TRANSPORTATION

INTRODUCTION

Fairfax County is served by an extensive transportation system comprised of roadways, bus and rail rapid transit, paratransit services and an international airport. In addition, an extensive sidewalk and trail system serves pedestrian and bicycle travel. The roadway and public transit system accommodates hundreds of thousands of trips every day. However, the provision of transportation facilities and services has not kept pace with the increasing travel demand in the county. This increased travel demand is fueled both by the growth within Fairfax County and by the growth in surrounding jurisdictions.

Over the past three decades, Fairfax County has been one of the most rapidly growing jurisdictions in the United States in terms of population growth – more than doubling the size of its population since 1970. Aided by the strong regional economy, growth in Fairfax County is projected to be significant in the future as well. While the rate of population growth is expected to decrease, overall population will continue to grow, with a 28% increase projected from 2005 to 2030. The number of households in Fairfax County is projected to grow from 378,000 in 2005 to 482,000 in 2030, an increase of 104,000 or 28%. Even more dramatic is the projected increase in jobs in Fairfax County from 600,500 in 2005 to 845,000 in 2030, an increase of 244,500 or 41%. That will make Fairfax County the second largest employment center in the Washington, DC metropolitan area, only slightly behind the District of Columbia.

In addition to experiencing growth, the demographic and socioeconomic characteristics of the population in Fairfax County have changed significantly and will continue to change in the future. Two examples are the cultural and ethnic diversification and the aging of the population. These demographic changes contain challenges for the provision of transportation facilities and services. For example, as the county's population ages, it becomes more important to provide transportation options and services geared to their needs.

One of the primary implications of the trends and forecasts for Fairfax County is that traffic conditions are likely to deteriorate further, even with extraordinary expenditures to improve the transportation infrastructure (including both roadways and transit). In addition, many forces outside the county, which generate increasing levels of traffic demand, are out of the county's direct control. Thus, it becomes imperative to explore possible options for reducing current and future demands on the transportation system.

The objectives and policies presented in this Transportation Section of the Comprehensive Plan provide the framework for the continued development of the county's transportation system, in the face of the continued growth in population and employment as well as the changing characteristics of the population. One of the options for bringing about long-term improvements to the transportation system is to exercise its ability to influence the pattern of land use in the county; specifically, to establish more efficient land use patterns with respect to transportation. Since it is apparent that roadway improvements cannot be relied upon to provide unlimited transportation capacity for the future, measures to bring about less demand for roadway capacity should be a focus of the county's Comprehensive Plan. It will be impossible to meet travel demand solely by roadways. The objectives and policies presented in this section thus emphasize the need to maximize the efficient use of the existing and future Fairfax County transportation system by reducing reliance on automobile travel, and by coordinating land use decisions and transportation planning within Fairfax County and the region as a whole.

Fairfax County's bicycle program was approved unanimously by the Board of Supervisors and launched in September 2006. The program's primary goal is to make bicycling a viable transportation mode and to make Fairfax County bicycle friendly and safe. Program management and implementation was assigned to the Fairfax County Department of Transportation. The Board established four program priorities: establish a staff position with substantial responsibilities devoted to bicycle facility planning, implementation, and coordination; create a county bicycle route map; examine roadways that may accommodate on-road bike lanes without substantial reconstruction; and create a pilot program in a specific area of the county for the establishment of an interconnected bike route. It was soon determined that a comprehensive bicycle master plan was needed to address bicycling as a transportation mode and to outline a long range plan defining both infrastructure improvements as well as policy objectives specific to bicycling.

BOARD OF SUPERVISORS GOAL

Transportation - Land use must be balanced with the supporting transportation infrastructure, including the regional network, and credibility must be established within the public and private sectors that the transportation program will be implemented. Fairfax County will encourage the development of accessible transportation systems designed, through advanced planning and technology, to move people and goods efficiently while minimizing environmental impact and community disruption.

A keystone policy for future planning and facilities includes achievement of a multi-modal transportation system to reduce excessive reliance upon the automobile. Regional and local efforts will focus on planning and developing a variety of transportation options. Sidewalks, trails and on-road bicycle routes should be developed as alternate transportation facilities leading to mass transit, high density areas, public facilities and employment areas.

COUNTYWIDE OBJECTIVES AND POLICIES

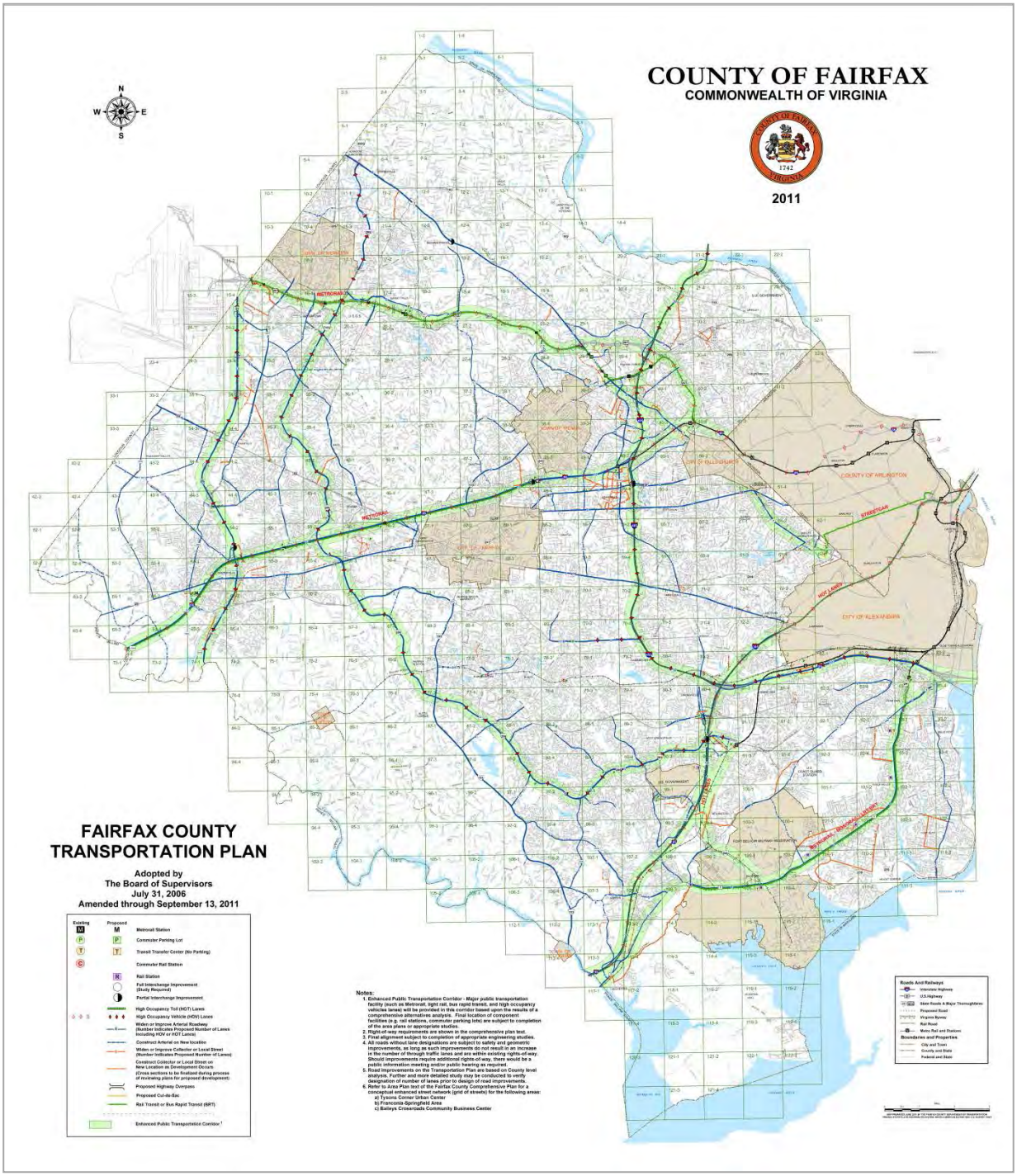
Objective 1: **Provide for both through and local movement of people and goods via a multi-modal transportation system that provides transportation choices, reduces single-occupancy-vehicle (SOV) use and improves air quality.**

Policy a. Integrate motorized and non-motorized transportation facilities and services in accordance with transportation elements in the Transportation Plan Map (Figure 1), the Countywide Trails Plan Map (Figure 2), Bicycle Network Map (Figure 3) and the Bicycle Master Plan, chapters 1-4 (Appendix 5).

