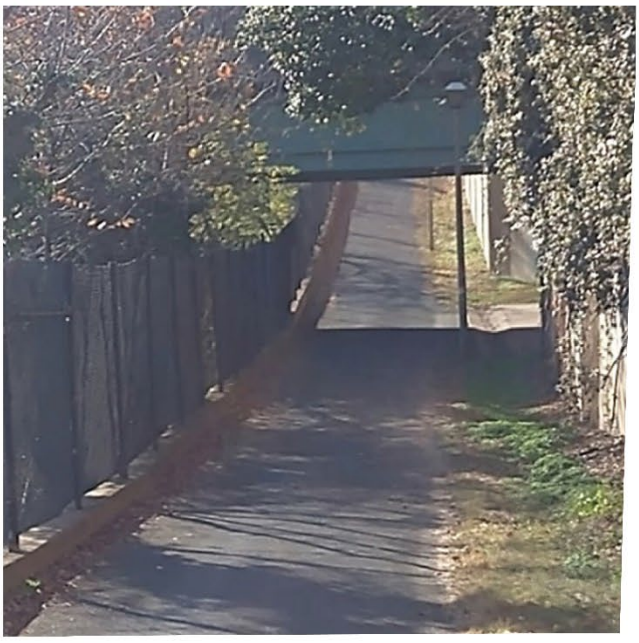
ARLINGTON COUNTY CUSTIS TRAIL NEEDS ASSESSMENT & PRIORITY IMPROVEMENTS STUDY



ARLINGTON
VIRGINIA

Prepared for Arlington County

JUNE 2024

ARLINGTON COUNTY CUSTIS TRAIL NEEDS ASSESSMENT AND PRIORITY IMPROVEMENTS STUDY

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Elwyn Gonzalez, AICP, Arlington County
Allison Bullock, AICP, Arlington County
Natasha Alfonso-Ahmed, Arlington County
Robert Capper, ASLA, CPRP, Arlington County
Ryan Delaney, Arlington County
Melissa Gildea, PLA, Arlington County
David Patton, Arlington County
Catherine Seebauer, PE, Arlington County
Brian Shelton, Arlington County
Elizabeth Thurber, PE, Arlington County
Robert Upton, Arlington County
Daniel Fourquet, Virginia Office of Intermodal Planning and Investment
Heidi Mitter, Virginia Department of Transportation
Jim Sebastian, AICP Toole Design
Hector Chang, Toole Design
Carrie Long, AICP Toole Design
J. Swiderski, Toole Design

ABOUT GAP-TA

The Growth and Accessibility Planning Technical Assistance (GAP-TA) program supports Virginia localities in planning and developing multimodal transportation opportunities. The program has four components, and each component has differences in eligible applicants, eligible activities, expected outcomes, and application evaluation criteria. Component 1 involves conducting multi-modal planning within existing or planned Urban Development Areas or Growth Areas. Component 2 involves developing or evaluating strategies to address emerging planning issues. Component 3 involves developing an accessibility planning process, Finally, Component 4 involves conducting multi-modal planning outside urbanized areas. Visit vtrans.org/about/GAP-TA for information about the GAP-TA program.

CONTACT INFORMATION

Elwyn Gonzalez, AICP
Arlington County Department of Environmental Services, Transportation Division
(703) 228-3480
egonzalez2@arlingtonva.us
Ellen M. Bozman Government Center
2100 Clarendon Boulevard
Arlington, VA 22201

TABLE OF CONTENTS

TABLE OF FIGURES

TABLE OF TABLES

INTRODUCTION AND PURPOSE

PROJECT PURPOSE

The *Arlington County Custis Trail Needs Assessment and Priority Improvements Study* provides a technical review and documentation of current Trail conditions and connections and equips the County with targeted recommendations. The purpose of the project is to document the conditions of the Custis Trail and its connections, and to identify both immediate and longer-term opportunities for investment in improvements that support the County's vision for a safer multimodal transportation network and accessible open space and recreation.

The four stages of the project (as reflected in this report's four sections) are:

1. **Literature Review**: The report begins with an introduction to the Trail and its history, providing context for its importance as a critical link in the transportation network and local asset for recreation. Analysis and recommendations of this report are informed by an initial and comprehensive review of existing planning documents and policies, best practices in trail design, and through engagement with the study team and local experts in trail design and related issues.
2. **Existing Conditions Analysis**: The existing conditions analysis blends on-site data collection and documentation with mapping exercises to integrate environmental, infrastructure condition and maintenance, and other context data. The Trail is divided into segments for more detailed analysis, and findings are organized into themes.
3. **Recommendations**: Identified issues are addressed through long-term and short-term recommendations and strategies. These range in terms of scope, timeline, and level of investment required.
4. **Implementation.** The final section includes suggestions on the phasing of the improvements.

Together, these elements support the County's decision on whether and where to invest in more detailed planning exercises and feasibility analysis, including future Capital Improvement Plan (CIP) investments.

STUDY AREA

The Custis Trail is a major east-west multi-use trail facility providing non-motorized transportation and recreation options in the northern half of Arlington County. Forming one of the three legs of the greater 16-mile Arlington Loop which encircles urbanized portions of the County (Figure 1), the fully off-street trail connects and supports access to 13 Arlington civic associations, six Arlington public schools, and six WMATA Metrorail stations. Named as part of the Custis Memorial Parkway, in honor of the Custis family who made Northern Virginia their home, the Trail was built in conjunction with the construction of Interstate-66 (I-66), as a traffic mitigation strategy to meet approval by the Federal Highway Administration (FHWA). Opened in 1982, the $12.5 million (in 2024 dollars) Trail was the first of its kind to be built parallel to a U.S. interstate highway, winning immediate praise and inspiring similar efforts around the Country, including VDOT's recently completed 18-mile 66 Parallel Trail between Dunn Loring and Centreville.

Now more than 40 years old, the Custis Trail has begun to show its age with most segments narrower than County guidelines. Cracks and potholes on the asphalt surface create ponding and icy conditions following rain and snow events, wayfinding signage to destinations is faded or incomplete, and steep grade differentials affect access for persons with disabilities. Lighting fixtures are damaged or missing in areas such as underneath above-grade bridges, and walls along both sides of the Trail are repeatedly graffitied upon.

This study aims to address these conditions and identify improvements to the 4.5-mile Trail and its connections to local destinations and other connecting multimodal facilities. The study area includes the full length of the Trail, as highlighted in Figure 2, which runs parallel to Langston Boulevard and I-66 and extends from the Washington and Old Dominion Trail near the western edge of the County to the Mount Vernon trailhead in Rosslyn adjacent to the Key Bridge. The study area also includes all access spurs to adjacent neighborhoods and activity centers.

Figure 1 The Arlington Loop (Custis Trail in red) and Images of the Trail in 1988 and Today.
(Source: Arlington County)

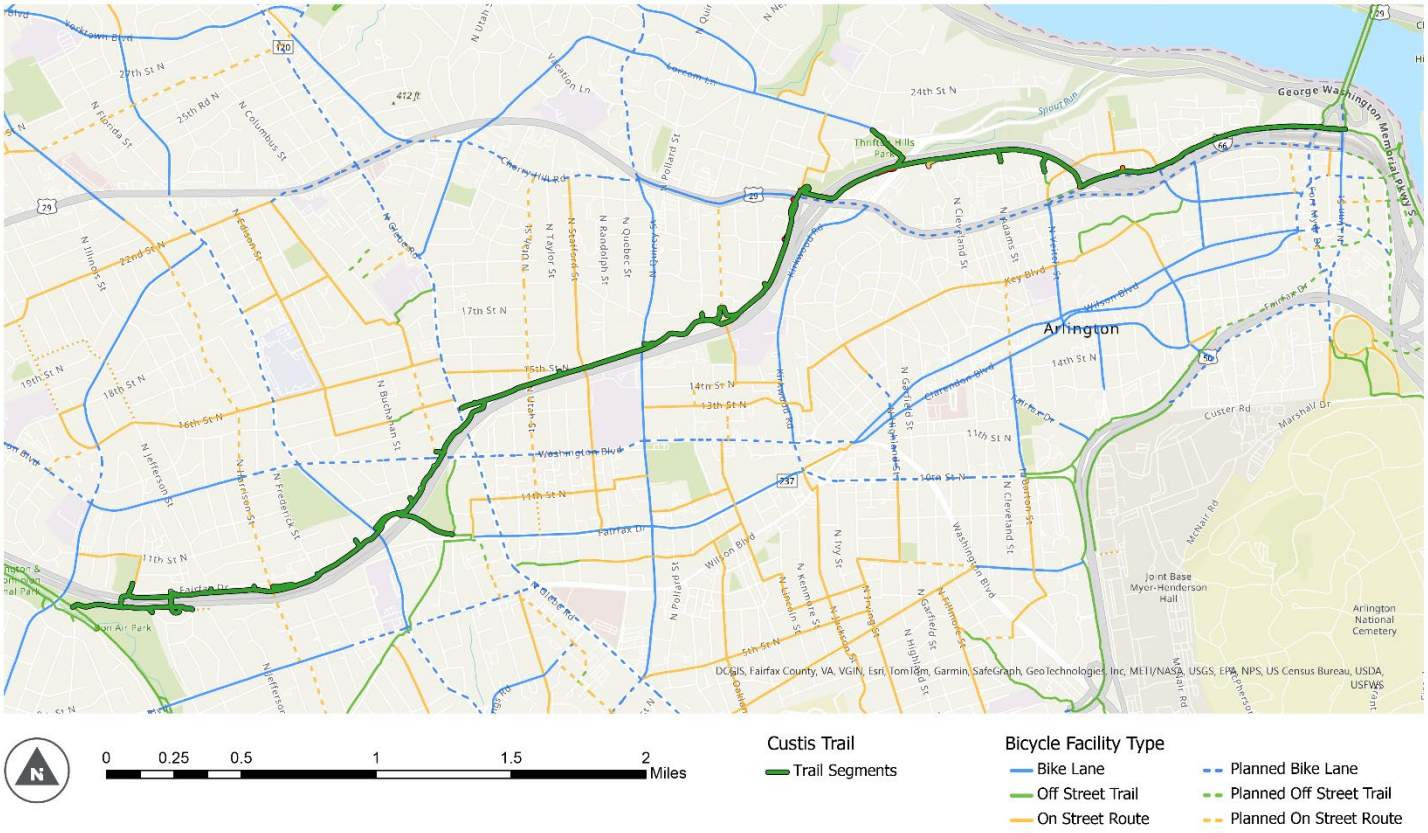


Figure 2 Custis Trail Study Area and Connecting Bicycle Network

The Custis Trail is part of the region's National Capital Trail Network, presented in Figure 3, which features existing and planned trails. The Metropolitan Washington Council of Governments (MWCOG) and its affiliated Metropolitan Planning Organization, the National Capital Region Transportation Planning Board (TPB), produced the Bicycle and Pedestrian Plan for the National Capital Region in 2022 which outlined a regional vision for the trail network as a connected, low-stress network of long-distance facilities, and identified priorities and projects to advance the National Capital Trail Network. This vision is also a priority identified in the region's Long-Range Transportation Plan, *Visualize 2045*. In total, the completed network would connect 1,549 miles of trails; MWCOG reports that as of 2023, 752 miles (approximately 49%) have been completed.

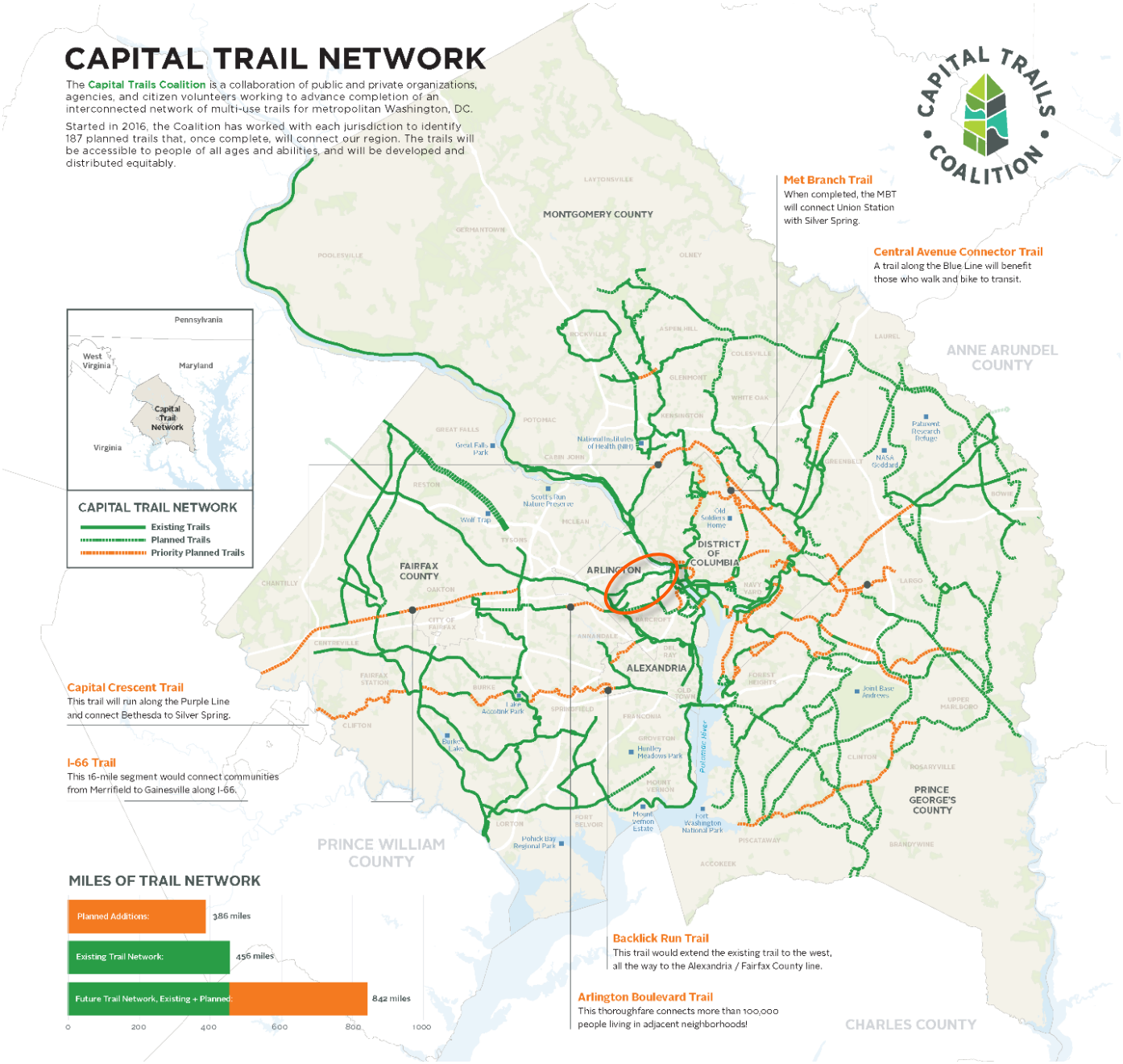


Figure 3 Capital Trail Network *(Source: Capital Trail Coalition)*

REGIONAL CONNECTIONS The Metropolitan Washington Council of Governments (MWCOG) emphasizes the importance of the National Capital Trails Network as a regional connector for all ages and abilities, and highlights the outsized impact this network has on the region and communities it serves:

- The Network will serve 63% of the region's population and provide access to 72% of the region's jobs;
- 92% of Equity Emphasis Areas, or areas with high concentrations of traditionally disadvantaged and lower income population groups — are connected by the trail network; and,
- The trail network provides multimodal links to nearly all Transit Access Focus Areas (TAFAs, or areas in greatest need for improved accessibility to transit), with 98% of TAFAs within the network.

Today, the Custis Trail is an active and well-used facility, with over 2,000 users per day. Figure 4 depicts the average hourly trail counts, with the x-axis reflecting the hours of the day (from midnight at left, to 11:59pm at right) and the y-axis showing the average volume of trail users; the chart itself features seven lines for each day of the week. The data presented was collected by a trail counter device and includes nearly fifteen years of data, from installation in 2009 through March 2024.

As shown in the graph, the Trail typically experiences peak volumes between 7 and 9AM, and 5 to 6PM, peaking at around 175 users per hour. (Note: This includes trail count data collected throughout the COVID-19 pandemic and resulting lockdowns, during which typical peak times and commute patterns were upended). This hourly volume provides a baseline for determining an appropriate width for the Custis Trail now and in the future, using the Trail Design Guidance found in the Local Plans and Design Guidance section below.

On weekdays, the Trail users are primarily people riding bicycles (72% of Trail users) with about one-in-four users walking the Trail. The number of people walking increased by a third on the weekends, with an average 518 pedestrian users per day accounting for 39 percent of weekend trail activity. While weekend bicyclists still make up the majority of Trail users (62%), there are fewer people traveling by bike on the weekend.

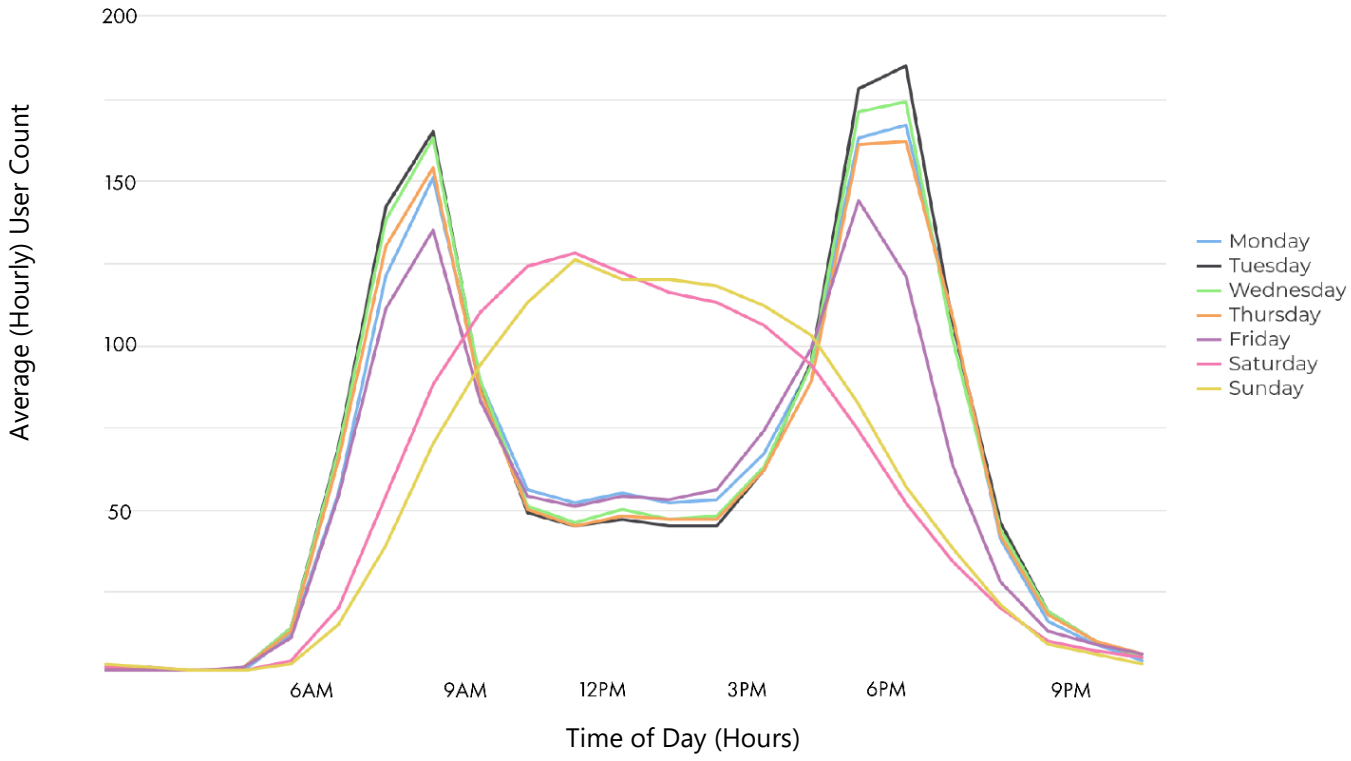


Figure 4 Custis Trail Average Hourly Volumes by Day of the Week at the Rosslyn Counter (2009 - 2024)

Micromobility, including e-bikes and e-scooters, are increasingly used along the Trail. Data compiled by RideReport.com reports approximately 1,600 scooters and 700 e-bikes traveled along the Trail since the summer of 2019. Figure 5 presents the number of shared micromobility trips, including dockless bicycles and scooters, that occurred within or close to the study area in 2024 (March through June). As shown, shared micromobility trips increase to the east from Lincoln Street and trips are highest within the Rosslyn area (these higher ridership areas correspond to segments 8 and 9 of the current project).

