roadway's superior pavement quality. For this reason, Breezeways will feature high-quality construction, surface materials and maintenance practices that maximize surface smoothness and pavement life, minimizing potential for pavement cracking and buckling (see Figure 3).



Figure 3. Pavement cracking along the Metropolitan Branch Trail

Montgomery County Breezeway Network

Specific construction requirements should be adapted to each location in a manner that's appropriate to local conditions and anticipated wear-and-tear. If maintenance, service or emergency vehicles will need to access the Breezeway, construction methods and materials should take that into account. In the course of Breezeway design, pavement technologies to be investigated include, but are not limited to:

- Fine-grained asphalt and porous asphalt surface courses to reduce road noise.
- Thickened pavement courses to accommodate vehicular loading where necessary and lengthen pavement life.
- Thickened aggregate base courses to accommodate vehicular loading where necessary and lengthen pavement life.
- High-modulus pavements to reduce pavement thickness.
- Higher asphalt content in asphalt base courses to increase durability and fatigue resistance.
- Structural enhancements for poor pavement subgrades to accommodate vehicular loading and lengthen pavement life.
- "Perpetual pavement" technologies to lengthen pavement life.
- Porous pavement to reduce ice-buildup and water spray from tires.

Breezeways should feature construction practices designed to result in high-quality pavement installation, including improved subgrade preparation and testing, installation of pavements with appropriate lift thicknesses, rigorous asphalt temperature monitoring and thorough compaction for uniform density and smoothness. Within the bikeway network, Breezeways should be prioritized for maintenance similar to priority arterials in the roadway network. This priority applies to snow removal, resurfacing, sweeping and other general maintenance activities.

Street Infrastructure

In addition to being separated from motor vehicle traffic, Breezeways should be free of obstructions, such as utility poles, trees or sign posts. Breezeways should also have corridor-long pedestrian-scale lighting. Lighting should provide continuous illumination along both the travelway and on immediate wayside areas. In residential areas or sensitive habitat areas, specialized lighting or screens may be required to avoid adverse impacts.

Branding and Wayfinding

Unique branding improves Breezeway Network legibility and helps the network develop its own identity as a high-quality transportation option.

There are many examples of how this branding might be handled, including using:

- Pavement markings (see Figure 4 from London, England or the Capital City Bikeway in St. Paul, MN).
- Different color surface treatment (e.g., in London, typical bikeways are identified in green and Cycle Superhighways in blue), though this would require FHWA experimentation approval.
- Signage that distinguishes the Breezeway from the rest of the network (as shown in Figure 5), In London, Cycle Superhighway signs are red, standard bike routes are light blue, "Quietways" (bicycle boulevards) are navy.

Montgomery County Breezeway Network

Wayfinding signage to guide Breezeway users to their destinations may be the same as existing countywide bicycle wayfinding or could be a different design unique to the Breezeway Network. Wayfinding signage from other facilities directing riders to a Breezeway route should identify it as such.



Figure 4. Pavement Marking used for Cycle Superhighway 3 in London (London Cycling Design Standards, 2014)



Figure 5. Wayfinding Signs used for Cycle Superhighways in London (London Cycling Design Standards, 2014)

Transitions

Transitions between Breezeways and standard bicycle facilities should be direct, seamless and intuitive. See the Montgomery County Bikeway Design Toolkit for details on designing high-quality transitions. Guidance on transitions is provided for multiple combinations of one- and two-way separated bike lanes connecting to other bicycle facilities in the Intersection Treatments section of the toolkit.

Policy Guidance

Implementing and maintaining the Breezeway Network may require adjusting a number of existing county and state policies and practices:

- Dedicated design guidance may need to be adopted by the Montgomery County Department of Transportation (MCDOT) in order to codify minimum widths and other design standards. Newer intersection treatments (i.e., two-stage turn boxes) may also need to be added to MCDOT's design standards.
- For Breezeways on state highways, the Maryland Bicycle Policy and Design Guidelines may need to be revised to allow for the high-quality design standards presented here. However, most of the dimensions for separated bike lanes in that guide are minimums, so it should not preclude the development of the type of network described herein.

Montgomery County Breezeway Network

- Maintenance practices and policies will need to be revised as follows:
 - New equipment will be required for sweeping, snow removal and emergency response on the county's separated bike lane network and growing trails network.
 - A maintenance, snow removal and repaving schedule should be developed for Breezeways. This process may require revisions to the existing prioritization process for maintenance and snow removal. Snow removal laws may require careful attention to bikeways in residential areas where Breezeways run alongside the roadway (i.e., as a sidepath), as it may not be clear whether residents or the county are responsible for snow and ice removal.

Conclusion

The overarching goal of the Montgomery County Bicycle Master Plan is to develop a world-class bicycle network. This ambition will require staff and elected officials to “think big” - tackling tough projects, upending long-standing practices in how public space is allocated and making sustained investments. The Breezeway Network has the potential to become an iconic part of Montgomery County's identity as a place, attracting residents and businesses looking for a healthy, active place to settle and grow.

Implementing this network will require tough choices; however, identifying the planned Breezeway Network within the Bicycle Master Plan will allow Montgomery County to take advantage of incremental opportunities that may arise for implementation. Piece-by-piece, as the Breezeway Network is constructed, the county will become a renowned destination for active, healthy living and a robust, multi-modal transportation system over the coming decades.