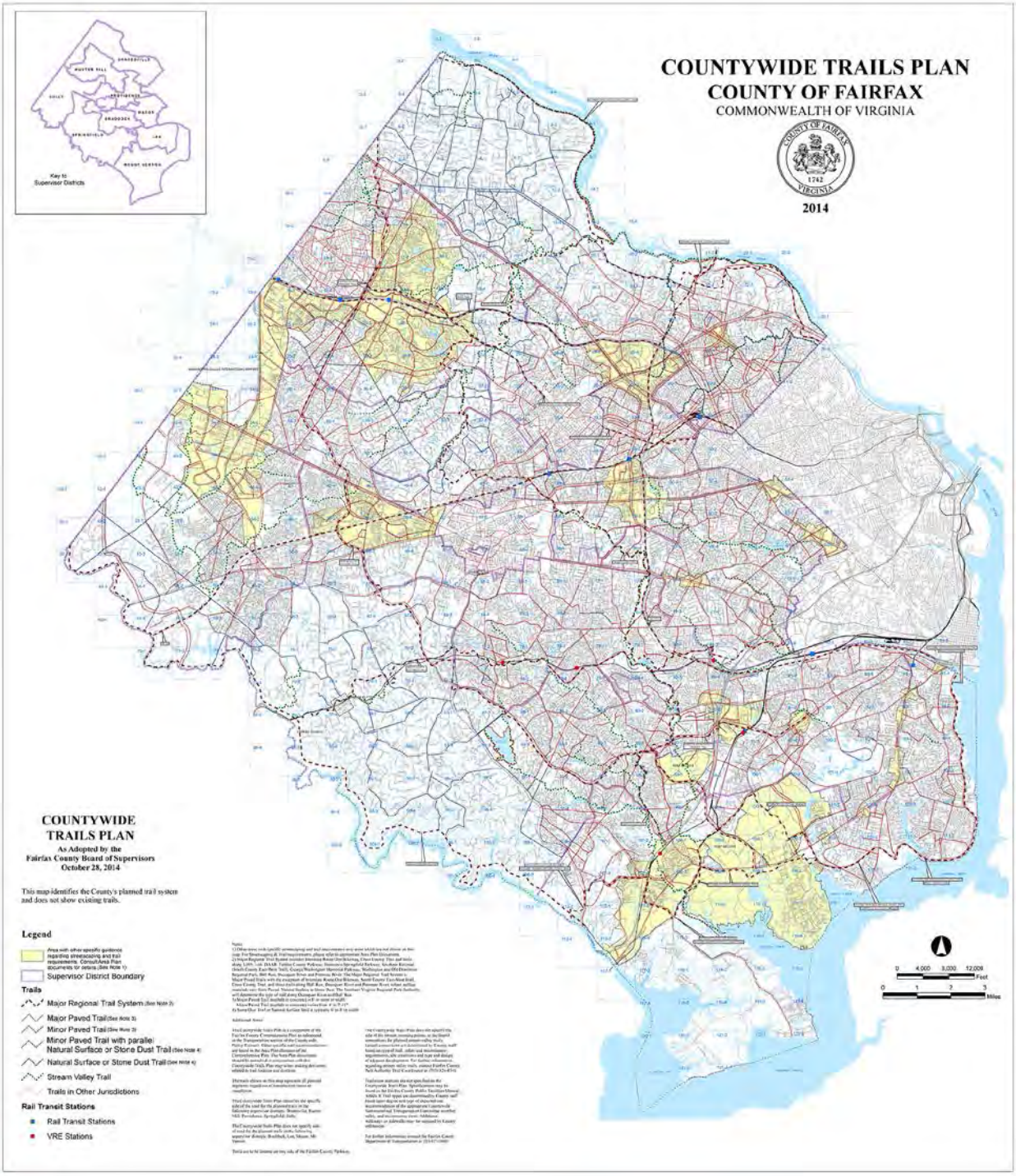
Policy b. Provide motorized and non-motorized transportation facilities or improvements that best meet county goals as determined by detailed corridor and/or subarea studies. Provide for full public participation in such studies.

Policy c. Accommodate inter-county and through trips with the Interstate and Primary Highway Systems, mass transit, high-occupancy-vehicle (HOV) and high-occupancy-toll (HOT) facilities.

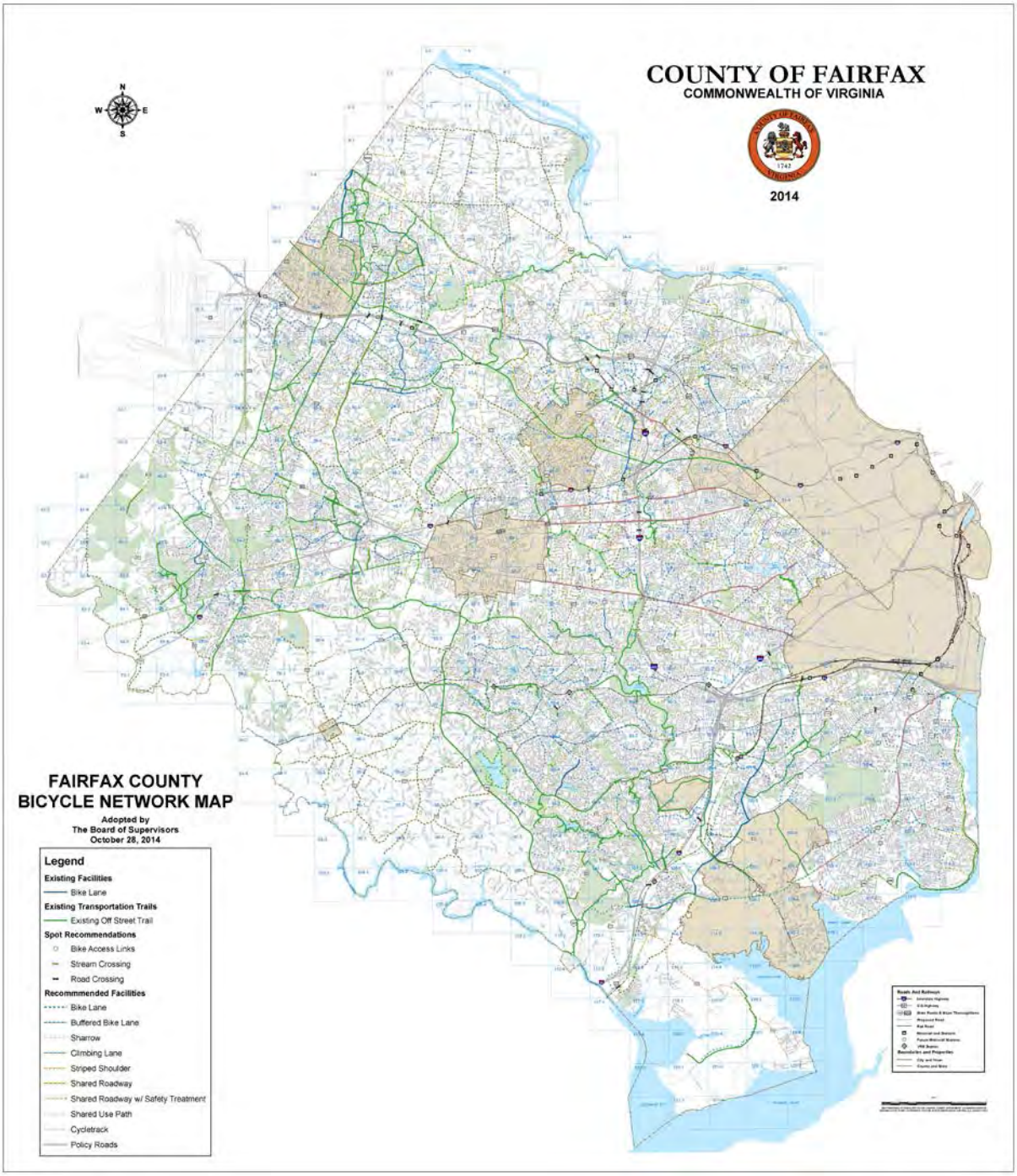
Policy d. Consider providing HOT lanes on limited access roadways to enhance throughput. Ensure that buses and HOVs have free access to HOT lanes.