E-bikes are readily available at multiple Capital Bikeshare docking stations on or close to the Custis Trail (Figure 6), as well as dockless e-bikes as provided. Below the map is a graph of the number of trips at each bikeshare station (i.e., trip start and end points). Figure 7 shows that the Roosevelt Island bikeshare station reports the greatest number of trips among the seven bikeshare stations assessed (i.e., close to the Trail); additionally, this station has rebounded to achieve pre-COVID levels of trips.

The County recognizes that usage of the Custis Trail will continue to grow as the County grows, as additional connections are made (e.g., the Capital Trails Network) and as residents and commuters continue to shift travel preferences towards walking and biking. Redevelopment opportunities along the corridor will continue to activate spaces along the Trail and increase the amount of people using the Trail for transport and recreation in the future.

Plans and other efforts to prepare for (and encourage) this modal shift and improve overall trail conditions are outlined in the following review of local plans and design guidance.

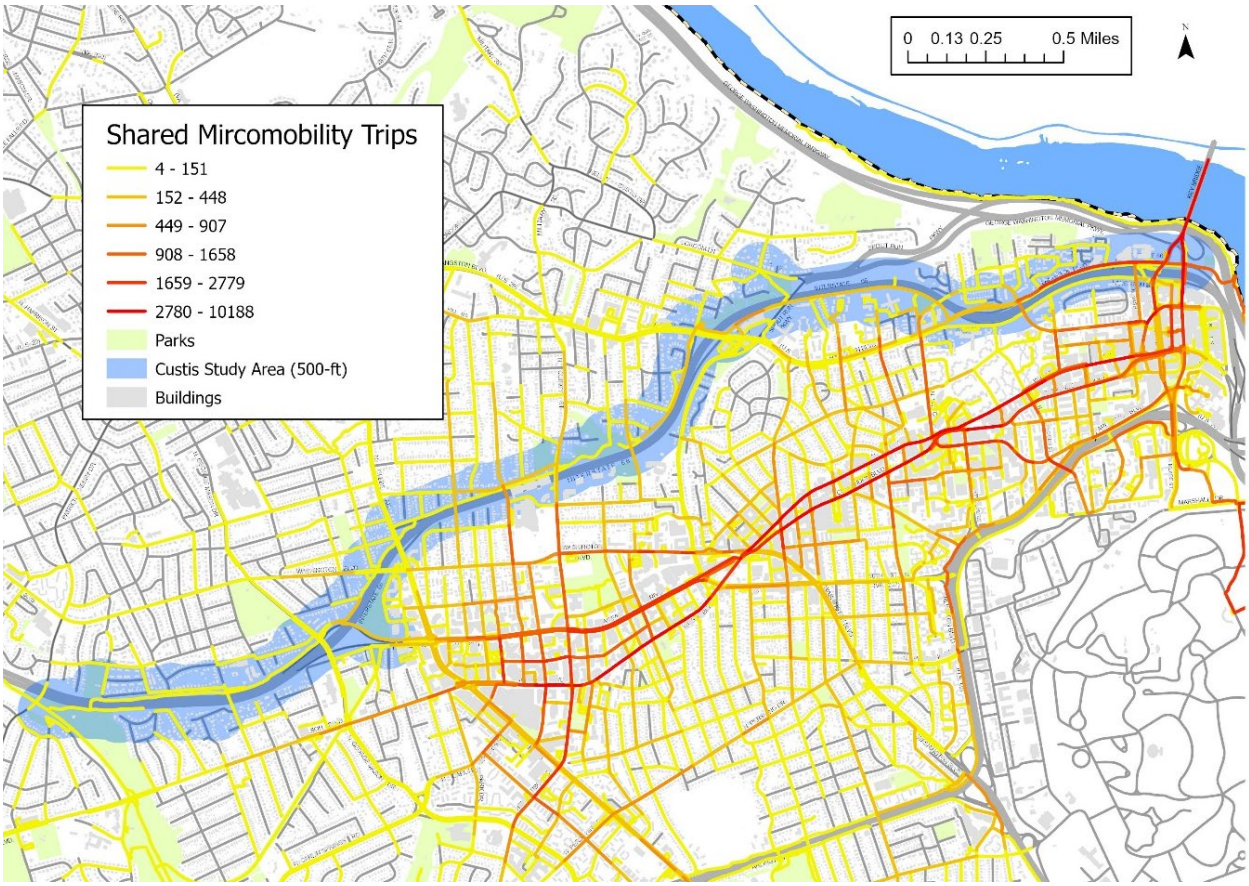


Figure 5 Shared Micromobility Trips – March to June 2024 *(Includes Dockless Bikes and Scooters)*

ACCESS TO BIKESHARE Figures 6 and 7 present Capital Bikeshare Stations located in proximity to the Trail, as well as the number of bikeshare trips (start and end points) that occurred at each of these stations between 2012 to 2023.

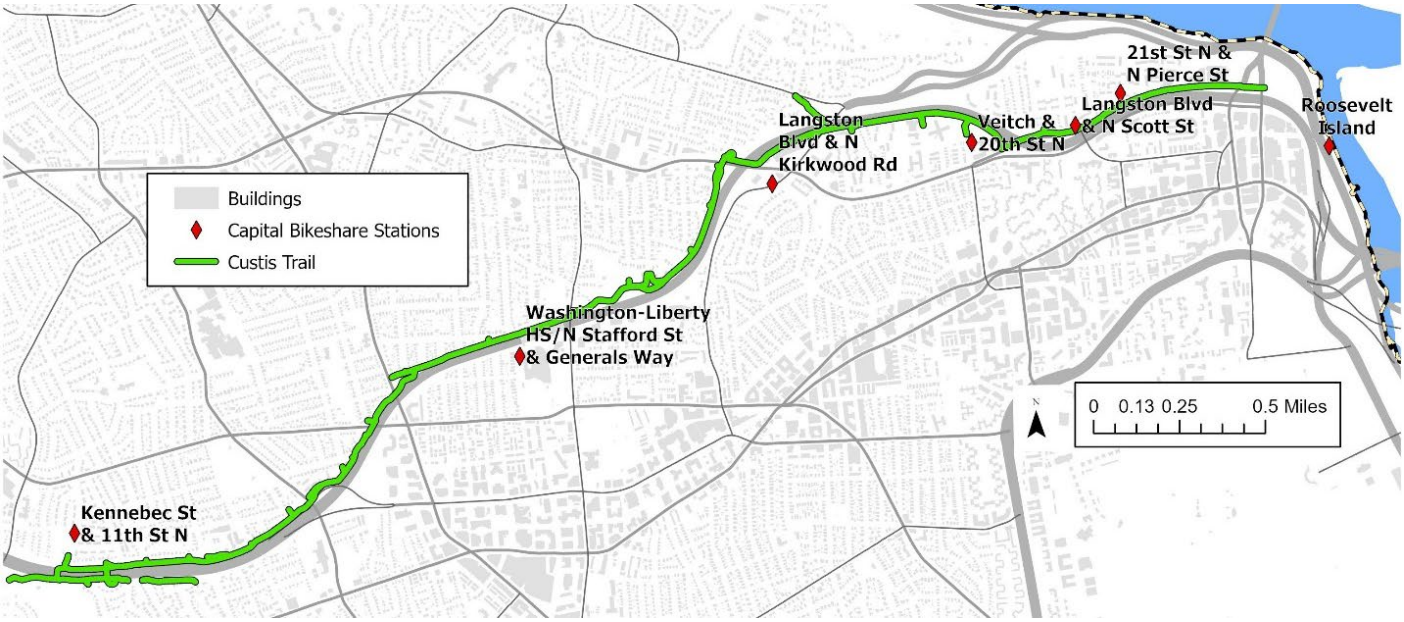


Figure 6 Capital Bikeshare Stations in Proximity to the Custis Trail

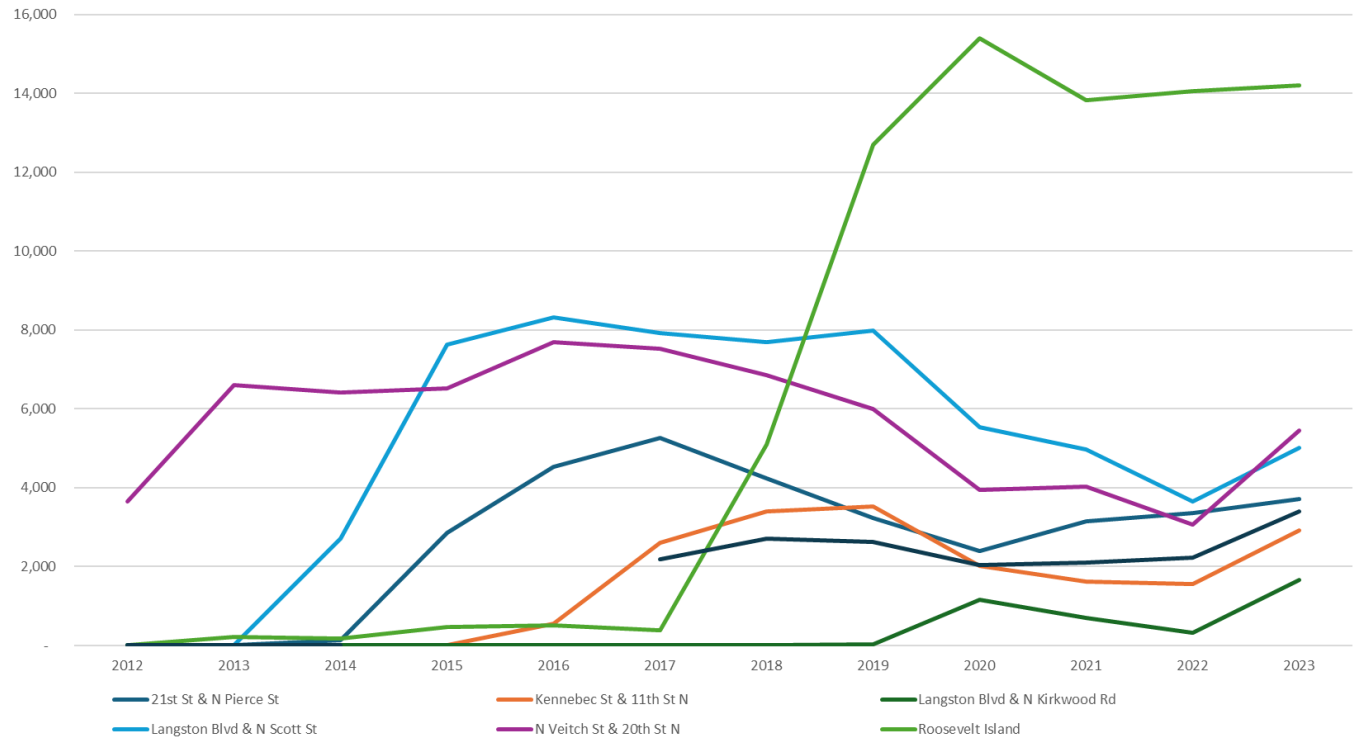


Figure 7 Custis Trail Adjacent Capital Bikeshare Trips (Starts/Ends)

LOCAL PLANS AND DESIGN GUIDANCE

This *Custis Trail Needs Assessment and Priority Improvements Study* builds on several local planning initiatives that center on the County's trail network, infrastructure and connectivity, and use. County and regional documents such as MWCOG's *Bicycle and Pedestrian Plan*, the County's *Master Transportation Plan,* and the local *Langston Boulevard Area Plan* highlight the importance of the Trail as a transportation and recreational asset for the Region, the County, and the neighborhoods it serves. Understanding the findings and recommendations from adopted transportation, environmental, and planning land use efforts provides important context for the analysis of current conditions. The following section introduces select planning guidance relevant to the Custis Trail study area, with emphasis on the takeaways most relevant to the current study.

In addition to reviewing current plans and planning efforts, the team conducted a review of established national, state, and local design guidance for trails and associated multimodal access and connectivity. A brief literature review of trail-related design manuals, code or regulatory context, and other design guidance provides an overview on best practices for trail facility design and considerations, wayfinding and signage needs, context-sensitive environmental considerations and designs, and other trail amenities and features.

Together, these literature reviews and summaries of local planning efforts and of trail design guidance equipped the project team with a foundation for the existing conditions summary and gap analysis (e.g., identifying features or physical conditions that do not meet established standards or preferred designs) and the recommended improvements introduced in Section 4. The elements of this project approach are presented in Figure 8.

EXISTING LOCAL AND STATE PLANNING GUIDANCE

The team reviewed several County and regional documents to understand the history, context, and infrastructure challenges of the Custis Trail, and to identify any relevant considerations to integrate into the corridor analysis. Documents reviewed include:

- VDOT I-66 Multimodal Study: Inside the Beltway (2012)
- OIPI VTrans Multimodal Transportation Plan 2025 Needs Assessment: Regional Needs Profile for Northern Virginia (2015)
- Virginia Outdoors Plan (2018)
- VDOT Community Trail Development Guide (2012)
- MWCOG Bicycle and Pedestrian Plan for the National Capital Region (2022)
- Arlington's Master Transportation Plan (2007-2019)
- Arlington's Public Spaces Master Plan (2019)
- Arlington Forestry and Natural Resource Plan (2023)
- Arlington's Stormwater Master Plan (2014)
- Pentagon City Sector Plan (2022)
- Rosslyn Sector Plan (2015)
- Lynn Street Esplanade and Custis Trail Improvements Report (2019)
- Langston Boulevard Area Plan (2023)

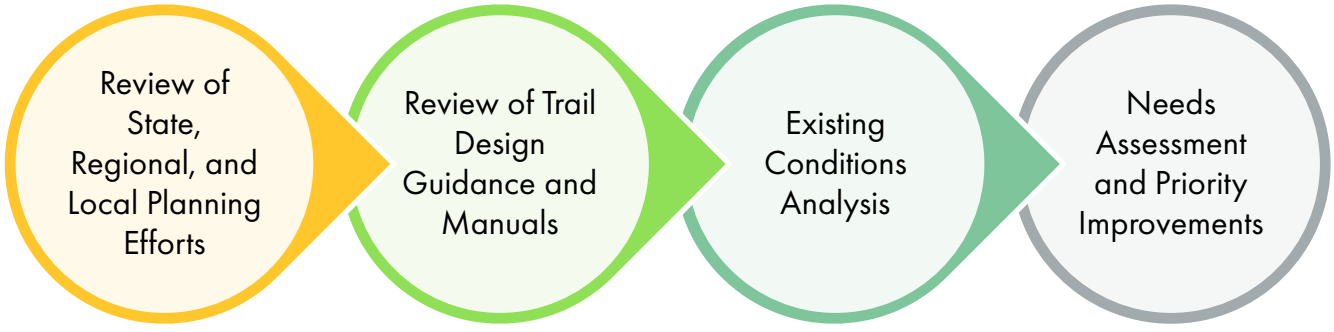


Figure 8 Project Analysis Overview

VDOT I-66 Multimodal Study: Inside the Beltway (2012)

The I-66 corridor is a major route used extensively by people traveling to employment centers in Fairfax and Arlington Counties and the District of Columbia (Figure 9). Based on travel time data, the segment inside the Beltway is experiencing increasing congestion. VDOT and DRPT sought to identify feasible transportation solutions to reduce congestion and improve overall mobility in the corridor and along arterial roadways serving the corridor. The *I-66 Multimodal Study* identifies regional factors influencing travel demand such as population growth patterns, land use, employment and demographic data, the existing highway network, existing transit service and ridership, existing bicycle and pedestrian trails and facilities.

This study notes "bottlenecks" on the W&OD and Custis Trails and discusses mediating projects such as trail widening, improving trail crossings, and renovating the Custis Trail. Specific renovations or improvements include the Lyon Village section of the Custis Trail and the switchback near Lyon Village where the Trail climbs to cross over Langston Boulevard for safety and ADA compliance. These proposed renovations are assessed to cost an estimated $2,295,000 and anticipated to yield roughly 5 to 10 million dollars in benefits, annually.

The study also documents concern that widening I-66 inside the Beltway could impact the Custis Trail due to possible grade changes which would threaten existing neighborhood connections. As a result of this study and subsequent planning, design, and construction efforts, VDOT has widened several sections of I-66. The existing Custis Trail has remained mostly unchanged, and a new trail, the I-66 Parallel Trail) was constructed along I-66 to the west. While the western end of the Trail connects to the Custis Trail, the eastern terminus of this trail can be reached via the W&OD Trail and Gallows Road.

Figure 9 I-66 Multimodal Study Area

OIPI VTrans Multimodal Transportation Plan 2025 Needs Assessment: Regional Needs Profile for Northern Virginia (2015)

This *VTrans Multimodal Transportation Plan 2025 Needs Assessment* is a 25-year multimodal transportation plan with a set of guiding principles and objectives to address Virginia's transportation infrastructure needs. The document sets forth an assessment of capacity and operational needs for all corridors of statewide significance, regional networks, and improvements to promote urban development areas established in the Code of Virginia and is updated every four years. While the profile covers the study area, it does not include trail needs for Northern Virginia or reference the Custis Trail.

Virginia Outdoors Plan (2018)

The *Outdoors Plan* is a comprehensive outdoor recreation and land conservation plan developed in partnership with federal, state, regional agencies and organizations and focused on priorities for long-term recreation opportunities. Public engagement conducted for the *Virginia Outdoors Plan* (the Virginia Outdoors Demand Survey) found trails to be ranked as the highest, most needed recreational opportunity. Other findings from this outreach consider the priorities of trail users such as preferred activities, reasons to use the Trail, desired amenities, and demand for trail connections.

The plan outlines trail development processes and priorities and identifies existing assets. To support these goals, the plan references the State Trails Advisory Committee (STAC), formed to assist with the development and implementation of a statewide system of trails. The STAC developed an inventory of proposed and existing connecting trails, including the Custis Trail. Connecting trails are defined as those that connect to a statewide trail directly or through another trail, are at least five miles long, connect to community destinations or natural assets, have established support through an existing management entity or inclusion in current planning or grassroots efforts. The *Outdoors Plan* provides a series of recommendations to expand and enhance the existing trails network, close gaps in the connected trail network, and support the continued development and maintenance of trails.

VDOT Community Trail Development Guide (2012)

VDOT created this *Community Trail Development Guide* to aid the process of grassroots trail planning, based on the knowledge of experienced planners and research of best practices around the nation as well as the state. The guide encourages individuals advocating for a new trail to connect with local groups, homeowner associations, and other interest groups. Attending current social activities for these groups and seeking support for new trails can create the base momentum for a larger interest group and trail planning group or coalition. Situations of concern occur when a proposed trail crosses a private property, needs to change traffic patterns to accommodate trail crossings (including new or modified traffic control devices), and increases access to private properties. The guide presents several approaches and opportunities for individuals or groups to engage in the planning process which will be helpful for cultivating and maintaining long-term community support of the Custis Trail.