TRANSPORTATION PLAN MAP **FIGURE 1**



COUNTYWIDE TRAILS PLAN MAP **FIGURE 2**



COUNTYWIDE BICYCLE NETWORK MAP **FIGURE 3**

Policy e. Design and construct trails, sidewalks, overpasses, bike facilities, transit amenities, and other non-motorized facilities leading to and accessing public transportation facilities and commuter collection points.

Policy f. Provide accessible transportation services and facilities that address the travel needs of the senior, disabled, and mobility challenged population.

Objective 2: Increase use of public transportation and non-motorized transportation.

Policies on Facilities

Policy a. Support the extension of the Metrorail system in the Dulles Corridor to the Dulles Airport and Loudoun County.

Policy b. Provide public transportation facilities (such as rail transit, commuter rail, bus rapid transit and/or HOV lanes) in major radial and intra-county commuter corridors designated as Enhanced Public Transportation Corridors in the Transportation Plan Map. Preserve land and rights-of-way where appropriate.

Policy c. Provide HOV lanes on freeways and major arterials where substantial travel benefits can be realized. Develop an integrated HOV system with direct connections between park-and-ride lots, transit centers, and other modal transfer facilities and to major mixed-use Centers. Strictly enforce HOV regulations to minimize violations.

Policy d. Establish and/or expand park-and-ride lots along major inter-county and intra-county corridors and at potential future modal transfer points such as rail stations in order to promote transit and HOV usage.

Policy e. Incorporate adequate, safe, and secure bicycle parking at all public buildings, park and ride lots, transit facilities, libraries, and schools. Adopt bicycle parking guidelines and policy defining the number of required bicycle parking spaces, approved equipment, and the proper placement/installation of the equipment.

Policy f. Establish a network of multi-modal centers as necessary to facilitate both inter-county and intra-county travel.

Policy g. Provide supporting facilities for the transit system, and provide resources to maintain county-owned equipments and facilities effectively.

Policy h. Provide safe and convenient non-motorized access (e.g., sidewalks, pedestrian crosswalk signals and markings, trails, on-road bicycle routes and secure bicycle parking) and user amenities (e.g. paved waiting areas, bus shelters and route/schedule information) for transit services and facilities.

Policies on Services

Policy i. Improve the speed, quality, reliability, convenience and productivity of transit service.

Policy j. Provide mass transit service in major commuter corridors, including those designated as Enhanced Public Transportation Corridors on the Transportation Plan Map. These services, including intra-county express bus service, should connect designated public transit transfer points and park-and-ride lots to mixed-use centers, the Metrorail system, and the metropolitan core.

Policy k. Provide feeder and local bus service to connect to mass transit facilities, mixed-use centers, educational facilities and employment centers.

Policy l. Provide local circulation service within mixed-use centers and employment centers.

Policy m. Make appropriate use of advanced transit technologies to provide service information and improve system operations. Evaluate and implement innovative services and methods to increase transit ridership.

Policy n. Facilitate transfer between modes at transit centers through coordination of services, schedules, fares, communication systems and information.

Policy o. Coordinate with neighboring jurisdictions to promote public transportation usage, bicycle route connectivity, and reduce SOV travel.

Policy p. Coordinate the planning and provision of public, human service agency, and non-profit transportation services targeted to the senior population, people with disabilities and low-income residents.

Policy q. Work with Fairfax County Public Schools and human service agencies to travel train the senior population and people with disabilities in the use of public transportation.

Objective 3: Ensure that the roadway system provides adequate local access and capacity for through movements, consistent with financial, social, and environmental constraints and with the county's goal of reducing SOV use.

Policy a. Plan, design and operate the roadway system consistent with the Roadway Functional Classification System.

Policy b. Provide a street network level of service as high as practical, recognizing the social, environmental, and financial constraints associated with the diverse areas of the county. At a minimum, level of service D should be provided, except where a lower level of service has been determined acceptable.

Policy c. Encourage the use of context sensitive solutions in roadway design to improve integration of roads into the physical environment and community.

Policy d. Provide new roadway construction which can be accepted by the Virginia Department of Transportation (VDOT) for inclusion in the state highway system.

Objective 4: Provide a comprehensive network of sidewalks, trails and on/off road bicycle routes as an integral element of the overall transportation network.

Policy a. Plan for pedestrian, bicycle, and trail system components in conjunction with the Bicycle Master Plan, the Countywide Trails Plan (Figure 2) and Countywide Bicycle Network Map (Figure 3).

Policy b. Incorporate pedestrian, bicycle, and other non-motorized components and supporting facilities that meet VDOT, American Association of State Highway and Transportation Officials (AASHTO), the Manual of Uniform Traffic Control Devices (MUTCD), the National Association of City Transportation Officials (NACTO) Guidelines, and/or county Standards.

Policy c. Provide for clearly-marked bicycle and pedestrian features, such as sidewalks, on-road bicycle routes, trails, crosswalks, curb cuts, refuge areas and pedestrian/bicycle signals, in the construction and reconstruction of roads and bridges. Evaluate road dieting and/or lane dieting concepts where roadway volume to capacity ratios allow in order to establish on-road bike lanes.

Policy d. Provide sidewalks, trails and/or on-road bicycle routes which link residential concentrations with transit stations, activity centers, shopping districts, recreational facilities, and major public facilities, and provide for pedestrian and bicycle circulation within activity centers.

Policy e. Provide sidewalks on both sides of streets.

Objective 5: Promote Transportation Demand Management (TDM) to support efficient use of the county's transportation system.

Policy a. Promote and market public transit, ridesharing, use of HOV lanes, bicycling and walking with all potential users.

Policy b. Promote TDM strategies including teleworking, teleconferencing, tele-education, alternative work schedules, flexible work hours and/or variable pricing.

Policy c. Implement parking management programs and parking controls in activity centers to encourage use of mass transit, HOV and non-motorized transportation.

Policy d. Encourage and support employers and landowners to establish transportation management associations (TMAs).

Policy e. Work with private and public employers by establishing alternative commute programs to reduce SOV use.

Policy f. Work with the county residents, developers, homeowner associations and property management companies through residential based programs to promote use of public transportation, HOVs, non-motorized travel, and other alternatives.

Policy g. Work with Fairfax County Public Schools, private schools, and area colleges to establish programs that encourage the use of bicycling, walking, carpooling and transit.

Policy h. Require that applicants for rezoning and special exceptions show evidence that they have analyzed and evaluated potential TDM strategies. Encourage proffers of TDMs and develop enforcement mechanisms and proffers in support of the county's transit system.

Policy i. Develop TDM strategies and programs in cooperation with MWCOG and other local jurisdictions.

Objective 6: Ensure that improvements to the transportation system are cost-effective and consistent with environmental, land use, social, and economic goals.

Policy a. Give priority to the programming of transportation improvements that assist in accomplishing the county's land use goals and objectives, particularly the encouragement of transit-oriented development at Transit Station Areas, Commercial Revitalization Areas, and in the cores of the Urban and Suburban Centers.

Policy b. Allocate capital improvement funds to advance the construction of those transit and HOV/HOT facilities that are the most cost-effective.

Policy c. Integrate non-motorized transportation projects into the programming of construction and maintenance projects and improve bicycle level of service with road reconstruction projects.

Policy d. Anticipate future demands and operating conditions in addition to existing conditions when making programming decisions.

Policy e. Consider direct and indirect costs, including operations and maintenance, in making programming decisions.

Policy f. Pursue advanced acquisition of easements and rights-of-way to reduce project costs and adverse impacts**.**

Policy g. Consider intersection improvements when funds are insufficient to permit construction of full segments between intersections.

Policy h. Consider the needs of all users, especially seniors and people with disabilities, when making programming deicisions.

Objective 7: Provide transportation facilities and services that minimize community disruption and adverse environmental impacts.

Policy a. Plan and design transportation facilities and services to minimize adverse impacts on Environmental Quality Corridors (EQCs), Resource Protection Areas (RPAs), other environmental resources, and heritage resources.

Policy b. Plan and design transportation facilities and services to minimize and mitigate adverse impacts to residents and neighborhoods.

Policy c. Adopt strategies to reduce vehicle emissions to meet the National Ambient Air Quality Standards.

Policy d. Minimize adverse impacts of storm water runoff from transportation facilities and services. Use innovative techniques and technologies to manage storm water run-off from transportation facilities.

Policy e. Apply best practices for walkable communities, pedestrian and bicycle planning, quality of life, and ecological preservation.

Policy f. Ensure pedestrian access and safety during construction of transportation facilities.

Objective 8: Identify the funding needed for the county's transportation system and potential sources for that funding.

Policy a. Develop and implement a responsible financial plan that considers both public and private sources of financial support for the county's transportation system.

Policy b. Pursue local, regional, state and federal funding support for the county's transportation system.

Policy c. Encourage and facilitate private sector initiatives to finance new construction, new transportation services, and improvements to existing facilities and services.

Policy d. Pursue increased funding for trails, sidewalks and on-road bicycle routes.

Objective 9: Ensure safety for users of transportation facilities and services and for the general public.

Policy a. Monitor safety and security associated with existing transportation facilities and services.

Policy b. Correct safety and security problems associated with existing transportation facilities and services that lie within the control of the County.

Policy c. Incorporate safety and security features into new transportation facilities.

Policy d. Incorporate medians and separate turning lanes in the design or redesign of roadways having four or more travel lanes.

Policy e. Upgrade existing roadways to correct unsafe conditions along segments with substandard geometrics.

Policy f. Monitor and enforce the provisions and regulations for transporting hazardous materials.

Policy g. Provide adequate maintenance of county transit vehicles and other county transit facilities, and enhance maintenance resources wherever possible.

Policy h. Reduce conflicts between motorized and non-motorized traffic and correct unsafe conditions for walking and bicycling.

Policy i. Work with VDOT and local communities to implement traffic calming and other measures where needed to encourage motorists to drive with caution and consideration in residential communities.

Policy j. Plan and prepare to assist with orderly evacuations (selected, staged or full-scale) in the event of an emergency. Provide assistance for residents without a means of transportation during an evacuation.

Policy k. Coordinate with regional public safety and transportation agencies using state-of-the-art communications technology for emergency operations and transportation incident management.

Objective 10: Maximize the operational efficiency of transportation facilities for all modes.

Policy a. Maximize the efficiency of existing roads through low-cost strategies to increase capacity such as channelization, turning lanes, optimized signalization, and signage, while avoiding negative impacts on pedestrians and bicyclists.

Policy b. Preserve and enhance the efficiency of the arterial street network by reducing and consolidating private entrances, median crossovers, and similar disruptions to traffic flow.

Policy c. Promote accessibility between residential developments to facilitate emergency access, local circulation of motorized and non-motorized traffic and potential neighborhood bus service.

Policy d. Develop a roadway system which discourages through travel while maintaining connectivity on local and collector streets.

Objective 11: Ensure that land use and transportation policies are complementary.

Policy a. Require all new developments to mitigate adverse impacts upon the transportation system. Evaluate measures to facilitate access by transit and to provide other enhancements necessary to promote use of transit and non-motorized transportation.

Policy b. Limit development to the low end of the planned range unless the applicant demonstrates that arterials and collectors within the impact area of the proposed project as defined by the county will operate at an acceptable level of service, upon completion of the project, taking into consideration expected development and transportation facilities within the area during that period.

Policy c. Encourage higher density residential development in activity centers to promote non-motorized trips and transit services to reduce SOV use.

Policy d. Support public transportation and non-motorized travel through the design and development of mixed-use projects in Tysons Corner Urban Center, Suburban Centers, Revitalization Areas, Transit Station Areas, and Community Business Centers. The road design and site design (including the location of parking, transit stops, pedestrian facilities, and secure bicycle parking), and other facilities should be supportive of public transportation usage and non-motorized travel.

Policy e. Encourage compatible commercial use and appropriate land uses such as childcare facilities in mixed-use centers and in close proximity to public transportation transfer points.

Policy f. Require new development and redevelopment projects, where applicable, to provide temporary pedestrian access when such access is affected by the development.

Policy g. Evaluate land uses around airports during the development review process, to ensure compatibility in terms of height, noise, and the functional classification of the facility; and encourage the Metropolitan Washington Airports Authority to procure aviation and related facility easements where appropriate.

Policy h. Encourage location of activities with significant demand for air transportation in close proximity to existing aviation facilities.

Objective 12: Preserve land needed to accommodate planned transportation facilities.

Policy a. Identify streets or highways shown in the Comprehensive Plan for improvement, by the anticipated number of lanes, typical cross-sections, and right-of-way requirements.

Policy b. Preserve the maximum potential requirements for the planned typical section and right-of-way, where planned roadway improvements have not been designed. (See the Roadway Right-of-Way Requirements Section in the Transportation Appendix.)

Policy c. Establish right-of-way requirements and preserve the land for future interchanges, transit stations and transit rights-of-way in the Enhanced Public Transportation Corridors and other public transportation facilities shown on the Transportation Plan Map. Develop potential right-of-way requirements based upon conceptual drawings where designs have not been approved.

Policy d. Prepare engineering plans for future transportation improvements as soon as feasible in order to clarify and secure right-of-way requirements and to develop improved cost estimates.

Objective 13: Review and update the Fairfax County Transportation Plan and Bicycle Master Plan once every five years.

Policy a. Monitor changes in travel patterns, traffic, transit use, and the implementation of transportation facilities and services for the purpose of evaluating progress towards attainment of transportation objectives.

Policy b. Promote public participation in the review and update of the transportation plan.

Policy c. Promote regional and subregional transportation planning by cooperating with neighboring jurisdictions to coordinate a planned network of transit routes, services and roads.

Policy d. Integrate planning and review so that non-motorized, mass transit, and motorized transportation needs are evaluated concurrently.

APPENDIX 1

ROADWAY SYSTEM FUNCTIONAL CLASSIFICATION

Roadway functional classification is the process by which streets and highways are grouped into classes according to the type of service any given facility provides. It defines the role of any particular road or street in serving the flow of trips through the roadway network. Functional classification is very useful in considering the dual role of the transportation network in providing both travel mobility and access to property. Although access is a fixed requirement which is necessary at both ends of a trip, mobility can be provided at varying levels incorporating a wide range of elements.

The development of an effective circulation plan for any area should rely on the delineation of a basic roadway functional classification system of that area. In developing such a system, consideration is given to the magnitude and distribution of projected travel demand, and types and spatial distribution of activities within the county. Because the effectiveness of any one type of transportation facility is dependent upon the adequacy of other types, it is necessary to determine the purpose and function of facilities and services prior to making recommendations.

The county's roadway functional classification is based on the Federal Highway Administration's functional classifications for urbanized areas, with consideration given to the local characteristics and variation within the county's roadway network. For this document, the roadway system is classified into freeways and expressways, other principal arterials, minor arterials, collectors and local streets. (See Figure 4).

Freeways and expressways are controlled access facilities providing for high-volume travel. Servicing abutting land is subordinate to accommodating the through movement of vehicles. It is desirable that medians, shoulders, acceleration and deceleration lanes, and grade separated interchanges be included in the design. Parking and pedestrian travel should not be permitted along the traveled portion of the roadway.

Other principal arterials also serve as main travel corridors. Some access is provided to abutting land, but the primary function of the roadway, particularly during peak periods, is to carry through traffic. Intersections with expressways and other principal arterials (see following description under Minor Arterials) should generally be grade separated. Where many turning movements could occur over a relatively short roadway section, service drives are desirable. Medians, shoulders, and acceleration and deceleration lanes are also desirable. Where shoulders cannot be provided, bus storage bays are desirable. Adequate and safe pedestrian and bicycle travel along and across these facilities should be included in the design. Parking should not be permitted along the traveled position of the roadway. These facilities should include four to six travel lanes with a minimum right-of-way of 122 feet.

Minor arterials usually carry an even mix of local and through traffic. They link collectors, and sometimes local streets, with principal (major) arterials. Minor arterials are lower service level roadways with partial control of access. Adequate and safe pedestrian and bicycle travel along and across these facilities should be included in the design.