MWCOG Bicycle and Pedestrian Plan for the National Capital Region (2022)

The *Bicycle and Pedestrian Plan for the National Capital Region*, prepared by MWCOG, presents a regional vision for bicycling and walking facilities and opportunities that serve all ages and abilities, and incorporates provisions for persons with disabilities in all stages of the transportation and land use planning process, from initial concept through implementation. Custis Trail renovations are specifically referenced in the plan's 2045 Network Projects list (TIP ID #BP8493), though scope and budget are undefined. The plan also includes guidance on trail planning and design relevant to the study area.

Recommendations highlight that communities should incorporate guidance from the FHWA *Bikeway Selection Guide*, minimize roadway width, and improve access for people with disabilities. A major goal of the plan is connecting islands of bikeability and increasing the share of bicycle trips accomplished entirely on low-stress facilities from 16 percent to 50 percent. Many local plans are starting to analyze the "level of stress" for bicyclists or pedestrians on the existing street network and use those results to inform and prioritize improvements. Other goals of the *Bicycle and Pedestrian Plan* center on encouraging multimodal transportation and transit options (such as walking, biking, or riding scooters) and improving facilities that serve or connect these modes. This includes improving sidewalks, bikeways, intersections, and strengthening links to transit for bicyclists and pedestrians in activity centers.

Arlington County Master Transportation Plan Bicycle Element (2019)

The Arlington County *Master Transportation Plan* provides general guidance for the County's transportation system through 2030. It includes a Bicycle Element, last updated in 2019, which describes the Trail Modernization Program whereby trails like Four Mile Run, Bluemont Junction and Custis will be repaved or improved. The Bicycle Element designates the Custis Trail as one of Arlington's Primary Bicycling Corridors and identifies specific Custis Trail improvement projects:

- 1-09: Implement at-grade improvements to the Custis Trail crossings of Lynn Street and Fort Myer Drive
- 2-15: Renovate trail sections with asphalt cracking and washout, and, where feasible, widen the Trail surface to 12 feet in width. Enhance trail markings and signage to lessen user conflicts. Rehabilitate or replace the existing trail lighting and extend trail lighting between Fort Myer Drive and the GWMP overpass.
- 2-16 Design and construct an underpass of North Lynn Street for the Custis Trail.

In addition to these projects that involve the existing trail facility, there are several other projects identified on roadways that connect to the Custis Trail, such as improvements to the bicycle facilities on George Mason Drive (3-02), Washington Boulevard (3-06), and Fort Myer Drive (3-24) to strengthen connections to the Trail. The plan recommends implementation of bicycle boulevards that offer low-stress connections to the Trail, such as 15th and 16th Streets (3-39), North Stafford Street (3-50), and John Marshal Drive (3-55).

Arlington County Public Spaces Master Plan (2019)

The *Public Spaces Master Plan* provides policies and actions for protecting, maintaining, and expanding the public space network in the County. The plan identifies the Custis Trail as one of the County's primary trails, with following definition:

Primary multi-use trails are key off-street recreation and transportation corridors, and many connect Arlington to surrounding jurisdictions and are part of the larger regional trail network. They are paved and should be a minimum of 10 feet wide and striped to separate directions or types of travel. They typically include seating areas and signage and a source for drinking water. Some portions of primary multi-use trails are currently lighted. Arlington should consider including trail-specific lighting as trail sections are rebuilt or as new primary multi-use trails are created. The user base is broad, including a wide variety of pedestrian, bicycle and non-motorized uses and users of different skill levels, ages and abilities.

The Custis Trail is referenced as a critical link in the trail network and in the County's open space plan and identified as part of the existing "Arlington Loop" along with the Four Mile Run, W&OD, Mt Vernon Trails. It would also be part of the proposed Inner Loop and Outer Loop with the addition of the Arlington Boulevard Trail and undetermined facilities in North Arlington (see Figure 10 for an overview of the County's Inner and Outer Loops).

The *Public Spaces Master Plan* discusses opportunities to ensure trails serve all users through high-quality design, such as safely separating modes (where space allows) on high traffic trail routes and where user conflicts commonly occur.

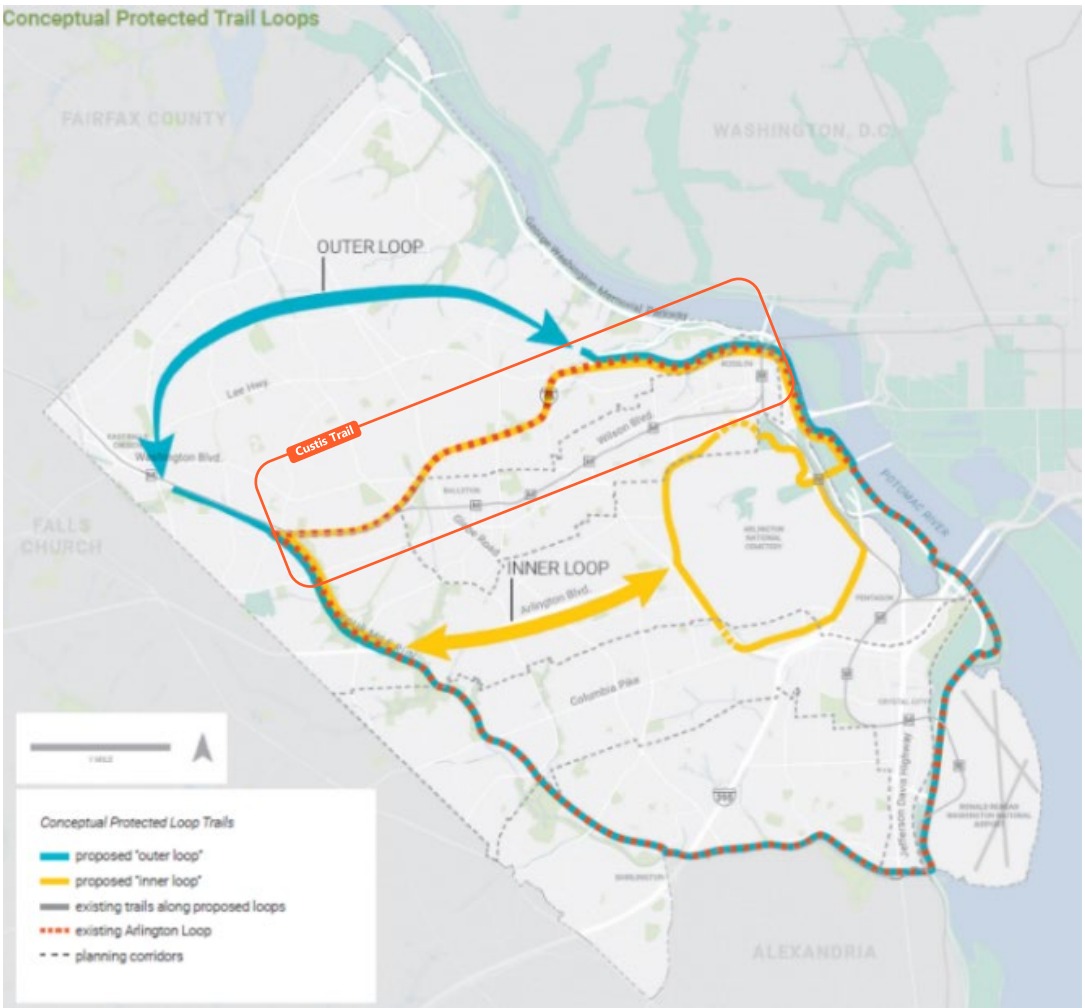


Figure 10 Conceptual Inner and Outer Trail Loops

Arlington County Vision Zero Action Plan (2021) and Equity Emphasis Areas

As part of Arlington County's *Vision Zero Action Plan* and to meet USDOT Title VI requirements, the County established criteria for Equity Emphasis Areas (EEAs) in 2023 based on socioeconomic indicators and other demographic data. EEAs are updated periodically in accordance with Federal Transit Authority (FTA) requirements. The County's EEAs, presented in Figure 11, reflect Census Block Groups where more than 16.7 percent of households report incomes below $50,000 and where 39.8 percent of the population is Black, Indigenous, or people of color. The County uses this data to evaluate transportation safety improvement projects to ensure historically underrepresented neighborhoods and communities are prioritized. The Trail, presented in the figure below, illustrates that the Trail serves several Equity Emphasis Areas west of George Mason Drive.

As a regional connector, the current study considers that individuals using the Trail to travel to jobs, friends and family, and essential services may be accessing the Trail from other neighborhoods within Equity Emphasis Areas. For these direct (adjacent Block Groups) and indirect (other users' access) reasons, improving conditions of the Trail and connecting street networks will help advance equity in the County.

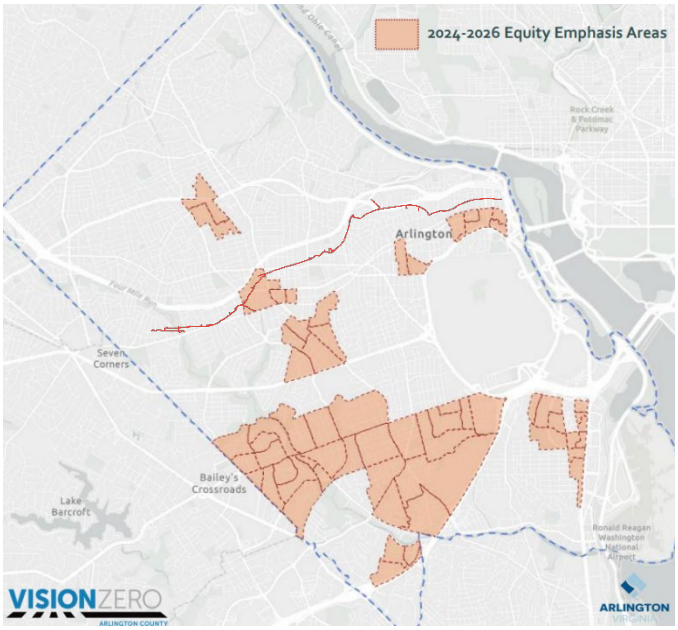


Figure 11 Equity Emphasis Areas and the Custis Trail

Arlington County Forestry and Natural Resources Plan (2023)

Many of the trail considerations and elements in the *Forestry and Natural Resources Plan* (FNRP) focus on natural surface trails such as walking paths through parks and forests. Relevant recommendations include ways to reduce light pollution, increase and expand 'no-mow' zones, and eco-educational campaigns to alert trail users to stormwater features, natural elements, and biodiversity concepts. The plan emphasizes the expansion and protection of natural lands and natural areas, and outlines strategies to "reconstitute pervious spaces through modifications to transportation plan, parking spaces, roadways and rights-of-way."

In addition, the plan includes specific "Strategic Directions" relevant to the Custis Trail and efforts to improve the Trail conditions by emphasizing explicitly sustainable and resource conscious in design, such as:

- 1.1.4 Ensure no loss of County-owned natural lands.
- 1.2.2 Establish and implement guidelines for natural infrastructure on public sites.
- 1.2.11 Evaluate roads and rights-of-way to identify opportunities for reducing impervious surfaces and expanding plantable space.
- 3.3.3 Identify biodiversity, natural infrastructure, and connectivity management opportunities on all underutilized or unplanned public lands, regardless of ownership.
- 3.5.1.2 Apply International Dark-Sky Association's five principles to County facilities, parks, and trails.
- 4.6.2 Reduce negative impacts to constituents, natural areas and wildlife.

Finally, the plan discusses recruiting, training, and maintaining volunteers to assist with maintenance and monitoring of assets.

Arlington Stormwater Master Plan (2014)

Arlington County's *Stormwater Master Plan* provides a comprehensive assessment of the County's current and future stormwater issues and documents the existing stormwater management infrastructure. *The Stormwater Master Plan* also outlines the strategies to improve stormwater capacity, reduce runoff, and mitigate risk of flooding. Specific strategies relevant to the project area include prioritizing investments in stormwater facilities on public land (such as trails and other transportation infrastructure), including stormwater upgrades in capital projects or work within the public right-of-way, as well as an emphasis on debris maintenance and storm drain clearance. Any proposed changes should be vetted with the *Stormwater Master Plan*, and plans should be reviewed for compliance with the Arlington County Code, Chapter 60 (Stormwater Management).

The *Stormwater Master Plan* fits within a series of stormwater and watershed analyses and supplemental plans, such as the *Stormwater Sewer Capacity Study*, *Four Mile Run Restoration Master Plan,* and studies related to the Spout Run and Lubber Run watersheds. The Master Plan and associated stormwater guidance identifies the study area and areas surrounding the Custis Trail as a flood-prone area; In particular, the Trail crosses through the Spout Run and Lubber Run watersheds which experience some of the most severe flooding in the County and of which flood events are expected to increase in frequency and severity in the future.

The data and analyses that are included in the Plan are referenced in the attached map series (see Figure 12 for an example of the data presented), with an emphasis on inundation areas, existing stormwater infrastructure, and noting the Resource Protection Areas (RPAs), Flood Insurance Rate Maps (FIRM) with notable flood risk, and the Risk Assessment and Mitigation Plan (RAMP) data presented with 100-year flood levels depicted. Evaluating potential capital projects within this area must consider the existing and projected stormwater needs and include infrastructure or other ecological interventions to mitigate flood risk and support effective retention, conveyance, and filtering of stormwater.

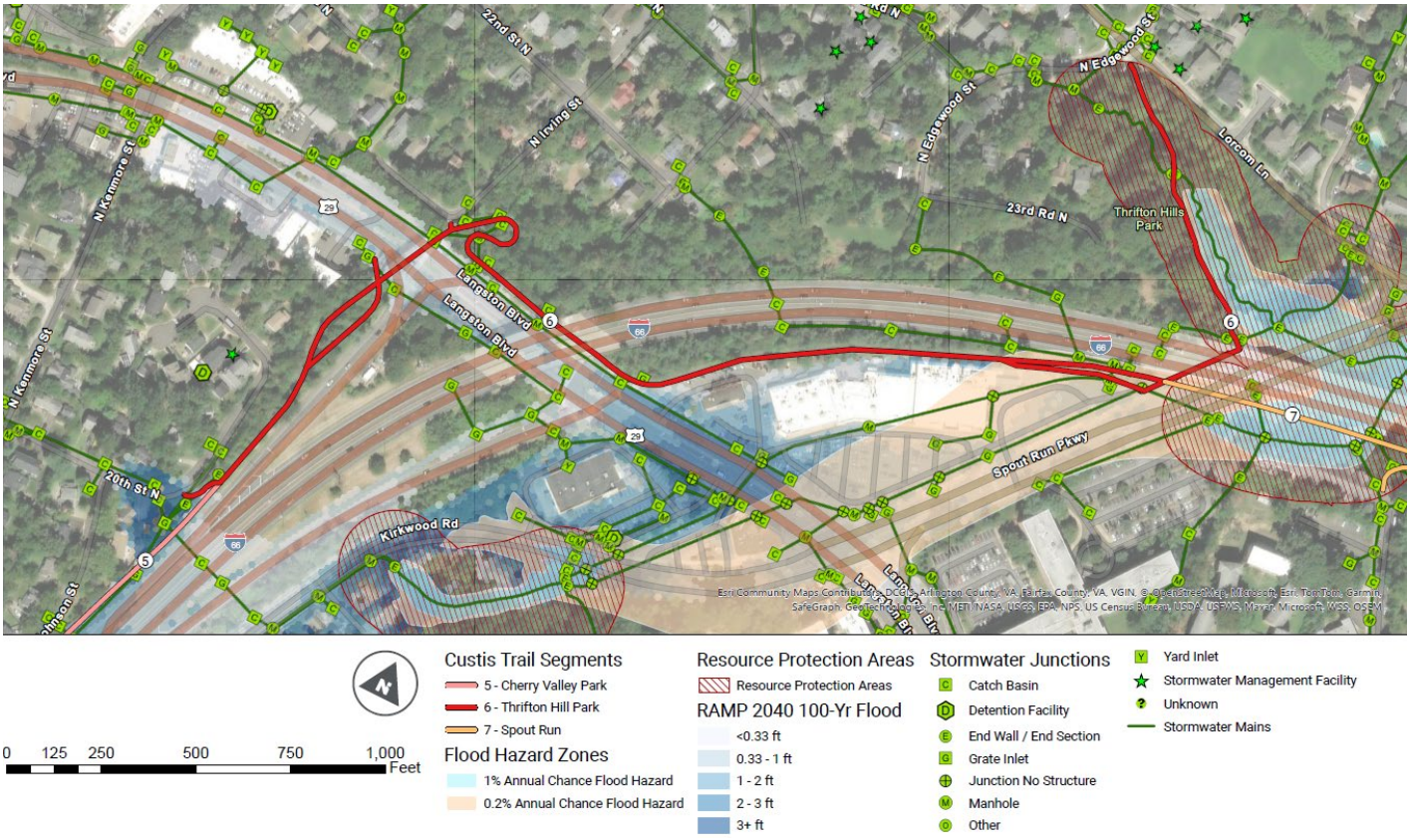


Figure 12 Stormwater Infrastructure and Inundation Area Map

Pentagon City Sector Plan (2022)

Public space design and policy is a major component of the County's *Pentagon City Sector Plan*, with an emphasis on the area's network of pedestrian trails and pathways referred to as the "Green Ribbon."

The Green Ribbon Design Guidelines present the elements and considerations to enhance pathway or trail conditions and improve connections across the area including lighting, planting, wayfinding, and surface elements. These recommendations are referenced in the Trail Design Guidance section that follows. Figure 13 shows the guidance established for planting zones and design options within the Green Ribbon.

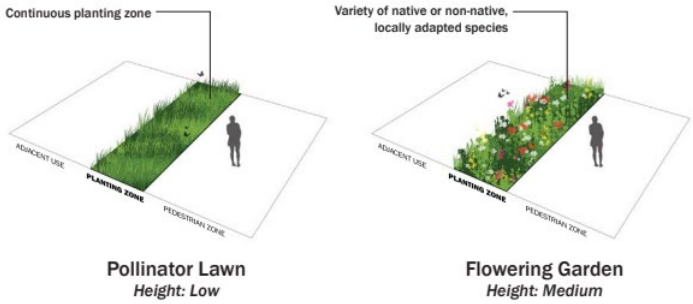


Figure 13 Planting Zone Guidance *(Source: Pentagon City Sector Plan, Green Ribbon Design Guidelines)*

Rosslyn Sector Plan (2015)

The *Rosslyn Sector Plan* outlines strategies to diversify the area and trend more towards higher-density mixed-used spaces so that the neighborhood can become more dynamic. The plan outlines community benefits, timing, and implementation of improvements with a focus on making streetscapes more welcoming and accommodating for the areas increased pedestrian activity.

Part of this effort to prioritize mixed-use and human-scale design emphasizes integrating the sidewalks and skywalks into a comprehensive pedestrian circulation system which links all the major components of Rosslyn (residential, office and retail) into a unified whole, and improving access to the Potomac River and nearby parks. Specific to trails, the plan identifies needs for facilities to encourage daily active recreation.

For the Custis Trail, the plan recommends:

- Improving the intersection of Lynn Street, Langston Boulevard, and the Trail; and
- Studying the feasibility of a Custis Trail underpass at Lynn Street.

The context for these recommendations is reflected in the development opportunities graphic shown in Figure 14.