A wide disparity exists in the characteristics of minor arterials found in the county. At one end, Braddock Road, with segments carrying over 70,000 vehicles daily on six lanes,represents a very high design standard. Conversely, Fox Mill Road, a two-lane rural road, is also a minor arterial because it carries a significant volume of through traffic over a relatively long distance. In an effort to recognize and accommodate this disparity, minor arterials are divided into two categories in this Plan.

Type A minor arterials are those which perform a particularly significant function in the transportation network due to their length and/or their design. These facilities closely approach principal arterials in terms of their traffic characteristics and role in the network. They include Braddock Road, Old Keene Mill Road-Franconia Road, Centreville Road, and several additional segments. They should be multi-lane divided facilities within a minimum right-of-way of 122 feet. Parking should not be permitted along the traveled portion of the roadway. Interchanges should be provided at intersections with freeways. Interchanges at other locations should only be provided where the results of a detailed traffic study indicate that an at-grade intersection cannot accommodate the traffic.

Type B minor arterials represent the remaining minor arterials which are somewhat shorter in length, traverse a less densely developed area, or are located in more mature areas and consequently were built to a somewhat older design standard. Examples include Backlick Road, Annandale Road, and Sherwood Hall Lane. They can generally be constructed within a 122-foot right-of-way, although in less developed areas or where additional lanes are needed, additional right-of-way may be necessary. Parking may be permitted, although it should generally be discouraged along the traveled portion of the roadway due to the arterial nature of the road. Interchanges should only be provided with freeways, and then only at selected locations, or where the results of a detailed traffic study indicate that an at-grade intersection cannot accommodate the traffic.

Collector streets provide direct service to and from local areas, routing traffic to the arterial street system. Generally, these roadways are not used for through trips. Collector streets are very important for the collection and distribution functions of transit service. As such, they should be designed in conjunction with the arterial system to permit safe boarding and alighting, and allow buses to safely enter, exit, and turn around if necessary. Medians, access control, and turning lanes are desirable only where traffic volume is expected to exceed about 5,500 vehicles per day. Parking is optional, and can generally be safely accommodated in most sections. Sidewalks and/or trails should be provided on both sides of the road. These facilities should generally allow for two travel lanes with sufficient pavement width to permit safe bus operations. Where traffic volumes are anticipated to be high due to relatively intense use of the area served, four travel lanes should be provided. Many unimproved rural roads in lower-density areas of the county serve a collector function. They are characterized by narrow pavement, poor horizontal and/or vertical alignment, and a lack of shoulder. These roads should be improved for safety reasons to minimum VDOT geometric standards.

Local streets provide access to properties abutting the roadway and within the immediate vicinity. Traffic speed and volume should be low. Parking should be accommodated and sidewalks and/or trails should be provided. Right-of-way widths should be in conformance with standards for safe operation and proper maintenance.

The above functional classification system is used to help develop recommendations to facilitate the flow of trips generated in or traveling through the county. Facilities intended to serve a certain type and magnitude of travel will require improvements consistent with such a function. The plan has been developed with heavy emphasis on separating local and non-local facilities by functional classification and maintaining the integrity of local streets by recommending improvements on higher type facilities. The highest three classification categories of the roadway system functional classification are depicted on Figure 4. The following lists the freeway and arterials in the county.

ROADWAY SYSTEM FUNCTIONAL CLASSIFICATION **FIGURE 4**

LISTING OF ROADWAYS BY FUNCTIONAL CLASSIFICATION
(Exclusive of Collectors and Local Streets)

	Freeways/Expressways	From	To
1.	Beltway (I-495)	American Legion Memorial Bridge	Alexandria City Line
2.	Dulles Airport Access Road (DAAR) and Dulles Toll Road (DTR)	Loudoun County	I-66
3.	Fairfax County Parkway	Braddock Road	Route 50
4.	Franconia-Springfield Parkway	Fairfax County Parkway	Beulah Street
5.	George Washington Memorial Pkwy	I-495	Arlington County Line
6.	I-66	Prince William County Line	Arlington County Line
7.	Shirley Highway (I-95 & I-395)	Prince William County Line	Alexandria City Line
8.	Route 28	Route 29	Loudoun County Line

	Other Principal Arterials	From	To
1.	Arlington Boulevard (Route 50)	Fairfax City Line	Arlington County Line
2.	Route 28	Route 29	Prince William County Line
3.	Route 123	Fairfax City Line	I-495
4.	Route 123	George Washington Parkway	Arlington County Line
5.	Columbia Pike	Little River Turnpike	Arlington County Line
6.	Route 123	I-495	George Washington Parkway
7.	Fairfax County Parkway	Route 50	Route 7
8.	Fairfax County Parkway	Braddock Road	Route 1
9.	Route 29	Fairfax City Line	Falls Church City Line
10.	Route 29	Prince William County Line	Fairfax City Line

11.	Route 50	Loudoun County Line	Fairfax City Line
12.	Route 7	Loudoun County Line	Falls Church City Line
13.	Route 7	Falls Church City Line	Alexandria City Line
14.	Little River Turnpike	Fairfax City Line	Alexandria City Line
15.	Route 123	Fairfax City line	Prince William County Line
16.	Route 1	Prince William County Line	Alexandria City Line
17.	Manassas National Battlefield Bypass	Route 29	Prince William County Line
18.	Tri-County Parkway	Prince William County Line	Loudoun County Line

	Minor Arterials (Type A)	**From**	**To**
1.	Baron Cameron Avenue	Herndon Town Line	Route 7
2.	Beulah Street	Franconia Road	Telegraph Road
3.	Blake Lane	Jermantown Road	Fairfax City Line
4.	Braddock Road	Backlick Road	Union Mill Road
5.	Burke Lake Road	Fairfax County Parkway	Braddock Road
6.	Centreville Road	Herndon Town Line	Route 50
7.	Franconia Road	Backlick Road	Telegraph Road
8.	Gallows Road	Route 7	I-495
9.	George Washington Memorial Parkway	Mount Vernon Highway	Alexandria City Line
10.	Holly Knoll Drive	Route 7	Loudon County Line
11.	International Drive	Route 7	Spring Hill Road
12.	Kingstowne Boulevard	Kingstowne Village Parkway	South Van Dorn Street
13.	Lawyers Road	Fox Mill Road	West Ox Road

14.	Lorton Road	Route 1	Route 123
15.	Manchester Boulevard	Beulah Street	Kingstowne Village Parkway
16.	McLearen Road	Route 28	Reston Parkway
17.	New Braddock Road	Union Mill Road	Route 29
18.	Old Keene Mill Road	Backlick Road	Fairfax County Parkway
19.	Poplar Tree Road	Sully Station Drive/ Sequoia Farms Drive	Braddock Road
20.	Reston Parkway	Route 7	Lawyers Road
21.	Shirley Gate Road	Route 29	Fairfax County Parkway
22.	South Van Dorn Street	Alexandria City Line	Telegraph Road
23.	Stone Road	Route 29	Braddock Road
24.	Telegraph Road	Alexandria City Line	Route 1
25.	Walney Road	Route 50	Westfields Boulevard
26.	Waples Mill Road	Route 50	Route 29
27.	West Ox Road	Route 29	Lawyers Road
28.	Westfields Boulevard	Walney Road	Sully Station Drive/ Sequoia Farms Drive
29.	Old Mill Road	Telegraph Road	Route 1

	Minor Arterials (Type B)	**From**	**To**
1.	Alban Road	Backlick Road	Rolling Road
2.	Anderson Road	Route 123	Magarity Road
3.	Annandale Road	Little River Turnpike	Falls Church City Limit
4.	Amherst Avenue	Calamo Street	Highland Street
5.	Armisted Road	Lorton Road	Route 1
6.	Backlick Road	Little River Turnpike	Fairfax County Parkway

7.	Beacon Hill Road	Route 1	Fort Hunt Road
8.	Belle View Boulevard	Fort Hunt Road	George Washington Parkway
9.	Beauregard Street	Little River Turnpike	Alexandria City Line
10.	Beulah Road	Route 7	Vienna Town Limits
11.	Braddock Road	Backlick Road	Columbia Pike
12.	Braddock Road	Pleasant Valley Road	Stone Road
13.	Browns Mill Road	Crowell Road	Beulah Road
14.	Burke Center Parkway	Burke Lake Road	Fairfax County Parkway
15.	Burke Lake Road	Fairfax County Parkway	Route 123
16.	Carlyn Springs Road	Seminary Road	Arlington County Line
17.	Cedar Lane	Gallows Road	Route 50
18.	Chain Bridge Road	Anderson Road	Route 123
19.	Clifton Road	Route 29	Route 123
20.	Colvin Run Road	Walker Road	Route 7 East
21.	Commerce Street	Old Keene Mill Road	Franconia Road
22.	Compton Road	Ordway Road	Clifton Road
23.	Crowell Road	Hunter Mill Road	Browns Mill Road
24.	Dranesville Road	Route 7	Herndon Town Limits
25.	Fair Lakes Parkway	West Ox Road	Stringfellow Road
26.	Edsall Road	Backlick Road	Alexandria City Limits
27.	Fort Hunt Road	Route 1	Vernon View Drive
28.	Fox Mill Road	Monroe Street	Reston Parkway
29.	Frying Pan Road	Route 28	Monroe Street
30.	Fullerton Road	Backlick Road	Fairfax County Parkway

31.	Furnace Road	Route 123	Route 1
32.	Gallows Road	I-495	Hummer Road/ Annandale Road
33.	Gallows Road	Annandale Road/ Hummer Road	Columbia Pike
34.	Georgetown Pike	Route 7	Route 123
35.	Glen Carlyn Road	Route 7	Arlington County Line
36.	Gosnell Road	Route 7	Old Courthouse Road
37.	Graham Road	Annandale Road	Route 29
38.	Great Falls Street	Route 123	Falls Church City Line
39.	Guinea Road	Little River Turnpike	Route 123
40.	Haycock Road	Route 7	Westmoreland Street
41.	Hayfield Road	Manchester Boulevard	Telegraph Road
42.	Henderson Road	Old Yates Ford Road	Clifton Road
43.	Hooes Road	Fairfax County Parkway	Route 123
44.	Hummer Road	Little River Turnpike	Gallows Road
45.	Hunter Mill Road	Baron Cameron Avenue	Blake Lane
46.	Huntington Avenue	Fort Hunt Road	Telegraph Road
47.	Idylwood Road	Cedar Lane	Great Falls Street
48.	Lee Road	Route 50	Stonecroft Boulevard
49.	Jermantown Road	Fairfax City Line	Blake Lane
50.	John Marr Drive	Ravensworth Road	Columbia Pike
51.	Kirby Road	Great Falls Street	Route 123
52.	Lawyers Road	Fox Mill Road	Vienna Town Line
53.	Lee Chapel Road	Burke Lake Road	Route 123
54.	Lewinsville Road	Route 7	Route 123

55.	Lincolnia Road	Columbia Pike	Beauregard Street
56.	Loisdale Road	Franconia Road	Newington Road
57.	Magarity Road	Lisle Avenue	Great Falls Street
58.	Monroe Street	West Ox Road	Herndon Town Line
59.	Mount Vernon Highway	Route 1	Mount Vernon Memorial Highway
60.	Mount Vernon Memorial Highway	Route 1	Mount Vernon Highway
61.	Newington Road	Loidale Road	Fairfax County Parkway
62.	North Kings Highway	Route 1	Telegraph Road
63.	Nutley Street	Vienna Town Line	Route 50
64.	Old Courthouse Road	Beulah Road	Gallows Road
65.	Old Dominion Drive	Georgetown Pike	Arlington County Line
66.	Old Yates Ford Road	Prince William County Line	Henderson Road
67.	Ordway Road	Prince William County Line	Compton Road
68.	Park Street	Vienna Town Line	Cedar Lane
69.	Patrick Henry Drive	Route 7	Route 50
70.	Pleasant Valley Road	Route 29	Route 50
71.	Pohick Road	Fairfax County Parkway	Route 1
72.	Poplar Tree Road	Stringfiellow Road	Westfields Boulevard
73.	Prosperity Avenue	Little River Turnpike	Gallows Road
74.	Ravensworth Road	Little River Turnpike	Braddock Road
75.	Roberts Parkway	Fairfax County Parkway	New Guinea Road
76.	Rolling Road	Braddock Road	Franconia-Springfield Parkway
77.	Rolling Road	Fairfax County Parkway	Pohick Road
78.	Seminary Road	Carlyn Springs Road	Alexandria City Limits
79.	Sherwood Hall Lane	Route 1	Fort Hunt Road

80.	Shreve Road	Route 29	Route 7
81.	Silverbrook Road	Route 123	Lorton Road
82.	Sleepy Hollow Road	Columbia Pike	Route 7
83.	South George Mason Drive	Seminary Road	Arlington County Line
84.	South Kings Highway	Telegraph Road	Route 1
85.	Spring Hill Road	Route 7	Georgetown Pike
86.	Springvale Road	Georgetown Pike	Route 7
87.	Stonecroft Boulevard	Route 50	Westfields Boulevard
88.	Stringfellow Road	Route 50	Route 29
89.	Sunrise Valley Drive	Centreville Road	Hunter Mill Road
90.	Sunset Hills Road	Herndon Town Line	Hunter Mill Road
91.	Swinks Mill Road	Georgetown Pike	Lewinsville Road
92.	Sydenstricker Road	Old Keene Mill Road	Fairfax County Parkway
93.	Towlston Road	Old Dominion Drive	Trap Road
94.	Trap Road	Towlston Road	Beulah Road
95.	Twinbrook Road	Braddock Road	Guinea Road
96.	Vale Road	West Ox Road	Vienna Town Line
97.	Vernon View Drive	Fort Hunt Road	George Washington Parkway
98.	Wakefield Chapel Road	Little River Turnpike	Braddock Road
99.	Walker Road	Georgetown Pike	Colvin Run Road
100.	Waples Mill Road	Route 50	West Ox Road
101.	West Ox Road	Centreville Road	Lawyers Road
102.	West Street	Route 29	Falls Church City Limit
103.	Westmoreland Street	Chain Bridge Road	Arlington County Line
104.	Westpark Drive	International Drive	Route 7
105.	Wiehle Avenue	Crestview Drive	Sunrise Valley Drive

106.	Willard Road	Stonecroft Road	Walney Road
107.	Wilson Boulevard	Route 7	Arlington County Line

APPENDIX 2

TYPES OF TRANSIT SERVICES AND FACILITIES

The Countywide Transportation Plan identifies improvements of public transportation services and facilities. The Transportation Plan designates a number of Enhanced Public Corridors where major transit services will be provided in corridors that carry higher volumes of inter-county and/or intra-county vehicular traffic. The Plan also maps out approximate locations for supporting facilities of the existing and planned transit services for the purpose of reserving rights-of-way required by the facility development. Final locations of component facilities are subject to completion of area plans or appropriate studies. This document outlines types of transit services and facilities based on comprehensive consideration of transit modes, technologies, rights-of-way, capacities, and service and operational characteristics.

Transit Services

Public transportation services can be generally categorized into three major types: rail transit, bus transit and paratransit.

Rail Transit is a mass transit service using rail technology and occupying a separate right-of-way. Heavy rail, commuter rail and light rail are the common rail transit services.

Heavy rail transit (HRT) is an electric railway with the capacity for carrying a heavy volume of urban passenger traffic. It is characterized by high speed and rapid acceleration passenger rail cars operating in multi-car trains on fixed rails, separate rights-of-way from which all other vehicular and foot traffic are excluded, and high platform loading. Most passengers access heavy rail services by walking, riding feeder bus services, or using park-and-ride facilities near suburban stations. The heavy rail transit service in the Washington DC region is referred to as Metrorail.

Commuter rail (CR) is a type of passenger train service that utilizes diesel-electric or electrically propelled trains and operate over existing railway track on the same rights-of-way used by intercity railway freight and passenger trains. Services are operated on a regular basis by or under contract with a transit operator for the purpose of transporting passengers within urbanized areas, or between urbanized areas and outlying areas. The Virginia Railway Express (VRE) is a commuter rail service that provides service between Virginia suburbs, including outlying counties, and downtown Washington DC.

Light rail transit (LRT) is essentially an improved and modernized version of the old streetcars and electric interurban railways that were common in the United States from the 1890s through the World War II. It utilizes electrically propelled passenger cars operating on fixed rails in rights-of-way that may or may not be separated from other traffic for much of the way. Light rail vehicles typically operate at surface level with power drawn from an overhead trolley wires. Light rail serves passenger trips within the densely developed urban and suburban areas. A modern streetcar is a form of light rail that has less capacity.