Figure 14 Development Opportunities at the intersection of Lynn Street, Langston Boulevard, the Custis Trail and the Mount Vernon Trail *(Source: Rosslyn Sector Plan)*

Lynn Street Esplanade and Custis Trail Improvements Report (2019)

The *Lynn Street Esplanade and Custis Trail Improvements Report* focuses on pedestrian and bicycle safety improvements and public art projects along North Lynn Street between the Lee Highway (east and westbound; updated to Langston Boulevard in 2021), and the segment of the Custis Trail along the Westbound Lee Highway/Route 29 between North Lynn Street and North Oak Street. Recommendations for each of these segments are summarized below.

Lynn Street Esplanade: the Report suggests widened sidewalks and an on-street bike lane on Lynn Street, as well as updating the lane configuration to feature 11-foot traffic lanes, upgrading streetlights, signage, and improving landscaping. A major element of this segment is the "corridor of light" illuminated public art installation at the I-66 bridge. These sculptures were installed in 2020.

Custis Trail: Improvements to the Route 29/Custis Trail segment include upgrades to the bicycle and pedestrian facilities that increase separation from traffic and widen the Trail to 16 feet (with a 6-foot buffer). One design concept included in this Report is the creation of a tunnel under Lynn Street to direct the Trail under the existing right-of-way and avoid conflict with turning vehicles. Other noted improvements include traffic and dedicated bike signals, new streetlights, and curb extensions at intersections.

Langston Boulevard Area Plan (2023)

The *Langston Boulevard Area Plan* is a comprehensive vision for the corridor from Rosslyn to Falls Church and includes consideration of land use, economic vitality, housing, public facilities and schools, transportation, public spaces, sustainability, and resilience, and more. There are several instances throughout the plan that reference the Custis Trail, specifically calling for improvements to trail segments running adjacent to planned areas along I-66 and/or Langston Boulevard where redevelopment is anticipated in the east end of the corridor, including the following recommendations, organized by area.

North Highlands West: the Plan encourages development in the North Highlands West area to provide direct frontage on the Trail with a focus on access and transparency directly from common spaces and residential units. Development is also recommended to incorporate adequate lighting for the Trail. Improved wayfinding and design solutions are highlighted as opportunities to better connect the Trail to Langston Boulevard and the surrounding street network and provide clear direction to trail users. The connection to the Trail at the area of Adams and Calvert Street is identified as a current challenge for visibility and accessibility, with recommendations to enhance the greenspace at this intersection (which features both privately-owned and public space) and address ADA accessibility needs and compliance.

North Highlands East: The Plan presents concepts to leverage potential and planned development to improve the Trail conditions and expand its role in providing active transportation access and connections in the area. Planned multifamily developments at properties abutting the Trail are identified as key opportunities to widen the Trail where possible to improve the comfort and safety of the Trail. Similar to the recommendations for North Highlands West, these properties and other development is encouraged to integrate and support trail amenities through direct frontages and connections, lighting, transparency, and wayfinding elements.

With the planned developments and proposed widening of the Trail, the Plan notes that modification of the sound wall along the Custis Trail could be considered and should be studied further in coordination with FHWA, VDOT, and other partner agencies.

TRAIL DESIGN GUIDANCE

A collection of trail-related design manuals and other guidance documents were reviewed by the consultant team to identify key takeaways for the Custis Trail context and potential improvements. Reviewed documents include:

- AASHTO Guide for the Development of Bicycle Facilities (in development, anticipated publication 2024)
- VDOT Complete Streets: Bicycle and Pedestrian Facility Guidelines, including VDOT Road Design Manual Appendix A(1)
- VDOT Maintenance Best Practices Manual (2021)
- Virginia Department of Conservation & Recreation Greenways and Trails Toolbox (2011)
- Arlington County Tree Preservation Ordinance
- Arlington County Department of Environmental Services Construction Standard Details (2020)
- Arlington County Bicycle and Pedestrian Trail Wayfinding Manual (2022)
- Pentagon City Sector Plan (2022)
- FHWA Trails As Resilient Infrastructure (2023)

These plans provide details and standards for general trail design, with the expectation that specific plans will undergo review and approval processes during the design phase.

AASHTO Guide for the Development of Bicycle Facilities (2024)

The *AASHTO Guide for the Development of Bicycle Facilities* provides design guidance on bicycle infrastructure and planning considerations for a range of facility types from on-road bicycle lanes to shared use paths and trails, as well as the signs and markings, traffic control devices, amenities, and other elements of bicycle facility design.

The AASHTO Guide explains the concepts that inform bicycle facility design, such as operating and shy spaces. As shown in the Figure 15, Operating Space refers to the physical space a person on a bicycle will use to travel, including lateral space to accommodate side-to-side motion while pedaling (see AASHTO section 2.5.3.4). The Shy space is the distance between the operating space and surrounding vertical elements (e.g., a light pole, fence, or other barrier at the edge of a trail). This distance relates to the space that bicyclists will seek to feel safe and comfortable while riding their bike, and to avoid risk of conflict with vertical elements or other users. Considerations when designing for shy space include considering if the vertical elements are continuous (like a fence or railing) or intermittent, like a light or utility pole (see AASHTO section 2.5.3.2).

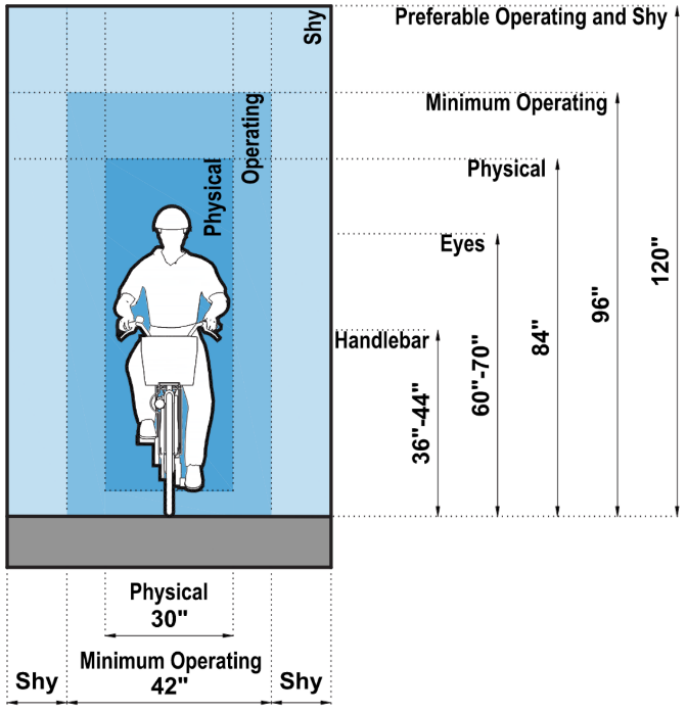


Figure 15 Typical Adult Bicyclist Operating Space *(Source: AASHTO Guide for the Development of Bicycle Facilities)*

The approved draft AASHTO guide features a review of Shared Use Path Level of Service (SUPLOS) to determine operating conditions and evaluate potential interventions or designs. Chapter 6 covers the design of Shared Use Paths, including a new table provided to help determine Shared Use Path Level of Service and ideal trail width (see Figure 16 for these reference tables). For example, to achieve a Good (B) level of service with 200 users per hour, a trail would need to be 12 feet wide.

Similarly, there is a new table (Figure 17) with recommended trail width based on volume for achieving LOS C.

Shared Use Path Level of Service (SUPLOS) and Operating Conditions	
SUPLOS	**Peak Operating Conditions**
A. Excellent	A significant ability to absorb more users across all modes is available.
B. Good	A moderate ability to absorb more users across all modes is available.
C. Fair	Path is close to functional capacity with minimal ability to absorb more users.
D. Poor	Path is at its functional capacity. Additional users will create operational and safety problems.
E. Very Poor	Path is operating beyond its functional capacity resulting in conflicts and people avoiding the path.
F. Failing	Path operating beyond functional capacity resulting in significant conflicts and people avoiding the path.
Adapted from Table 6-1 in the AASHTO Guide	

Figure 17 Shared Use Path Level of Service (SUPLOS)

Shared Use Path Level of Service Look-Up Table, Typical Mode Split*										
Shared Use Path Peak Hour Volume	Shared Use Path Width (ft)									
	8	10	11	12	14	15	16	18	20	≤ 25
50	B	B	B	B	B	A	A	A	A	A
100	D	C	B	B	B	A	A	A	A	A
150	D	C	B	B	B	A	B	A	A	A
200	D	D	C	B	B	A	B	A	A	A
300	E	D	C	C	C	B	B	B	B	A
400	F	E	D	D	C	C	C	B	B	A
500	F	F	D	D	D	C	C	C	C	A
600	F	F	E	E	E	D	D	C	C	A
800	F	F	F	F	F	E	E	E	E	A
1,000	F	F	F	F	F	E	F	F	F	A
≥ 1,200	F	F	F	F	F	F	F	F	F	A

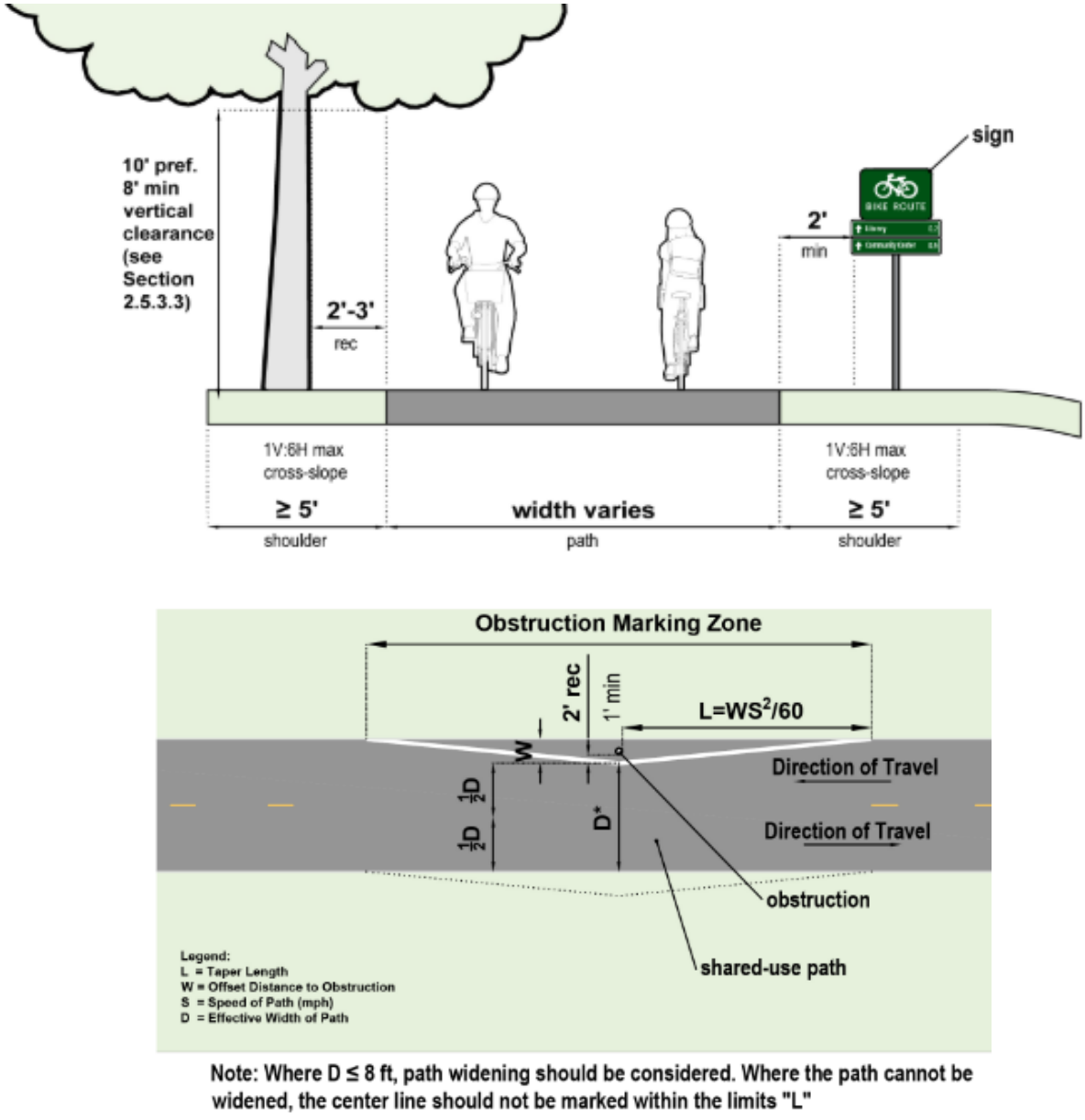
Shared Use Path Operating Widths and Operational Lanes*					
SUPLOS "C" Peak Hour Volumes	Recommended Operational Lanes	Practical Minimum	Recommended Lower Limit	Recommended Upper Limit	Practical Maximum
150 to 300	2	8 ft	10 ft	12 ft	13 ft
300 to 500	3	11 ft	12 ft	15 ft	16 ft
500 to >600	4	15 ft	16 ft	20 ft	None

*Typical Mode Split is 55% adult bicyclists, 20% pedestrians, 10% runners, 10% in-line skaters, and 5% child bicyclists

Figure 16 Recommended Shared Use Path Widths

Section 6.6.1.2 provides guidance on local trailside vertical elements (lights, trees, signs, etc.). As with the previous edition, AASHTO recommends a minimum of two feet between the Trail edge and any vertical elements. Section 6.6.8 provides guidance on trail lighting but does not specify lighting levels. Instead, it refers to the AASHTO Roadway Lighting Guide and the ANSI/IES Lighting Roadway and Parking Facilities Recommended Practice. Another section which may be relevant to the Custis Trail is 6.6.9.3 which describes pavement markings for obstructions (Figure 18):

Recommended width guidance additionally applies to projected volumes, as future volumes will have ramifications on trail width needs and constraints. For the Custis Trail, current volumes average 180 users, requiring a width of 11 feet to meet SUPLOS C and at least a12-foot width to achieve a "Good" SUPLOS B; this does not account for expected future growth in trail volumes.



Note: Where D ≤ 8 ft, path widening should be considered. Where the path cannot be widened, the center line should not be marked within the limits "L"

Figure 18 AASHTO Guidance for Shoulders and Shy Distance on Shared Use Paths

VDOT Complete Streets: Bicycle and Pedestrian Facility Guidelines (VDOT Road Design Manual Appendix A(1)) (2023)

The document includes a section on Shared Use Path design, which draws from the trail chapter of the last AASHTO bike guide. Figure 19 presents the typical shared use path cross section provided in the manual (source: Figure A(1)-7, Cross-section of Two-way Shared Use Path from page A(1)-27). The minimum width for a shared use path is 10 feet, with design waivers required in any instance of a path narrower than 10 feet.

The manual also provides guidance on trailside slopes, railings, curve radii, intersection treatments, and signing and marking. For example, the guidance establishes that a minimum 5-foot-wide separation from the edge of the pavement to the adjacent hazard is required, or the separation can be achieved by a vertical element like a railing, vegetation, or a fence. Recommendations for trailhead information emphasize the need for clearly noting if the trail is accessible for people with disabilities, with reference to conditions like maximum grade and cross slope.

VDOT Maintenance Best Practices Manual (2021)

The goal of the *Maintenance Best Practices Manual* is to provide maintenance employees with guidance on how to conduct various maintenance activities on state roadways and facilities. The Manual describes specific maintenance activities for the Virginia Capital Trail (Richmond to Hampton Roads) but does not mention any other trails, such as the Custis Trail, by name. It specifically states that VDOT does not provide snow and ice control services for sidewalks, bike trails, pedestrian crossovers, and private entrances. It does state that care should be taken to ensure that snow from the road is not pushed back on sidewalks and not piled up at sidewalk ramps. The only other mention of trails within the Manual relates to the Integrated Directional Signing Program whereby the residents and localities can request signs on state facilities.

Virginia Department of Conservation & Recreation Greenways and Trails Toolbox (2011)

The *Greenways and Trails Toolbox* serves as a comprehensive, step-by-step guide to help localities, groups and individuals plan and develop trails of all kinds. The toolbox is primarily geared toward the development of new trails, with topics like planning a trail network, supporting local trail organizations, and land acquisition.

The chapter on trail operations and maintenance covers topics like signage, policing, drainage, and volunteer coordination (e.g., organizing, supervising, and planning the work of volunteers). For public-private and volunteer partnerships, the toolbox highlights a trail-focused memorandum of understanding (MOU) to establish responsibilities and daily operations for trail management and maintenance.

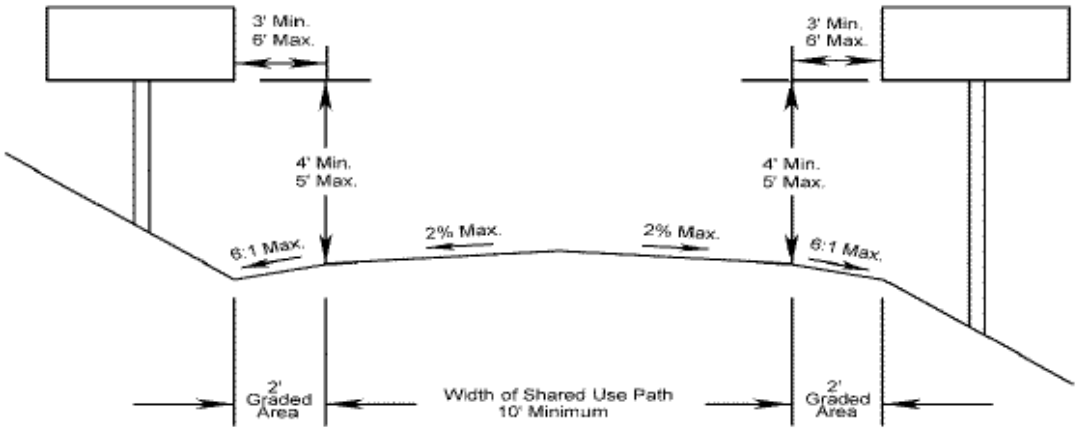


Figure 19 Two-way Shared Use Path Diagram

Arlington County Tree Preservation Ordinance

Arlington County has standards and guidance related to the activities that require planting, moving, or removing trees. The Tree Preservation Ordinance (Ord. No. 02-25, 11-16-02) outlines regulations related to removing trees and shrubs and the process for reviewing and requesting permission for tree removal in the case of overriding need for public improvements. In instances of a tree approved for removal, the County Board can require a one-to-one replacement of a similar tree in a suitable location or other solution according to the tree replacement guidelines.

The Department of Parks and Recreation (DPR) has tree protection, planting, and other design-related notes and guidance relevant to the Trail and potential recommendations. One of the most important concepts is the Critical Root Zone (CRZ) as this area is most sensitive and most directly linked to tree survival. The CRZ is illustrated in Figure 20. The CRZ assumes 1-foot radius for each inch of the tree trunk diameter (if the tree is larger than 8-inches wide). Projects and activities should avoid the CRZ when possible or work within the County Guidelines for tree impact including preserving the structural root zone. Where appropriate, the Department of Parks and Recreation provides support to evaluate and mitigate CRZ impacts before beginning any work. If necessary, the Department will provide guidance on alternatives such as removing, replacing, or transplanting the tree(s) as appropriate.

The *Tree Conservation Guide* (2023) provides details and a visual reference on the process for considering and minimizing impact to trees during a project, such as:

1. How to maximize tree conservation during the planning and site design process.
2. Reducing damage to the tree and soil during construction.
3. Ensuring the tree is cared for (e.g., tilling the soil, watering, and pruning the tree) after the project is completed.