Automated guideway transit (or people mover) is an electric railway of guided transit vehicles, operating singly or in multi-car trains, without an onboard crew. AGT systems provide short-distance collection and distribution service, usually in major

activity centers. Service may be on a fixed schedule or in response to a passenger activated

button. AGT systems are located in several U.S. cities but are more commonly found in downtown areas and at airports and amusement parks.

Monorail is a form of guided transit where the vehicles are supported by or suspended from a guideway formed by a single beam, rail or tube, usually elevated. If the trains do not have an onboard crew, they are considered automated guideways.

Bus Transit utilizes rubber-tired vehicles operating on fixed routes with fixed schedules on roadways. Bus transit can be further classified in the following types.

Local bus service is the most common type of bus service. Buses may stop every block or two along a route several miles long and serve a destination end or traffic generator, for example, a shopping mall or a hospital, for example.

When limited to a small geographic area or to short-distance trips, local service is often called feeder, circulator, or shuttle service. Such routes may operate in a loop and connect, often at a transfer center or rail station, to major routes for travel to more destinations. Most Fairfax Connector bus routes are categorized as local bus service.

Express service is a high-speed limited-stop service generally operating within transportation corridors oriented to a principal destination. It consists of longer trips, especially to major activity centers during peak commuting hours, and operates long distances without stopping. Examples include services accessing freeways, and services on major streets that operate local service on the outlying portions of a route until a certain point and then operate non-stop to activity centers. Reverse commute is a type of express service transporting passengers from residential locations in urban core areas to employment centers in the outlying areas. It is operated in the opposite direction of the peak direction of travel.

Bus rapid transit (BRT) is a limited-stop service developed in the 1990s that relies on technology to help speed up the service. It combines the quality of rail transit and the flexibility of buses. Bus Rapid Transit can operate on exclusive rights-of-way, within high-occupancy-vehicle (HOV) lanes, on expressways, or on ordinary streets. A BRT typically combines intelligent transportation system (ITS), technology applications, signal priority for transit, cleaner and quieter vehicles, rapid and convenient fare collection, and integration with land use policy.

Paratransit is a demand-responsive shared-ride transportation service without a fixed route. In practice, paratransit covers two broad areas: ADA paratransit and other paratransit.

ADA paratransit, in compliance with the Americans with Disabilities Act (ADA) and other rulings, transports people with disabilities who are unable to travel alone on fixed route system. MetroAccess is the ADA paratransit service for the Washington DC metropolitan area.

Other paratransit services can transport individuals to a destination ("many to one") or to several destinations ("many to many"). There are several forms including shared-ride taxi, general public dial-a-ride (typically used in areas of low transit demand), human service agency transportation, and ridesharing including vanpools. Vanpools, comprised of vans operating as a ridesharing arrangement, provide service to a group of individuals traveling directly between their homes and a regular destination within the same geographical area.

Transit Facilities

Transit facilities provide access and modal transfer for users of public transportation services.

Bus stop is where one or multiple bus routes pick up passengers. A bus stop should have minimum amenities such as schedule and route information displays, sidewalks or trails accessing the stop, benches and/or shelters. The provision of benches and shelters should take into consideration daily passenger boarding levels and adjacent land use characteristics.
Transit transfer center (T) is a passenger loading and waiting area where a number of bus routes and/or other modes converge. A transit transfer center should have good access to nearby arterials and/or freeways in order to minimize transit travel times. It could be a free-standing individual facility or could easily be integrated with the design of a building. A transit transfer center typically has significant infrastructure such as a waiting room, benches, restrooms, sales outlet, ticketing or pass vending machines, and/or other services. In some instances, a timed-transfer system is used and buses converge on the transit center at a specific time to exchange passengers. Parking typically is not provided at these locations, although the transit transfer center could be co-located with a rail station parking facility or park-and-ride lot.

Rail Station (R) is defined as a location where a rail rapid transit service picks up and drops off passengers. A rail station typically has a bus transit waiting area, kiss-and-ride, bicycle parking and other amenities listed under transit transfer centers. It may or may not be accompanied by vehicle parking areas, depending on the nature of the station area.

Commuter Rail Station (C) is defined as a location where commuter rail service is provided. It has passenger amenities similar to those provided for a rail station.

Park-and-Ride (P) is a parking garage and/or surface lot used for parking passengers' vehicles, either free or for a fee, while they use public transportation facilities or vanpools. Park-and-ride facilities are generally established as collector sites for multiple bus routes, rail service, and high-occupancy-vehicle (HOV) lane access, and may also serve as collector sites for vanpools and carpools. They may have amenities similar to transit transfer centers.
Kiss-and-Ride is a location where passengers in non-transit vehicles are dropped off to board public transportation vehicles. Kiss-and-Ride areas could be located at transit transfer centers, rail stations, commuter rail stations, and park-and-ride facilities.

APPENDIX 3

BICYCLE AND TRAIL CLASSIFICATION AND DEFINITIONS

COUNTYWIDE TRAILS PLAN MAP

Major Regional Trail: Includes the Interstate Route One Bikeway, Cross County Trail, and trails along I-495, I-66, Dulles Airport Access Road, Fairfax County Parkway, Franconia-Springfield Parkway, Norfolk Southern Railway, George Washington Memorial Parkway, Washington and Old Dominion Regional Park, Bull Run, Occoquan River and Potomac River. Most of the trails designated in this category are paved trails, 8 feet or more in width. However, surface materials vary from paved, natural surfaces and stonedust for the Interstate Route One Bikeway, South County East-West trail, Cross County Trail and those trails along the Bull Run, Occoquan River, and Potomac River.

Major Paved Trail: Concrete or asphalt trail, 8 feet or more in width.

Minor Paved Trail: Concrete or asphalt trail, 4 feet to 7 feet 11 inches in width.

Minor Paved Trail with Parallel Natural Surface or Stone Dust Trail: Concrete or asphalt trail, 4 feet to 7 feet 11 inches in width adjacent to, and in the same easement with a stone dust or natural surface trail typically 6-8 feet in width.

Natural Surface or Stone Dust Trail: Stone Dust or natural surface trail typically 6-8 feet in width.

Stream Valley Trail: Trails along stream ways as determined by Fairfax County Park Authority Staff.

Trails in Other Jurisdiction: Trails to be reviewed by and located in the Towns of Herndon, Vienna and Clifton and the Cities of Fairfax and Falls Church.

COUNTYWIDE BICYCLE NETWORK MAP(S)

The Bicycle Master Plan recommends a network of various types of on and off-road bikeways. As noted, bikeway design may include pavement markings, signage, signals, improved surfaces, and geometric features. The recommendations reflect the desire to provide a high level of bicyclist comfort and mobility, while also balancing each travel mode's need for a share of the public right-of-way. The recommendations are intended to be cost-effective, and on-street recommendations generally involve retrofitting the existing roadway using pavement markings, signs and modest amounts of additional pavement. The following define the types of facilities incorporated in the Plan:

- **Shared Roadway:** consists of a low volume, low speed street that is compatible with bicycling without any striping, marking or geometric change to the roadway. Bike route signs may or may not be needed depending on the street's role in the larger Bikeway Network.

- **Shared Roadways with Safety Treatment:** is a recommendation for generally narrow, hilly, and winding two-lane roads. Improvements can include: signs such as "BIKES MAY USE FULL LANE" additional shoulder pavement, and/or pavement markings.

- **Shared Lane Markings:** (sharrows) are used on roadways where bicyclists and motor vehicles must share the same travel lane. The shared lane marking helps position bicyclists in the most appropriate location to ride, while also providing a visual cue to motorists that bicyclists have a right to use the street. Refer to the the Virginia Department of Transportation (VDOT) policy for guidance on the proper use of Shared Lane Markings.

- **Striped Shoulder:** provides space for bicycle travel to the right of the travel lanes. Paved shoulders serve a variety of transportation purposes in addition to providing a benefit for cyclists, including serving as a breakdown lane, contributing to overall pavement integrity, and providing a place for pedestrian travel where there are no sidewalks. A shoulder designated for bicycles should be no less than four feet in width.