These parameters should be referenced any time trees, shrubs, plantings, or other bioretention elements are being implemented on the Trail or nearby areas to reduce risk of flooding, root heave, visibility obstructions, and detrimental ecological impacts. The Guide reviews prioritization of trees for conservation, noting the highest priority is intact forest systems and forest patches, followed by mature trees over 12 inches in diameter, and lastly trees under 12 inches. DPR can provide support and outline parameters regarding these processes, siting and spacing, selecting plant types and designs, maintenance, ecological impacts, and special considerations for planting within stormwater features. The following recommendations are noted for the project area:

- Trees with shallow root systems or those that bear nuts, berries, or large seeds should be placed at least 20 feet away from the Trail edge.
- Plantings (i.e., other than trees) must be placed at least six feet from the Trail edge.
- Consider visibility on steep slopes and hills when planting trees since trunks or low branching may change sight distances.
- Consider in-ground and overhead utilities.

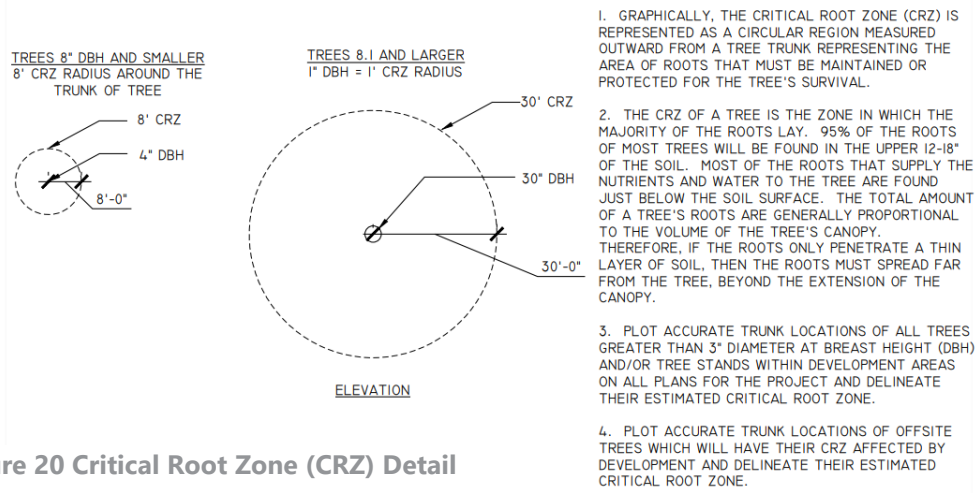


Figure 20 Critical Root Zone (CRZ) Detail

Arlington County Department of Environmental Services Construction Standard Details

The DES Construction Standard Details include a detailed set of drawings for all types of construction in the County. Some of the relevant considerations include trail railings (R-3.3), trail bollards (R-6.0) and a typical trail cross section (R-6.1).

Arlington County Bicycle and Pedestrian Trail Wayfinding Manual (2022)

The *Bicycle and Pedestrian Trail Wayfinding Manual* serves to update the County design and planning process for trail wayfinding activities to ensure consistency (e.g., in design and siting decisions) and reflect best practices in trail wayfinding. The Manual provides a step-by-step overview of the wayfinding process for the trail network—from identifying wayfinding needs to designing, fabricating, and installing effective signage, and overseeing maintenance and continuous evaluation. The Manual reviews components of signage, shown in Figure 21, including the standardized symbols, cues, and terms to be used.

Additionally, the Manual presents details on appropriate application and placement considerations to support universal design and accessibility. When siting new signage, the Manual recommends conducting an audit of existing signage and then identifying the gaps in the wayfinding network; this process of reviewing and monitoring the existing signage (and documenting needs) is presented as an ongoing effort. Finally, the Manual highlights opportunities to utilize pavement markings such as centerline striping, wayfinding dots, or other directional wayfinding through junctions and confusing transitions.

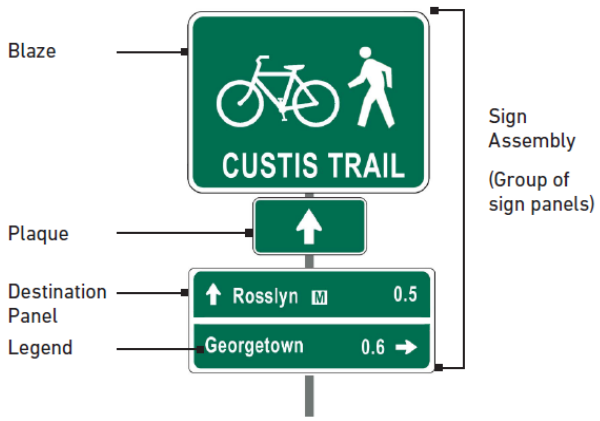


Figure 21 Modified MUTCD-D11-1 Sign with Labeled Elements

Pentagon City Sector Plan (2022) – Design Guidance

While the *Pentagon City Sector Plan* encompasses many elements of planning and development, a major theme is the expansion of a Green Ribbon, a network of paths that connect public spaces and parks with other community destinations, recreational assets, and other transit. The Sector Plan includes an appendix of design guidance related to this concept, which centers on the integration of biophilic and natural elements, and reflecting natural patterns, textures, and shapes in design, and providing welcoming amenities to users and visitors of the Green Ribbon. Design elements include recommended placement and potential designs for lighting, planters (including in-ground plants and shrubs), pavement design, wayfinding, and seating and other public furniture.

FHWA Trails As Resilient Infrastructure (2023)

In 2023 the FHWA published a guidebook on planning and designing trails to accommodate sustainability and resilience goals, particularly amid changes to climate and other severe weather events. The Guide, *Trails as Resilient Infrastructure,* explores the types of events and risk factors to be considered in a vulnerability assessment, offers detailed design guidance, and provides suggested management and maintenance approaches to improve existing trails' resilience.

EXISTING CONDITIONS

FIELD REVIEW

A subset of the project team met the morning of November 13th and the afternoon of November 30th for initial site reviews and analysis of the Trail segments (Figure 22). The team was joined by County staff and other partners for these visits. The first visit met at the east end of the Trail, near the intersection with Fort Myer Drive, and traveled west to Glebe Road. The second visit met at Glebe Road and continued west to the end of the Trail, then returned east by bike after dark to assess lighting conditions. The initial visits uncovered some trail widening opportunities along with some challenges and identified additional information needed on traffic, utilities, and more to determine feasibility of the various options.

The team collected photos, measurements, details on facility and environmental issues and gaps, as well as other observations. These details and observations are consolidated and presented on two map series included in Appendix A. The maps provide specific considerations related to existing conditions as well as environmental conditions along the trail including stormwater and wooded areas, existing infrastructure and aerial imagery of nearby areas and amenities. The first series segments the study area into 24 quarter-mile segments and features field review issues. These include the following issue types:

- Curb Ramp (ADA issue)
- Drainage
- Drop-off or Sewer Grates
- Fixed Object
- Lighting
- Pavement Condition (excellent, good, fair, poor);
- Signage/Wayfinding
- Steep Slope
- Trail Width
- Tree/Root Heave
- Visibility (i.e., Blind Spots)
- Other (e.g., trailhead amenities, maintenance needs, and other facility or use-related issues)

The second map series is organized into nine segments as (Figure 23), and focuses on existing environmental conditions with an emphasis on stormwater infrastructure, needs, and opportunities related to the Trail.

Figure 22 Project Team Field Review

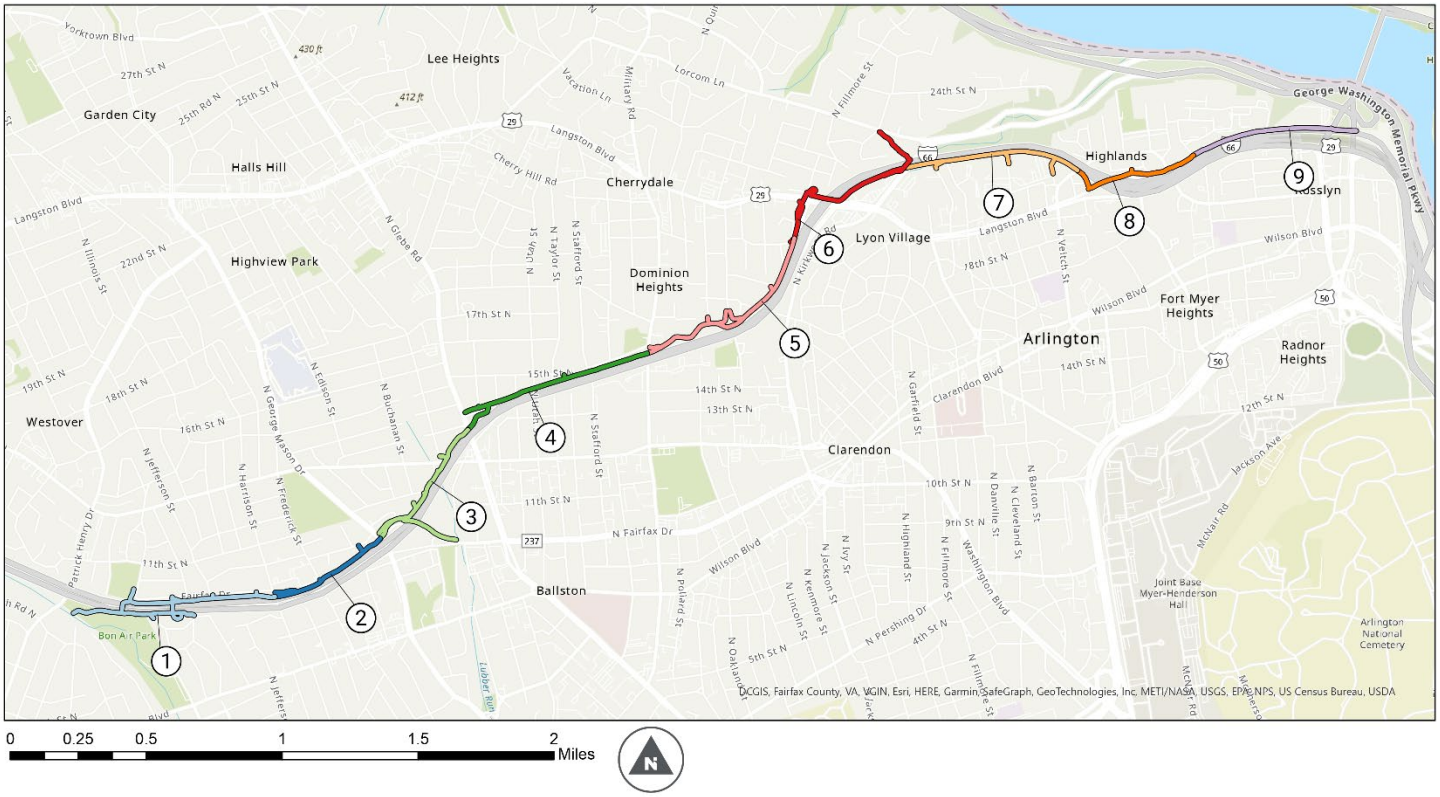


Figure 23 Existing Conditions Trail Segments

These segments were established to reflect natural or infrastructure barriers that present varying contexts or typical cross-sections. The list below presents the nine trail segments, presented from west to east:

1. **Bon Air Park segment** from the W&OD Trailhead to North Harrison Street
2. **Bluemont segment** from North Harrison Street to North George Mason Drive
3. **Waycroft-Woodlawn segment** from North George Mason Drive to North Glebe Road
4. **Waverly Hills segment** from North Glebe Road to North Quincy Street
5. **Cherry Valley Park segment** from North Quincy Street to 20th Street North
6. **Thrifton Hill Park segment** from 20th Street North to Spout Run Parkway
7. **Spout Run segment** from Spout Run Parkway to 21st Street North
8. **North Highlands segment** from 21st Street North to North Quinn Street
9. **Rosslyn segment** from North Quinn Street to the Mt. Vernon Trailhead

Of note, segments 8 and 9 are parallel to Langston Boulevard which is on Arlington's Vision Zero High Injury Network (HIN), further emphasizing the need for safe, convenient, and comfortable transportation facilities in the area.

The following section outlines key observations and major themes for each of these nine segments.

EXISTING CONDITIONS SUMMARY

General Observations

Based on available County data and site visits, the Trail is overall in good condition. The segment overviews presented in this section address existing physical or facility constraints, features in need of maintenance or repair, and painpoints for people walking, biking, or rolling along the Trail (e.g., confusing or uncomfortable areas due to the existing conditions). General themes that emerged from the observations are presented below:

- **Signage**: Some signs are quite old. A few are so weathered as to be unreadable; others use former department names and may have other out-of-date information. Most have previous County logo.
- **Trail Width**: Most of the Trail is roughly 10 feet wide, but in many segments the width is less or feels constrained because the Trail runs immediately adjacent to a soundwall and less than two feet from a light pole. Several trailheads are particularly narrow, steep, or degraded compared to the width and condition of the main Trail.
- **Lighting:** Maintenance of lighting assets must be continuously evaluated to support safety and visibility. Examples of maintenance needs include replacing expired bulbs and repairing broken fixtures. The placement of existing poles can be a physical barrier to trail expansion; moving the existing light poles to a new location may be less feasible than replacing or installing new lighting along the Trail.
- **Stormwater management:** Adequate stormwater infrastructure is a major consideration as the Trail and surrounding area features several flood prone areas and touches on Resource Protection Areas. Stormwater grates in some areas are large, with wide gaps that may not meet accessibility requirements and may be hazardous to bike riders and children (especially west of Glebe Road). Many storm drain inlets are located in corners at trail exits, with steep drop-offs from the Trail surface, which may make them hazardous, especially at night. However, in most cases, these grates are not in the path of travel.
- **Environmental and Natural Features:** The trees, shrubs, and other natural features lining the Trail are important assets for both the surrounding ecosystem and their contributions to trail conditions. For example, the location of existing trees can constrain trail width or limit visibility, root heave of existing trees can impact pavement quality of trails not installed to withstand this impact, at the same time the trees can establish a welcoming sense of enclosure, and tree canopy can provide comfortable shade for trail users. Environmental and natural features also include the habitat value and connectivity for the County's ecosystems, offering protection and resources to conserve sensitive natural lands and restore habitats for plants and wildlife.
- **Graffiti**: There are several instances of graffiti along the Trail and on surrounding infrastructure, such as the sound wall.
- **Other Miscellaneous Observations:** (1) Capital Bike Share docking stations are in short supply throughout the study area which could be a barrier to commuters using the Trail. (2) Trash collection is conducted at night by contractors.

These observations are presented in the maps within the Appendix A and summarized in the following section.

Segment 1: Bon Air Park segment from the W&OD Trailhead to North Harrison Street

The segment begins with a steep slope leading to a roundabout before crossing I-66 (Figure 24). The conditions on the south side of the Trail between the underpass and the next I-66 overpass feature limited wayfinding and poor lighting; on the north side of the Trail, the Trail narrows (10-foot width), with no buffer between the Trail and the abutting wall or drainage ditch (Figure 25).

Throughout the segment there are outdated wayfinding signage (e.g., "Bike Route" signs) and no signage available at the Lexington/Bon Air Park or Harrison Street trailhead entrances. The team additionally identified areas with poor or cracked pavement condition, and several curb ramps with accessibility issues such as slope or lack of detectable warning surface (DWS).

Figure 25 Custis Trail Roundabout

Figure 24 Trail between I-66 Under/Overpasses

Segment 2: Bluemont segment from North Harrison Street to North George Mason Drive

The Trail between Harrison and Frederick Streets is in good condition, aside from lack of lighting available especially under the bridge. The segment would benefit from new trail amenities, especially at the connection to 10th Street where features like seating, trash and recycling receptacles, or other amenities could support the existing park-like atmosphere (Figure 26). Limited or outdated wayfinding signage between Frederick and Edison Streets needs improvement, including new directional signage at this 10th Street park area and opposite of Frederick Street.

The width of the Trail narrows to a 9.5-foot width and is further narrowed by light poles and trees on the south side of the Trail, and drainage to the north side, that both physically and visually constrains the Trail (Figure 27). The team identified curb ramps with accessibility issues at Harrison Street, Frederick Street, and 10th Street.

Figure 27 Park-like Area by 10th Street

Figure 26 Trail from Frederick to Edison

Segment 3: Waycroft-Woodlawn segment from North George Mason Drive to North Glebe Road

The Trail segment is 10 feet wide but feels narrower due to the lack of buffer between the wall and nearby light poles (~1 foot from the pavement edge). These conditions also create blind curves for trail users (Figure 28). A lack of signage at the George Mason Drive exit is confusing for those exiting the Trail; this access point is further complicated by the presence of DWS leading to a bike lane (the crosswalk is across the intersection and to the north, see Figure 29). There are several pavement condition issues, including an expansion joint on the bridge over I-66 and pavement with cracks or root heaving throughout the segment, including a particularly narrow exit at Buchanan Street (Figure 30).

The team identified locations for replaced or repaired lighting, signage, and/or curb ramps, and areas that lack amenities to improve the user experience. A major challenge in this segment is the unmarked staircase connecting to Washington Boulevard.

Figure 31 Blind Curves on Trail

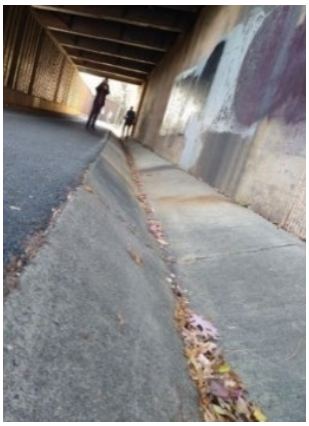
Figure 32 Curb Ramp at George Mason Drive

Figure 30 Exit, Buchanan Street

Segment 4: Waverly Hills segment from North Glebe Road to North Quincy Street

The primary constraints in segment 4 relate to the Trail width and constrained conditions due to walls and steep drop-offs (e.g., drainage ditches see Figure 31). The team identified areas with poor or cracked pavement condition, limited, or outdated signage, and several curb ramps with accessibility issues such as slope, placement of flexposts or bollards within the ramp, or lack of DWS.

While there were noted areas of poor lighting in the segment, the lack of lighting was most notable at the North Glebe Road and Quincy Street underpasses (Figure 32 shows the Trail at the underpass at dusk).



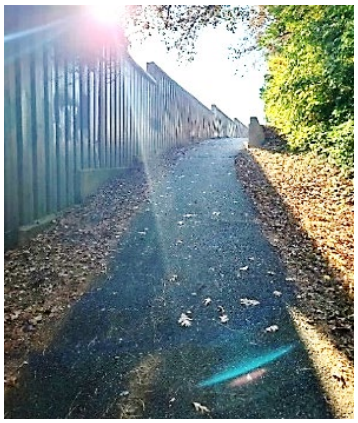


Figure 29 Trail Width Constraints (Glebe Road, left; towards Utah Street, right)

Figure 28 Quincy Street Underpass

Segment 5: Cherry Valley Park segment from North Quincy Street to 20th Street North

This segment featured a large amount of root heaving and associated pavement condition issues where the Trail is damaged or physically disrupted by roots. The width ranges from 9-9.5 feet wide but does appear to have usable space near the Trail (Figure 33).

There were several wayfinding and signage observations in this segment, including missing Custis Trail signage, small and unclear exit signs at Nelson and Lincoln Streets, lack of warning signage for blind curves, and observing that the exit to Quincy Street does not mention the street name, but does reflect nearby destinations. Figure 34 presents one section between 17th and 20th Street with a blind curve and limited shy space along the wall.

Figure 36 Example Trail Cross-Section

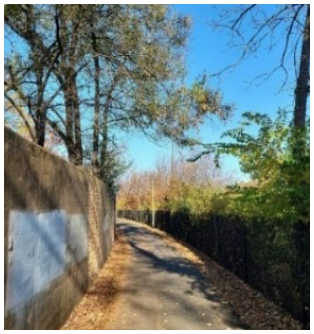


Figure 35 Trail Curves and Condition

Segment 6: Thrifton Hill Park segment from 20th Street North to Spout Run Parkway

Two entrances in this segment — the entrance at 20th Street and the entrance ramp from Spout Run — feature blind corners that can pose challenges to people accessing and exiting the Trail (Figure 35). When the Trail continues to travel under the expressway the width is narrow and bounded by high barriers on both sides that further reduce usable width (Figure 36). The team noted several blind curves, including a curve complicated by nearby parking (behind the shopping center) where parked cars overhang into the trail area. Other conditions in this segment include unclear signage and oversized or unprotected drain grates that need to be replaced.

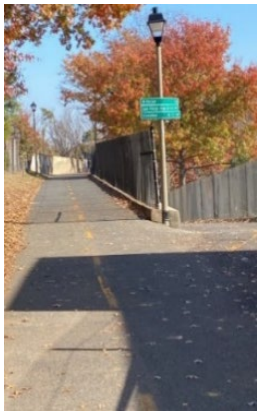


Figure 34 Blind Entrances at 20th Street (left) and Spout Run (right)

Figure 33 I-66 Underpass

Segment 7: Spout Run segment from Spout Run Parkway to 21st Street North

Segment 7 runs parallel to I-66 and presents the most perceived exposure to the roadway. At Spout Run Bridge (Figure 37) the Trail is very loud due to expressway traffic. The 21st Street overpass (Figure 38) is similarly loud and has several areas with significant fencing damage that influences the actual and perceived buffer between the Trail and the roadway.

The team noted several and significant flooding and drainage issues along this segment, including design and maintenance challenges. In particular, the team noted the existing stormwater conveyance moves water towards the highway wall (by Veitch Street), as well as areas where the retaining wall drains to the trail (by Adams Street) but the trail lacks drainage.

Figure 38 Spout Run Bridge

Figure 37 Near 21st Street Overpass

Segment 8: North Highlands segment from 21st Street North to North Quinn Street

The team noted inconsistencies in the signage information (i.e., different mileage markings on the distance to nearby destinations) as well as opportunities to add amenities where there are currently few or none. There are several ad hoc footpaths or goat paths throughout the section, suggesting desire lines for people walking and biking to access the trail, which could be formalized or blocked from use if necessary. There are likewise gaps identified at trailheads and access points due to limited amenities and wayfinding, and areas with unmarked ramps or ramps with no DWS.

The Trail width in front of the sound wall is very narrow at only 7 feet wide (Figure 39). The poor visibility of westbound trail users and steep slope present safety hazards to trail users, especially as the intersection of Langston Boulevard and North Quinn Street is a high-crash intersection.

Figure 39 Narrow Trail

Segment 9: Rosslyn segment from North Quinn Street to the Mt. Vernon Trailhead

The sound wall and retaining walls in this segment are very high, reducing the visual line-of-sight within and beyond the trail (Figure 40). This makes the trail feel narrower than its 10-foot width; in addition, the lack of visibility reduces the "eyes on the trail" and ability to see and be seen by other modes. Trees and poles placed close to the trail edge similarly reduce the available space for trail users, and this is further complicated by steep drop-offs at the trail edge particularly between Oak Street and Quinn Street (Figure 41).

The existing three-lane design of Langston Boulevard appeared to provide excess capacity for vehicular traffic observed during fieldwork and may present opportunity to reallocate space for trail or other active transportation facilities.

Figure 41 Trail and the Tall, Adjacent Walls

Figure 40 Tree, Pole, and Drop-off at Edge

One spot in Segment 9 that comes up frequently in public comments and past studies is Rosslyn Circle where the Custis Trail ends, and the Mt Vernon Trail begins (Figure 42). The high number of right turns from the Parkway onto Lynn Street makes it difficult for trail users to cross. A dynamic "No Right on Red" sign gives trail users partially protected time to cross, but there are still dual right-turn conflicts, and the intersection remains a Vision Zero Hot Spot due to the high number of pedestrian and bicycle crashes.

Figure 42 Right Turn Conflict at Mt Vernon Trail Junction

PUBLIC ENGAGEMENT

In February 2024, in tandem with the ongoing existing conditions analysis and study process, the County independently developed and shared an interactive and web-based public engagement tool to collect feedback and experiences related to the Custis Trail. This tool included a survey and interactive mapping exercise, through which participants could share broad input and feedback, or map their input by providing specific feedback associated with a given location or segment (e.g., geocoded to a specific point on the map). A secondary benefit of this interactive approach was the ability for participants to react and respond to others' mapped comments, enabling a richer discussion of supportive context, agree/disagreement, and allowing feedback to more easily show shared interests and experiences with the trail.

The County posted about the online engagement resources on the project webpage and on the County's social media platforms, shared information through email in Countywide transportation update emails and through local civic association and advocacy emails and posted yard signs along the trail. As part of this effort, the County contacted eleven Civic Associations and various organizations such as the Rosslyn Business Improvement District (BID), Friends of the Mount Vernon Trail, and the Capital Trails Coalition.

This multi-pronged outreach approach helped the County to successfully engage hundreds of individuals on their trail experiences, interests, and concerns. Approximately 175 individuals provided more than 560 comments on the interactive mapping tool, and 918 individuals completed an online survey related to the trail. In addition, approximately 16 County residents also provided feedback in emails to the project team.

To complement the online engagement, the project team hosted a bicycling tour with members of the Arlington County Bicycle Advisory Committee on February 10th (see Figure 43).

Figure 43 Public Trail Tour

Survey Responses

The County provided the project team with a summary of feedback and data collected through the public engagement process. A full summary of the public engagement is included as Appendix B.

Figure 44 presents a word cloud of the key terms and themes shared throughout the survey process, noting terms like "convenient," "connection," "exercise," and "safe" ranked among the most referenced terms. A snapshot of the interactive mapping platform, demonstrating how the survey enabled specific place-based feedback, is reflected in Figure 45.

Figure 44 Online Feedback - Key Themes

Figure 45 Online Survey, Interactive Mapping

The County evaluated the open-ended comments provided by respondents into 21 different issue types, presented in Figure 46. The top five issues were Vision Zero safety concerns (78), followed by Visibility/Blind Spots (69), Narrow Trail segments (52), Trees/Root Heaves (50), and other Trail users' behaviors (39).

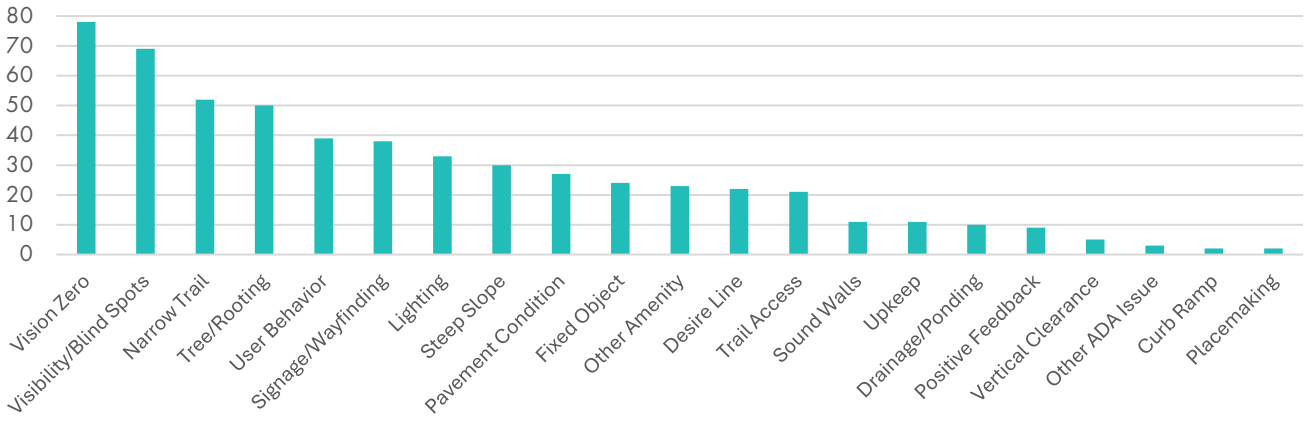


Figure 46 Issue Types (Survey Responses)

The County summarized place-based feedback collected through interactive mapping, identifying themes of:

- Concerns expressed about existing Custis Trail crossings at Lynn Street and Quinn Street.
- Bumpiness and pavement damage of the Trail as a result of tree root heaves and general wear and tear.
- Unease with bicycle users traveling at high speeds, especially in places where there are existing curves or steep slopes.
- Several specific locations where people have limited visibility due to blind spots at curves.
- Lighting concerns for people traveling at night.
- Suggested enhancements to trailheads such as wider access trails, additional trail connections from neighborhoods, and amenities, such as water fountains and benches.
- Additional tree plantings and expanded natural surface areas.
- Desire for updated and better wayfinding throughout the Custis Trail to access specific destinations such as schools and neighborhoods, as well as to trailheads.
- Better upkeep and placemaking of the Trail when it comes to trash removal, sound walls, and public art.

Sample Survey Comments

- *"It would be helpful to have maps at trail junctions to help us understand where trails will take us."*
- *"Tree root damage makes it very bumpy for cyclists and tricky for people with strollers."*
- *"A lot of cyclists use the path to get to DC safely - it is a commuting corridor, now with e-bikes which scare the cyclists. We need more, wider paths… population is growing, we are stuck with one path."*
- *"I would love to have a trash receptacle nearby. I pick up plastic on my jogs to keep it from going into the river but have no place to dispose of it."*
- *"Spout Run S-curve can be dangerous - particularly in autumn when it's covered with wet leaves."*
- *"Cyclists are frequently traveling too fast, it feels dangerous and I don't bring my dog or children on the trail because I worry for their safety."*
- *"There are several intersections on the Custis in Rosslyn that have obscured sightlines for trail users and cars turning onto Lanaston Boulevard."*

RECOMMENDATIONS

Recommendations for improving the Custis Trail build on the gaps identified in the existing conditions gap analysis and the best practices included in the review of best practices and planning documents. These are presented as **Long-term Recommendations** and **Short-term Recommendations** in Table 1, and organized by location and type in Appendix C. A prioritization of the proposed recommendations is provided at the conclusion of this section based on a ranking method and criteria developed by the project team in partnership with the County. The final prioritized list includes a planning-level cost estimate for reference and next steps for implementation.

For both short and long-term recommendations, any strategies or projects suggested for VDOT right-of-way and involving (but not limited to) sign placement, barriers, crosswalk additions, and lighting relocation require coordination with VDOT Traffic Engineering and VDOT Bicycle/Pedestrian Coordinators.

"Making the trail wider makes it safer for the multiple types of users that utilize the trail. Everyone is doing the best they can with their available options. We need to make those options better and safer."

Table 1 Recommendations Reference Table

RECOMMENDATION	SUMMARY	FEASIBILITY
Long-Term Recommendations		
Trail Widening	Expand the trail to a consistent width of 12 feet (minimum) throughout the full extent of the trail, and improve the safety of the trail by increasing available edge clearance (e.g., available space before a vertical element or drop-off)	High cost, high impact; meets guidance and demand; included in other plan and public comment
Lighting (replacement)	Address current issues with light poles sited too close to the trail (less than 2 feet from trail edge), apply IDA's five principles (dark sky) and incorporate space for trail widening.	Necessary for widening; high cost, but could be financed in part by power company
Stormwater Infrastructure	Install or improve stormwater gardens, drains, grates, and other tools to improve conveyance and management on the trail, reduce flooding risk, and support County goals.	High cost, but can be incorporated into widening projects
Slopes	Mitigate steep slopes along the trail and adjacent to the trail (e.g., edges and drop-off areas). Where change is not feasible, improve signage and other warning devices.	High cost but only a few locations that could be regraded, possibly with a widening project

Short-term Recommendations		
Signage and Wayfinding	Ensure that the trail wayfinding signage is clear, consistent, and meets County standards for design and placement. Consider placemaking signage to orient trail users to the surrounding neighborhood and destinations (often led by local groups or civic associations).	Low cost, short timeline, visible improvement
Lighting (maintenance)	Repair or replace broken fixtures along the trail and install new lights at key areas such as underpasses and bridges. Update light fixtures to follow a photometric design.	Low cost for bulb, glass, and fixture replacement. Higher cost for new lights (include long-term replacement)
Pavement	Repave short cracked and heaved sections.	Low-cost safety improvement
Accessibility Improvements	Address ADA compliance with repairs to curb ramps at trail access points and inclusion of detectable warning surfaces.	Mostly low cost; key for safety, access, and compliance
Trail Amenities	Add trail amenities to enhance the user experience, including seating and tables, repair stations, and bicycle parking or bike share docking stations.	Medium cost but few installations
Art-based Interventions	Install public art, such as murals or other pieces, along the trail and at key points (trail heads, areas with significant wall surfaces)	Low cost, high visibility
Friends of the Trail Group	Establish a group of volunteers dedicated to Custis Trail activity, programming, and maintenance.	Low cost, high impact for long-term sustainability

LONG-TERM RECOMMENDATIONS

Trail Widening

Widening the trail is one of the primary recommendations of this study. This recommendation, and the implementation details outlined below and in the appendices, carry forward earlier recommendations and priorities of local plans and initiatives including the *VDOT I-66 Multimodal Study* (2012), the *Arlington County Master Transportation Plan Bicycle Element* (2019), and the *Langston Boulevard Area Plan* (2022). "Narrow Trail" was also listed as one of the top concerns during the public engagement phase for this study.

Figure 47 provides an illustrative reference for widths along the Trail. This map is intended to provide a high-level reference and understanding of the comparatively wider and narrower areas; further analysis would be necessary to determine accurate widths for each segment.

Most of the current Custis Trail is approximately 10 feet wide. However, the effective width is often less than 10 feet due to adjacent vertical elements such as sound walls, light poles, trees, and edge conditions of the trail (e.g., drop-offs and drainage). In many instances the light poles along the trail are sited less than 2 feet (and often 1 foot) from the trail, rather than the standard minimum of 2-foot distance as required by relevant guidance.

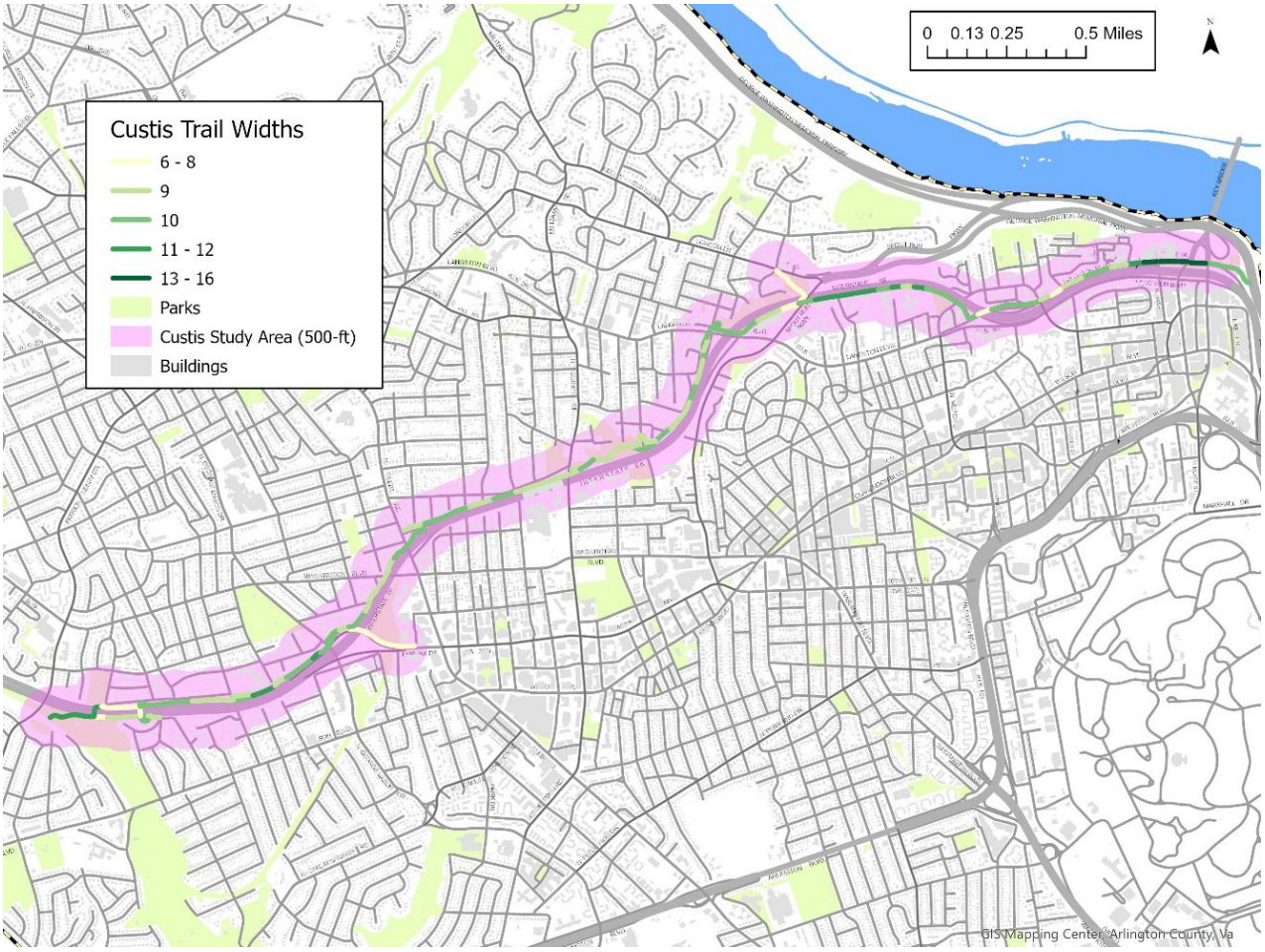


Figure 47 Generalized Widths of the Custis Trail

The minimum recommended width for the trail is informed by the recorded volume of trail users, the trail design guidance in Section 2 of this report, and the expectation that demand for the trail will increase as the population increases. Assuming that Trail Level of Service should remain at LOS B or better, a minimum width of 12 feet is needed to accommodate current users and leave some room for future growth. Where feasible, additional width is desirable at high volume and unconstrained segments. The recently widened portion of the Trail, from North Oak Street to North Lynn Street, is 16-feet wide.

Generally, the relocation or removal or light poles and other vertical elements will be required along segments of the trail. There are some segments of the trail that could more easily accommodate the minimum 12-foot width where the trail has adjacent lawn areas that could be reallocated as trail surface. More constrained segments of the trail may require covering the drainage infrastructure and ditches to create more space. The segment of the trail that runs parallel to Langston Boulevard may be able to integrate new width for the trail and green space by reclaiming space from the roadway, such as removing an underutilized vehicle travel lane as recommended in the *Langston Boulevard Area Plan*. Some areas, such as the stretch between Spout Run Parkway and McCoy Park, allow no space for widening.

A long-term goal for the Custis Trail should include a consistent and adequate minimum 12-foot width throughout the full length of the trail, as feasible. Figure 48 presents examples of typical sections, each with a different challenge for widening due to adjacent infrastructure such as soundwalls, stormwater infrastructure, or overpass structures.

While the County's *Public Space Master Plan* suggests mode separation for multi-use trails where space allows, separation (e.g., of bicycles, micromobility, and pedestrians) is not currently recommended for the Custis Trail. Separation is mostly considered if peak hour volumes exceed 300 users and pedestrians comprise more than 30 percent of users, and if there is adequate space. The Trail does not have reliable space for the 15-foot minimum width to accommodate separated paths for pedestrians and other active users.

By Bon Air Park

By Quincy Street

By Quinn Street

By North Frederick Street

Figure 48 Trail Widening - Example Locations

Recommended Approach

There are two approaches for widening the trail:

1. Remove the existing trail and replace the trail with a wider, minimum 12-foot width design.
2. Expand the width of the existing trail by adding new pavement that connect to the existing trail base (see Figure 49).

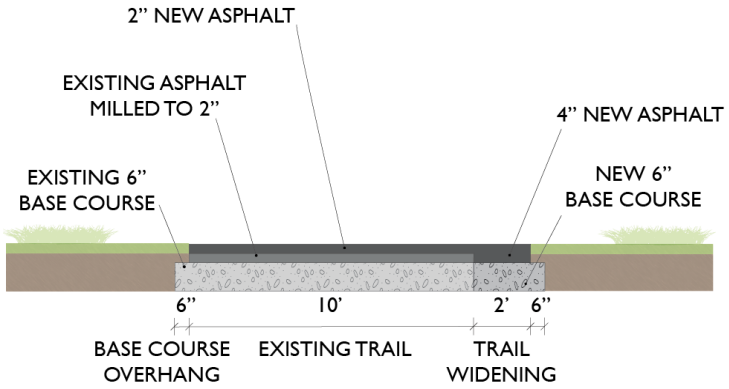


Figure 49 Trail Widening Approach

Environmental Considerations

Widening the trail means potential environmental impacts that must be considered. At the most basic, widening the trail increases the County's impervious surface coverage which can impact stormwater runoff and maintenance, heat effects, and other impacts to the natural environment. Reviewing options for trench drain grates or drainpipes where feasible is presented as a solution for widening in areas without available space, but this change must be vetted for its impact on stormwater management and local watershed impacts. Removing trees, or even excavating near them to allow for wider trail space, similarly impacts the surrounding ecosystem, as trees, shrubs, and other features establish a welcoming sense of enclosure, provide comfortable shade for trail users, and contribute to the overall experience of the trail.

This study did not include a detailed assessment in the impact to trees in the corridor that would be posed by widening the trail. Almost all of the trees in the Custis Trail corridor are outside the required two-foot buffer from the trail. However, impacts to the trees from trail widening extend far beyond the tree trunk. For example, a 10-inch diameter tree sited 10 feet from the trail has roots that extend under the trail itself. Widening the trail, or replacing it with a wider trail, will involve excavating to a depth of approximately eight inches, adding base course (small rocks) covered by asphalt. This will impact trees near the trail. There are construction techniques such as porous/flexible pavement and root aeration matting (Figure 50) that can be used to minimize tree impact in sensitive areas. Additionally, in areas where the edge and base are narrow, but plants are desired, the County will drive tree roots lower to prevent buckling and protect the roots.

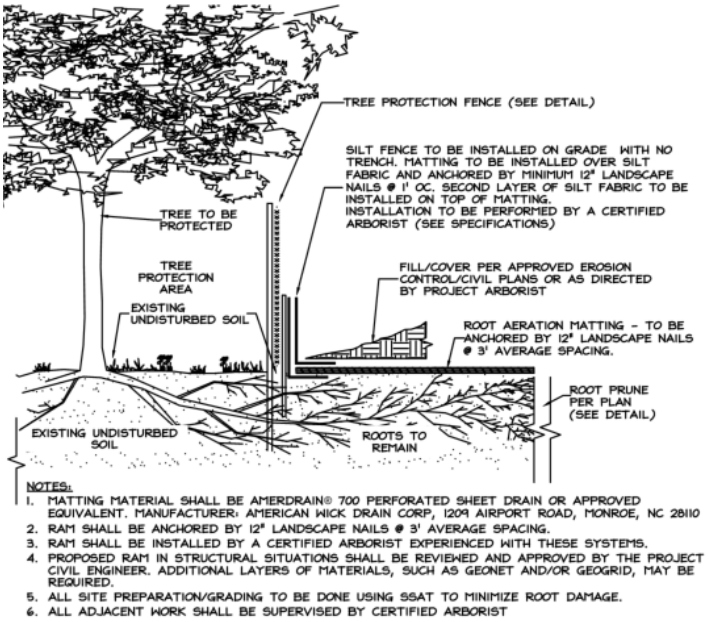


Figure 50 Root Aeration Matting

Recommended Approach

Prior to developing plans for future infrastructure improvements, the County should conduct a tree inventory study to identify and document the current trees and plants within the Trail area. This inventory would note both native and invasive trees, their condition (e.g., healthy or decaying) and other understory plans and shrubs. Where possible, this information would be used in future planning to prioritize healthy, native trees, support reforestation of wildlife corridors, and limit invasive plants. Native plants and trees should also be incorporated wherever feasible, such as in green stormwater infrastructure designs, as recommended in the County's Forestry and Natural Resources Plan.

Any potential tree removal must adhere to County code and should be vetted with County staff to determine any ecological or potential stormwater impacts. As discussed in the review of design guidance, the project impacts will be evaluated for impacts to tree critical root zone (CRZ) and will consider both final design and efforts to mitigate damage during construction. Overall, the County is committed to a net-positive impact on the trees by planting more trees than are identified for removal.

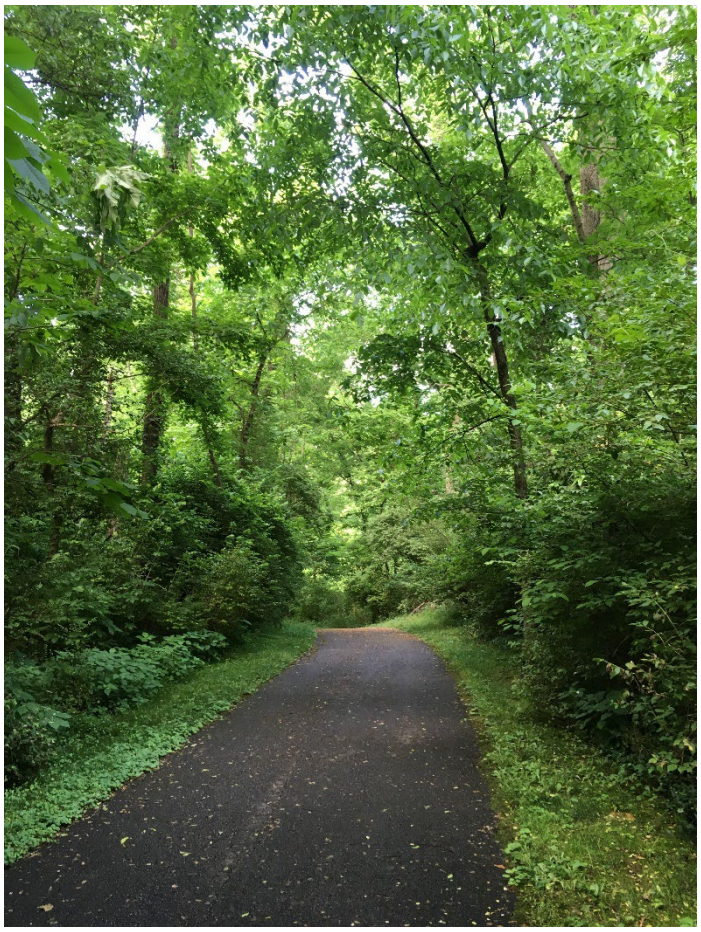


Figure 51 Shelby Bottoms Greenway in Nashville, TN
(Source: Arlington County)

Lighting

Lighting improvements are an important priority for a comfortable and safe trail experience. Across the entire Custis Trail, the County is recommended to adhere to lighting guidance identified by the International Dark-Sky Association (IDA) as a means to reduce light pollution. For most of the corridor, efforts to widen the trail will require relocation of light poles, as shown in Figure 52. As the existing poles are made of concrete and over 30 years old, the long-term recommendation is to replace the lighting rather than removing and reinstalling the current lighting infrastructure. Replacing the lights will enable the County to reassess and redesign the lighting system to better utilize available space, to incorporate best practices in lighting design (and updated technologies) and emphasize illumination of the trail itself. The County could also partner with utility providers (such as Dominion Energy) to provide lighting, financing, and ensure the new lights adhere to standards and designs and are a dark-skies alternative.

Recommended Approach

Lighting replacement is anticipated to provide a more cost-effective solution than removing and re-siting the existing equipment. The first step in this lighting strategy involves confirming the light poles that require relocation (or new infrastructure) and evaluating the feasibility of replacing light poles along the trail. The lighting should be consistent and reflect the County's photometric standards and current best practices in design.

Upgraded lighting should feature light emitting diode (LED) lamps to reduce energy emissions and enable greater control on the lighting provided.

- Lighting should clearly and fully illuminate the trail but limit any light pollution onto nearby properties.
- Lighting should incorporate the International Dark-Sky Association (IDA) five principles to County facilities, parks, and trails, as outlined in the Forestry and Natural Resources Plan.
- Pole design should be of human-scale, though the pole height and placement may vary based on the surrounding topography and infrastructure, such as a sound wall or fencing. Typical heights range from 10 to 16 feet above facilities for walking and biking; at intersections with roadways, the height of available lighting will return to the typical 25 to 30-foot height.
- Illumination should account for current and proposed landscape design for trees, shrubs, and other planting that may interfere with proposed lighting.

Additional recommendations and best practices are available in national guidance such as *AASHTO Roadway Lighting Design Guide*. The County may also engage with Dominion regarding current lighting replacement programs to understand and potentially use the recommended designs of those incentivized programs. County staff will continue —and encourage trail users— to report any malfunctioning existing lights through the County's Report-A-Problem system.

Figure 52 Pole at Trail Edge

Bridge (by Fairfax exit)

Quincy Street Underpass

Figure 53 Lighting Needs

Safety Improvements and Intersection Redesigns

There are several areas where the Trail connects to or crosses the County or State's roadway network, presenting safety concerns to trail users navigating the crossings. Addressing these intersections and conflict zones with intuitive and comfortable bicycle infrastructure will improve the overall safety of people walking, biking, or rolling along the Trail. In particular, the North Lynn Street crossing, Trail roundabout (in segment 1), and the intersection of Quinn Street are identified as major safety priorities.

The intersection of the Trail and North Lynn Street that has been evaluated in several local planning documents and emphasized in the public feedback collected for this project. Figure 54 depicts the turning conflicts that evaluated in the 2019 Lynn Street Esplanade and Custis Trail Improvements Report. This Report also assessed the feasibility of continuing the Trail as a tunnel beneath North Lynn Street. The evaluation considered three alternatives: an open excavation and two trenchless tunnel options.

The Report noted that further analysis including a geotechnical survey would be required for next steps and conceptual design. While a tunnel could be considered as a long-term proposal, other safety improvements, including signal changes and facility improvements (at-grade) are short-term approaches.

Figure 55 Intersection of North Lynn Street

As the Trail moves past Bon Air Park, a small roundabout (Figure 55) directs users to follow the Trail under I-66, or to continue straight (east) and complete the Trail spur. This roundabout is a noted safety concern, with many survey participants reflecting on the facility and perceived unsafe experiences.

Figure 54 Roundabout

Short-term recommendations include improvements to make the turning movements more clear, reduce confusion, and reduce conflicts between users. Regrading the hill that leads to the roundabout would be a longer-term (and higher cost) option.

> *"Traffic circle is overkill and difficult to navigate eastbound… [suggest] flattening that circle and making it visual rather than physical?"*
>
> *"Traffic Circle is dangerous… narrow, and unsafe."*
>
> *"Confuses a lot of users and often has people behaving in unexpected ways around it."*

Finally, the intersection of Langston Boulevard and Quinn Street is a noted safety concern of the County and a high-crash intersection as identified through Vision Zero efforts. The Trail crossing this intersection (Figure 56) experiences high risks of conflict with turning vehicles and a challenging negotiation of movement between different users. Short and long-term recommendations look to improve visibility of Trail users and pedestrians crossing the intersection.

Figure 56 Intersection of Langston Boulevard, Quinn Street, and the Trail)

Stormwater Infrastructure and Needs

As part of trail widening, stormwater management improvements will need to be made. Some areas of the Trail experience ponding after rain. The range of stormwater infrastructure along the trail appear to adequately convey water based on field observations, but the interaction with these designs and trail users can prove challenging and sometimes dangerous. Some storm grates are large, with wide gaps that may not meet accessibility requirements and may be hazardous to bike riders and children. This issue is most notable west of Glebe Road. Many storm drain inlets are located in corners at trail exits, with steep drop-offs from the trail surface, which may make them hazardous, especially in dark conditions. Fortunately, in most cases, these grates are not in the path of travel. Figure 57 presents a range of these and other stormwater-related issues and infrastructure gaps identified along the trail.

The majority of the Custis Trail runs through or adjacent to areas that experience localized flooding, especially along the segments with the soundwall or other physical features that convey run-off. Due to the extensive storm water system, most of the Trail drains well in its current condition. However, there are some spots and experience ponding that could present a hazard for trail users. These locations are included in the list of specific recommendations provided as Appendix C.

To mitigate these issues, the areas could be improved with regular cleaning to ensure the trail and path of water conveyance is clear of debris, or with new and improved infrastructure as part of a trail widening project. Potential relocation of select stormwater infrastructure may be recommended based on the trail design and to address safety concerns. Any movement, redesign, or upgrades to stormwater infrastructure must adhere to the Arlington County Code (Chapter 60, Stormwater Management) and state regulations, and should align with the County's *Stormwater Master Plan* and other local or watershed plans.

By 9th Road North

By Washington Boulevard

Figure 57 Stormwater Infrastructure Needs

Evaluating potential capital projects within this area must consider existing and projected stormwater needs and include infrastructure or other ecological interventions to mitigate flood risk and support effective retention, conveyance, and filtering of stormwater. Stormwater considerations and designs will be wholly entwined with recommendations related to widening of the trail, and the movement of trees, shrubs, and light poles.

Recommended Approach

Site planning or design for the Trail should consider and review the potential stormwater impacts and incorporate elements that will benefit the ability to effectively manage stormwater and other flooding events. Designs should prioritize low-impact development (LID) which supports natural infiltration and bioretention to reduce stormwater issues. Examples include rain gardens to capture, filter, and use water; rain barrels to capture and store water; and pervious surface treatments such as porous pavement to improve the absorption of water (rather than runoff). The Environmental Design Guidelines developed for the Great Rivers Greenway in St. Louis, MO, presents examples of cross-sections and designs to incorporate stormwater management infrastructure below or along a trail.

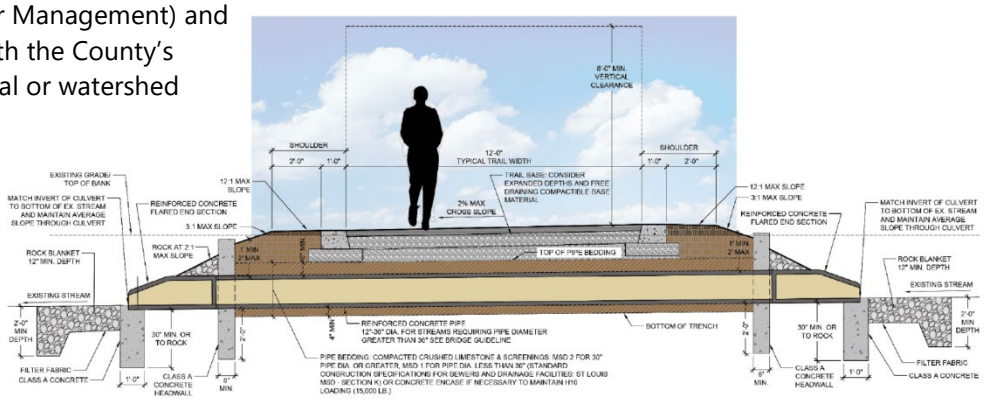


Figure 58 Example Cross Section *(Source: Great Rivers Greenway)*

There is a natural conflict between low-impact development and designs and advancing the safety of the trail through widening. Widening the trail will necessarily increase the impervious surface area by reallocating 2 feet of trail edges (typically grassy area) as a paved trail. Long-term plans for this process must include adequate stormwater plans to mitigate this increased impact and improve the capacity of the trail area's stormwater infrastructure. In certain sections of the trail there may be the potential to site rain gardens as outlined in the County's Green Streets program. Rain gardens enable stormwater to flow into an area and slowly filter to a drain. This process reduces runoff by slowing the filtration process, while the garden component offers aesthetic and environmental benefits.

Figure 59 Example of a Rain Garden along W&OD Trail

While stormwater management is a continuous and long-term priority, there are certain issues that could be addressed in the near future with phased treatments. For example, segments of the trail have steep edge trenches for stormwater. Capping these to provide a single surface while continuing to allow water to flow beneath will reduce safety risk for trail users. Other shorter-term phasing of this recommendation could be led by the County or Friends of the Trail and would monitor ponding issues to identify priority areas and expand regular maintenance activities to ensure drains are clear of debris or other issues. Hazardous grates should be replaced with grate designs that will not catch bicycle tires. Steep inlets should be retrofit with more suitable designs to reduce steep drop-offs.

Figure 60 Example of Stormwater Management along a Trail in Victoria, BC *(Source: Toole Design)*

SHORT-TERM RECOMMENDATIONS

As the County looks towards prioritizing the longer-term recommendations and potential for the Custis Trail, there are near-term improvements that would significantly improve the pedestrian and cyclist experience and support accessible connections to the County's transportation network and community destinations. Short-term recommendations include:

- Signage and Wayfinding
- Lighting
- Pavement
- Accessibility Improvements
- Trail Amenities
- Art-based Interventions and Placemaking
- Coalition-building (a Friends of the Trail Group)

These recommendations can be considered independently and as strategies towards longer-term priority projects.

Signage and Wayfinding

The Custis Trail contains an extensive system of wayfinding signs. Most are the standard green MUTCD and County style, including a large bike route sign and smaller destination subplates. However, many signs are missing, faded, or vandalized and need to be replaced. The short-term recommendation map and list in the appendix includes a list of specific wayfinding sign improvements for new and replacement signs. In addition to the green wayfinding signs, there is an assortment of posts with mileage numbers. These posts should be standardized and expanded. Appendix C of the Wayfinding Manual provides a sign installation worksheet.

Update Wayfinding Signs

Standardize and expand mile markers and confirm information provided

Address missing signage

Add safety/advisory signs

Add information for trail users

Figure 61 Sign and Wayfinding Needs

Recommended Approach

Addressing and improving the wayfinding amenities along the Trail will begin with an audit of current signage. This process involves traversing the Trail and documenting each sign (e.g., often taking a photo of the sign with a whiteboard documenting placement, type, a unique identifier, and any other details). Audits may also look at the gaps in the wayfinding information provided to ensure each entrance and exit has visible signage related such as trail plate ("Custis Trail"), nearby destinations and directions and distances, or other relevant signage. From this audit the team will identify the following:

1. Meets the design and placement standards;
2. Signs that require repair or maintenance (e.g., damaged or illegible due to graffiti or signpost issues);
3. Signs that do not meet Wayfinding Manual standards;
4. Locations that do not meet current wayfinding needs (e.g., missing at trailhead or incorrect destinations, or gaps at areas that would benefit from safety alerts such as "curve ahead").

This information will be used to determine the new signage needs, from which new signage can be produced and installed. Signage design and siting should reflect the guidance provided in the Arlington County Trail Wayfinding Manual. Specific wayfinding considerations and designs that should be considered for the Trail are outlined at right.

Wayfinding to local destinations and connecting trails: Incorporate signage that orients users to the County's trail network and connecting trailheads. Establishing a logo or branding standard for the Arlington Loop provide a cohesive and identifiable reference and could be applied to other features and amenities (e.g., signs, trash bins, and at trailheads).

Signs directing to destinations, as well as placemaking signage to provide a gateway to different neighborhoods, could be led and maintained by local groups or civic associations.

Asphalt Treatments: Pavement markings can be an intuitive wayfinding tool to clearly define the space or direct movements of trail users. Asphalt treatments can provide highly visible information to all users, such as alerting to major crossings and areas where trail users will interact with other modes, and highlighting connections.

As shown in the images below, painted striping along trails can be used to separate two-way travel and direct trail users through complex or confusing segments (e.g., a colorful centerline to identify the path of travel). Green pavement markings on roadways at trail crossings is a visible cue to alert drivers to expect trail users. Similarly, well-defined pedestrian crossing areas are critical for safety.

Figure 62 Examples of Trail Wayfinding Design: Pedestrian Crossing (left) Modal separation (center), Mile marking on elevated structure, Green pavement crossing treatment. *(Source: Arlington County)*

Lighting (Maintenance)

Long-term priorities for improving the Trail lighting will focus on the relocation of lighting poles. In the near-term, the County could improve lighting conditions by addressing broken or missing lights with repairs and maintenance. Maintenance of lighting assets is noted throughout the trail and must be continuously evaluated to support safety and visibility. When updating lighting, ensure that lighting levels within underpasses are similar to those following the underpass, to reduce risk of momentary blindness upon exiting.

Recommended Approach

Lighting Siting: Specific siting considerations for trail lighting as outlined in the AASHTO Guide for the Development of Bicycle Facilities includes the following areas:

- Trailheads
- Parks and other gathering or rest spaces
- Crosswalks (or where the trail passes another non-motorized path or sidewalk)
- Entrances and exits to bridges, tunnels, or overpasses
- Along streets and roadways
- At or by signs and other wayfinding

Lighting Design: Lighting updates in the near-term should focus on addressing issues with the existing light poles and bulbs while exploring longer-term opportunities to replace lighting. Replacements or reinstallation of existing light infrastructure should follow the photometric design outlined in the County's Lighting Specification (2023) and should reflect coordination with utility providers (such as Dominion Energy or DE) to meet lighting standards and designs. Photometric design should use options available in the DE catalog, with iterations using colonial and cobra style lighting to achieve the minimum required lighting level using the least numbers of poles.

Secondly, these designs should incorporate IDA principles (see Trail Design Guidance, and specifically Action Step 3.5.1.2 of the County's Forestry and Natural Resources Plan which recommends incorporating IDA principles at the time of bulb replacement for existing public infrastructure).

The County should prioritize low wattage cobra (e.g., Type II 70W equivalent), and —since DE does not include any wall or bridge attachment products —designs that involve mounting onto existing structures would need to be carried out using County-owned light fed from meters.

Figure 63 Dominion Energy Lighting Example: Cutoff Colonial, a dark-sky version of the existing Colonial lamps along the Trail, and Cobra Lighting *(Source: www.dominionenergy.com/virginia/products/lighting-fixtures)*

Pavement

Addressing trail pavement issues such as cracks in the pavement or curb ramps, root heaving, and other pavement quality is a near-term priority and recommendation. The short-term recommendation map and list in the appendix includes specific reference to areas with notable pavement issues, cracks, and holes to be addressed. The County also tracks and documents pavement conditions, as presented in Figure 60. Areas categorized as in "fair", or "poor" condition should be prioritized for near-term improvements, in addition to the specific issues.

Recommended Approach

Where possible, identify the stressors or external factors that may cause disproportionate pavement damage on the trail, and explore opportunities to mitigate issues when possible. Of note, the County has completed recent pavement improvements (e.g., milling and repaving) at Custis Trail crossings of Lynn Street and Fort Myer Drive, as well as the Trail segments in Bon Air Park and Cherry Valley Park.

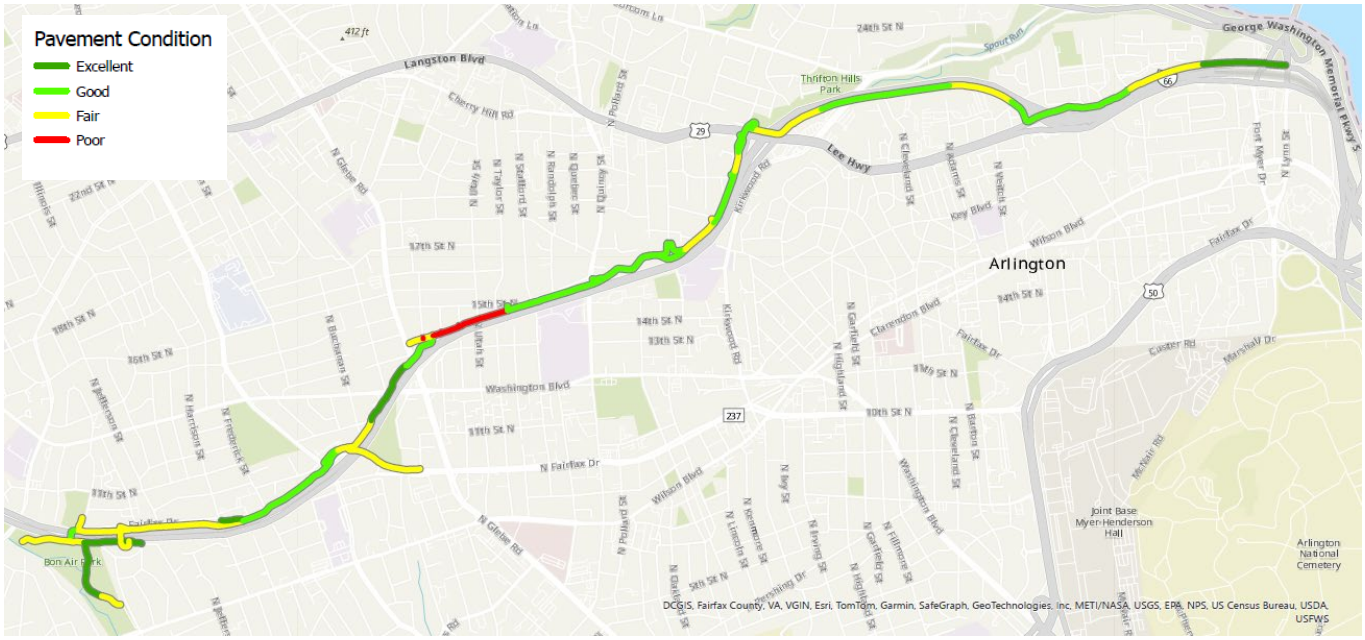


Figure 64 Pavement Quality (by segment)

Accessibility Improvements

Throughout the study area the team identified facilities and connections not in compliance with ADA or PROWAG standards as accessibility gaps. Many of the recommendations center on the improvement of available ramps to the trail. Near-term projects include improving ramps at trail access points, such as pavement repair and ramp grade (e.g., addressing ramps that are too steep), and ensuring the ramps available meet accessibility requirements. The short-term recommendations map and list in Appendix C notes ramps that do not have truncated dome detectable warning surface (DWS) treatments (as required by PROWAG). Areas that do not meet accessibility standards should add signing to direct trail users to an alternate, accessible route. This is shown in the third recommendation related to improved accessibility: addressing the stair access to the trail at Washington Boulevard. These stairs are currently inaccessible for many trail users, and there are proposed short-term priorities:

1. Adding a bike runnel to the stairs to make walking a bike on the stairs an easier and less physically demanding process; and
2. Signing alternative routes to enable trail users to avoid the stairs entirely. Suggested routes include directing users via Abingdon, 13th Street, and Buchanan or Aberdeen

.

At Vermont Street

At 20th Street

By Washington Boulevard

Figure 65 ADA Infrastructure Needs - Example Locations

Trail Amenities

Trail amenities can reflect a range of features, furniture, designs and equipment that make the trail more welcoming and comfortable for users. Examples of trail amenities include:

- **Seating** and **tables** (e.g., picnic tables; this can also include transit shelters with areas for waiting if applicable);
- **Educational** and **informational signage** (including maps or other wayfinding details), especially at trailhead locations;
- **Drinking fountains** and **water refill stations** (where existing water pipes are available);
- **Trash and recycling receptacles;**
- **Bicycle parking**/bicycle racks, and other parking accommodations including vehicle parking and micromobility parking;
- **Bike share docks** (e.g., Capital Bike Share);
- **Bicycle repair stations** including features such as air pumps or wheel patches;
- **Restrooms** or wayfinding to nearby public restrooms.

This short-term recommendation focuses on park-related amenities at trailhead locations, as well as specific tools to support walking and biking along the trail. These amenities are not prescribed for every trailhead along the Trail; each recommended amenity should be reviewed on a case-by-case basis where feasible and relate to the specific needs and context of that specific location. Amenities are sited off of the trail and should not conflict with users riding or walking along the trail. Of note, public art is an important amenity included in the discussion of *Art and Placemaking Recommendation*.

Park area (by Segment 3)

Bicycle repair station

Bikeshare station

Figure 66 Trail Amenities

Art and Placemaking

Public art such as murals, sculptures, and other art installations can be an impactful tool for improving the trail experience, reflecting the character of the community, and fostering a connection to the trail and among fellow users. In the near-term, the County could explore opportunities to activate available walls and physical elements with murals or other painting. The soundwall is one canvas for art that, if painted, would bring interest to an otherwise unwelcoming and visually constrained environment.

Art and placemaking go hand-in-hand as artwork can be used to reflect the character of a neighborhood and its culture; art can also create a sense of enclosure and a clear, identifiable landmark. Art and art installations encourage users to pay attention to and respond to the trail environment, creating memorable moments along one's ride that improve the experience of using the trail. Installing public art at trailheads can provide a gateway and defined entrance to a community and help identify the trail or points of interest.

These features can serve deeper value as wayfinding or educational tools and encourage new visitors to the space. For example, the County's Four Mile Run Trail features a pavement art installation, "Watermarks" (Figure 68) which serves to remind riders of the water resources below and surrounding the trail. This form of installation can help interpret and celebrate the natural environment and connect trail users with their surroundings and is highly encouraged in both the County's FNRP and Public Spaces Master Plan.

Additionally, art can also be used as a graffiti and vandalism deterrent. The field review identified several instances of graffiti along the trail on surrounding infrastructure like the sound wall.

Figure 67 Mural on the Metropolitan Branch Trail in Washington, D.C.

Figure 68 Watermarks Thermoplastic Art Installation
(Source: Elman Studio, via Arlington County)

Recommended Approach

While VDOT does not generally support installation of public art on VDOT-owned infrastructure or soundwalls, these recommendations may be possible for County barriers and walls along the Trail. Before engaging in any planning or outreach, the County should confirm the site is suitable and supported by existing owners (i.e., County-owned, or private property).

For selected and approved sites, engage neighbors and trail users in the selection of designs and consider engaging the community for the act of installing the mural or art as a public program. Consider determining if the mural or other installation will be individualized, or part of a broader series (e.g., many parts that together make a linear art piece, as notably done in the poem that flows along the ceiling of the pedestrian concourse between stations in New York City, or the "love letters" murals that line the elevated rail in Philadelphia, PA). Monitor the installation regularly for any graffiti or other damage.

Friends of the Trail Group

To facilitate and organize efforts to improve the trail, the County may establish a coalition of interested advocates, residents, and volunteers to focus exclusively on the Custis Trail. Often "Friends Of" the trail groups can engage with the County to take on specific responsibilities such as maintenance of monitoring the trail for issues or working with the community to organize programming or other campaigns and events. Trail groups can be important champions and partners for projects related to the trail; these can be operated independently, supported by existing coalitions for broader trail, bike, or recreation groups; or organized through the County similar to an ambassador program.

A "Friends Of" group does not necessarily need to be created as an entirely new group but could instead build upon or formalize existing volunteer groups, or create dedicated subgroups focused on Custis Trail efforts and programming. There are many active partners in the advocacy community focused on walking, biking, improving public spaces, and encouraging safer and more welcoming public infrastructure. These existing groups could be leveraged as resources and serve as "Friends Of" the Trail.

The Rails to Trails Conservancy has a chapter on "Friends Of" groups in their Manual "Secrets of Successful Rail Trails."

COST ESTIMATE SUMMARY

Cost estimates were developed for the two long-term and one short-term scenarios identified:

- Trail Widening, with lighting.
- Trail Replacement, with lighting
- Short-Term Improvements

These estimates are intended to be general and used by the County in applying for funding. Construction costs will vary based on the ultimate project scope, actual site conditions and constraints, schedule, and economic conditions at the time of construction. The VDOT Pre-Quantity Tool (PQT) Version 1.3 was used to develop the cost estimate for each project. The tool and user guide were downloaded from the VDOT website, https://www.vdot.virginia.gov/doing-business/technical-guidance-and-support/cost-estimation/.

COST ESTIMATE ASSUMPTIONS

Contingency

- The construction estimates (CN Estimate), which includes roadway, hydraulic, traffic, and earthwork pay items, includes a 30% contingency to cover items that are undefined or are typically unknown early in the planning phase of a project.

Preliminary Engineering Cost

- The VDOT PQT includes an estimate for preliminary engineering (PE) costs. The PE cost is a percentage of the construction estimate. VDOT provides the following recommendations based on construction estimate totals. The widening alternative assumes 20% for PE. The replacement option assumes 15%. The short-term improvements assume 35% for PE.

Pavement Design

- The widening and replacement alternatives assume four inches of asphalt over six inches of base course. This is two inches more asphalt depth than recommended by VDOT due to the urban nature of the trail and frequent use by maintenance and emergency vehicles.
- The widening alternative assumes milling and paving the top two inches of asphalt combined with all new materials for the widened area.
- Neither alternative includes widening or replacement of access trails to the main trail due to their presumed lower user volumes.

Earthwork Volumes

- For both long-term alternatives, this estimate includes clearing, grubbing and seeding for three feet on each side of the trail. Although the PQT does not include a pay item for trees, this County understands the costs associated with tree removal and relocation or replacement, and the PQT developed for this project includes 200 new trees, approximately one tree every 100 feet for the entire corridor.

Lighting

- The lighting estimate includes all new lights from the W&OD trail to Spout Run Parkway. East of here, newer lights have been installed and streetlights take the place of trail lights along eastern Langston Boulevard. The estimate assumes new poles and lights every 80 feet with standard lighting fixtures provided in the PQT. The actual cost of new lighting on the Custis Trail may be lower depending on the details of the Tariff Agreement with Dominion Energy. Dominion may charge less upfront under the agreement in which the County pays the annual energy cost.

Signing and ADA Improvements

- The long-term estimates do not include the signing and curb ramp improvements identified in the Short-Term Improvement scenario. It assumes those improvements will take place prior to the long-term improvements.

COST ESTIMATE SUMMARY

Based on these assumptions, Table 2 is a summary of the cost estimate for Custis Trail Improvements. A more detailed breakdown can be found in the PQT sheets also included in the appendices.

Table 2 Cost Estimate Summary

	CN ESTIMATE	PE	PROJECT TOTAL
Long-Term - Widening	8,420,000	1,684,000	$10,104,000
Long-Term - Replacement	12,120,000	1,818,000	$13,938,000
Short-Term	210,000	74,000	$284,000

IMPLEMENTATION

The current study evaluated existing conditions and assessed current gaps along the Custis Trail. From this gap analysis the project team identified a series of short and long-term improvements to consider. This section furthers these recommendations by prioritizing the proposed improvements based on feasibility and cost. Variables that inform prioritization include a preliminary and planning-level cost estimate (using the VDOT Pre-Quantity Tool or PQT) and identifying next steps toward implementation such as funding opportunities, roles and partnerships, and other opportunities and considerations.

SHORT-TERM IMPROVEMENTS

The short-term improvements reflect high-impact but lower-cost treatments to improve the comfort of the Trail without major physical change or construction. The County should start by implementing the short-term improvements identified in the previous section, which include: operational or engagement improvements, establishing a "Friends of" Trail Group; maintenance improvements including pavement repair, lighting and signage replacement, accessibility upgrades to meet ADA and PROWAG requirements, and adding trail amenities such as repair stations or seating, and art-based projects and placemaking features.

These physical improvements could be executed with existing or standalone contracts for the entire corridor. For example, the wayfinding signage improvements could be handled by a design/build sign contract whereby the County works with a vendor to do a more detailed assessment of the signs, design the signs, and then install them.

LONG-TERM IMPROVEMENTS

Along with the short-term improvements, the County should begin planning and programming the long-term improvements as well. This includes the widening of the Trail and the associated lighting and stormwater upgrades. These are major improvements that will require significant investment from the County and its partners. Because the long-term improvements for the entire trail will be relatively expensive, the County should break these long-term improvements into separate projects or phases for design and construction. Table 3 presents a basic prioritization and phasing approach for the long-term recommendations. Each phase includes two trail segments and is estimated to cost an average of roughly two million dollars.

Table 3 Prioritization for Long-term Improvements (Widening)

SEGMENT	LINEAR FEET	PHASE
1. W& OD to North Harrison Street	3190	**Phase 1**
2. North Harrison Street to North George Mason Drive	1840	
3. North George Mason Drive to North Glebe Road	2195	**Phase 2**
4. North Glebe Road to North Quincy Street	2915	
5. North Quincy to 20th Street North	3160	**Phase 3**
6. 20th Street North to Spout Run Parkway	2560	
7. Spout Run Parkway to 21st Street (only widen from Veitch/Bendict to 21st Street North)	450	**Phase 4**
8. 21st Street North to North Quinn Street (Scott Street to Quinn Street lane reconfiguration)	1975	
9. North Quinn to Mt. Vernon Trailhead (only widen from North Quinn to North Oak Street	1120	**Phase 5** (Langston Boulevard lane reconfiguration)

Assuming the phased approach above, the County could complete the long-term improvements in phases over consecutive years, staggering design and construction as depicted in Table 4 below. The final phase does not include additional funding for the Langston Boulevard lane reconfiguration. This project did not develop a cost estimate for that scenario. The dollar figures below are for illustrative purposes only.

Table 4 Proposed Phasing for Improvements

	Year 1	Year 2	Year 3	Year 4	Year 5
Short-Term Improvements (Design/Construction)	300,000				
Long-Term Improvements (Design)	400,000	400,000	400,000	400,000	
Long-Term Improvements (Construction)		2,000,000	2,000,000	2,000,000	2,000,000
TOTAL	**$700,000**	**$2,400,000**	**$2,400,000**	**$2,600,000**	**$2,000,000**

NEXT STEPS

This study provides sufficient detail and analysis for Arlington County to make an informed decision to pursue trail improvements in the study area. With short-term and long-term improvements identified, along with rough cost estimates, County staff have the information to propose new capital projects for design and construction in future Capital Improvement Plan cycles, establish budgets, seek approvals, and seek grants. The next steps for implementation would be a joint effort between the Arlington County Department of Parks and Recreation and Department of Environmental Services, with support from other County and Regional stakeholders and partner agencies as appropriate.

An important next step will be to continue collaboration with relevant departments within Arlington County government and key stakeholders such as VDOT and other adjacent property owners to build momentum and commitment toward implementation.

APPENDICES

The following appendices are included with this report and available for reference:

A. Short-Term Recommendations Map Series

B. Short-Term Recommendations List

C. Long-Term Recommendations Map Series

D. Long-Term Recommendations List

E. Field Review Issues Map Series

F. Public Engagement Summary

G. Public Engagement Map Series

H. Stormwater Map Series

I. Pre-Quantity Tool Estimate – Long-Term Replacement

J. Pre-Quantity Tool Estimate – Long-Term Widening

K. Pre-Quantity Tool Estimate – Short-Term Improvements