- **Bike Lane:** is an area of roadway pavement designated for the preferential or exclusive use by bicycles. The lane is normally 4 – 6 feet in width and marked with a longitudinal white line and bicycle symbols Refer to the VDOT Bicycle Design Standards for guidance on bike lanes and bicycle pavement markings.

- **Climbing Lane:** when insufficient width exists to accommodate bike lanes in both directions and the roadway features a vertical grade, a climbing lane is considered. A bike lane (climbing lane) is provided in the uphill direction to accommodate slow moving bicyclists and a shared lane marking is provided in the downhill direction, where bicyclists can typically travel at speeds closer to motor vehicle speeds.

- **Buffered Bike Lanes:** created by striping a buffer zone (three feet in width or greater) between a bike lane and the adjacent travel lane.

- **Cycletrack:** is a bicycle facility for cyclists only that is physically separated from both the roadway and the sidewalk. A cycletrack may be constructed at the roadway level using roadway space, or at the sidewalk level using space adjacent to the road. Cycletracks can be provided in either one way or two way configurations.

- **Shared-Use Path (trail):** is an off-street multi-use facility that is physically separated from motor vehicle traffic. Trails are often located in independent right-of-way (e.g. a park, stream valley greenway, a utility corridor, or an abandoned railroad corridor) or located adjacent to the roadway within roadway rights of way. It is intended for use by bicyclists and pedestrians and normally is designed to accommodate two-way traffic

- **Policy Roads:** are multi-lane highways (functionally classified as principal arterials) that carry large volumes of traffic and/or have relatively high posted speeds (40mph or greater). These roads traverse a wide variety of land uses. Specific bicycle facility recommendations must be made in conjunction with other transportation and land use planning efforts.

The bicycle network maps also define recommended spot improvements:

- **Bicycle Access Links and Crossings** indicate locations where there are opportunities to improve neighborhood connectivity, for example by connecting cul de sacs, enhancing mid-block and trail/shared-use path crossings and by improving access to existing trails.

- **Interchange Improvements** represent locations where free flowing entrance and exit ramps create difficult conditions for bicyclists traveling along the road.

- **Transit Station Improvements** signify locations where existing and planned transit stations (Metro and VRE) create especially high demand for bicycle travel and need for bicycle accommodations. Appropriate accommodations may include bicycle racks, covered bicycle parking, high security parking, facilities on station access roads, curb ramps, crossing improvements or paths that provide safe and convenient station access.

- **Stream Crossings** are recommended in locations where linear barriers to bicycle travel exist at the crossings of streams. These bridge crossings will be designed for bicycle and pedestrian transportation.

- **Road Crossings** are recommended in locations where linear barriers to bicycle travel exist at the crossings of major highways. These crossings can be standalone bicycle and pedestrian bridges or bike lanes and shared use paths as part of a bridge that also serves motor vehicles.

APPENDIX 4

ROADWAY RIGHT-OF-WAY REQUIREMENTS

In an effort to preserve land for roadway improvements, to decrease delays in land acquisition, and to obtain land before land values increase with developed properties, requirements are hereby set forth regarding right-of-way requirements for roadways shown on the transportation plan.

The rights-of-way specified herein should be obtained through the development approval process (e.g. rezoning, special exception, site plan, etc.) as applications are submitted to the county. The provision of these rights-of-way will allow for future road improvements to be constructed with adequate ancillary features such as turning lanes, sidewalks, trails, and buffering, while minimizing impacts on properties which are subsequently developed.

It should be stressed, however, that the ultimate roadway designs will recognize available right-of-way to the extent possible; the intent of these requirements is not to impose rigid right-of-way standards through areas or mature neighborhoods, but rather to secure additional right-of-way needed for road improvements as development or redevelopment occurs.

Freeways/Expressways

Right-of-way needs along freeway facilities can be variable and extensive. The right-of-way may need to accommodate HOV/HOT lanes and rail transit as well as roadway configurations such as interchanges, ramps, and collector-distributor lanes. The right-of-way requirements for freeway facilities should be based on studies for each facility. These could include the detailed corridor analyses, feasibility studies, location and design studies and/or environment impact studies.

Arterials

Right-of-way requirements for arterials should be similar throughout the county. Table 1 summarizes the right-of-way requirements for arterial roadways based upon the number of lanes and the type of edge treatment: 'curb and gutter' or 'shoulder'. The number of lanes refers to the designation on the transportation plan. The edge treatment will vary by location within the county as follows:

(1). In the Low Density Residential Areas of the county, right-of-way should be provided as described for a 'shoulder' edge treatment. The provision of sufficient right-of-way to accommodate shoulders will allow for the ultimate typical section to be determined at the time detailed design is initiated. It is anticipated that this decision will be made based on a number of factors, including cost, clearing and grading requirements, the presence of storm sewer lines in the area, aesthetics, and other concerns. However, it is recognized that in all other areas of the county, curb-and-gutter treatments having less right-of-way requirements will normally be appropriate.

(2). The 'shoulder' edge treatment is optional in suburban neighborhoods.

(3). Additional right-of-way requirements for items such as turn lanes, service drives, parking lanes and on-road bike lanes are noted on Table 1.

When highway projects have approved designs or are in active stages of design, the strict application of these right-of-way requirements, shown in Table 1, could result in inconsistencies with such plans. To avoid this situation, approved or active designs should be utilized to determine right-of-way requirements on those projects where no change is envisioned in the Plan designation for

number of lanes. However, where the new Plan recommendation provides for more lanes than were previously shown on the Plan, or where there are no design plans, right-of-way should be provided in accordance with Table 1.

The cross-section illustrations in Figure 5 and Figure 6 correspond to the measurements provided in Table 1. These cross-sections represent the typical right-of-way needed and can serve as guidelines in the development of roadway plans.

Other Considerations

Additional right-of-way might be required to support traffic operations and facilitate non-motorized transportation. Table 1 includes the required rights-of-way for turn lanes, service, etc. Provision of such facilities should be determined on a case-by-case basis, taking into consideration community development characteristics, land use types and density, traffic volume and turning movements, transit service, and non-motorized users.

TABLE 1

Right-of-Way Requirements for Roads
Shown on Transportation Plan Map Where No Plans Exist [1, 2]
(Measurement in Feet for the Entire Cross Section)

	Typical Curb and Gutter Section	Typical Shoulder Section
Lanes	Feet	Feet
2-lane	---	87
4-lane	119	161
6-lane	143	185
8-lane	167	209

Add XX feet of right-of-way for each of the following special circumstances:

	Feet
Dual Left Turn Lanes at Major [3] Intersections on All Legs	12
Right Turn Lanes at Major [3] Intersections on All Approaches	12
Enhanced Median Treatments [4]	4
Service Drives [5]	92
Parking Lanes [6]	9
On-Road Bike Route [7]	4

Add 15 feet in ancillary easements. Add supplemental right-of-way with transitions to avoid special features (e.g., historic properties, parks, cemeteries, wetlands, landfills, sewage and water treatment facilities, existing buildings, etc.) and/or to improve horizontal alignment. Add 40 feet radius at intersections dedicated to the chord of the radius curve.

---

1 Where design plans consistent with the Comprehensive Plan and providing all anticipated future turn-lane requirements are developed to a sufficient level of detail and approval, right-of-way and easement dedication requirements should be based upon them.

2 Where a substitute trail is to be provided in easements within the development site, the right-of-way requirements can be reduced in an amount to be determined by VDOT and DPWES; however, adequate right-of-way must be retained to meet VDOT clear zone requirements.

3 Within 500 feet of intersections of arterial roads with collectors or with other arterials unless specifically determined by a traffic study to not be needed. The use of dual turn lanes requires a width of 30 feet on the receiving road.

4 Commercial revitalization areas or other special areas where pedestrian refuge, landscaping or special design features are desired within the median.

5 Primary Highways, except where waived.

6 On side(s) of road where residences front on the road or service drive. Does not apply to shoulder sections.

7 On-road bike route is a designated lane or signed route to accommodate bicycle users. Design features should be determined on a case-by-case basis, as either a marked bike lane, wide shoulder lane, or paved shoulder.

FIGURE 5

Cross Section Illustration of a Typical Curb and Gutter Section
(Measurement in Feet)

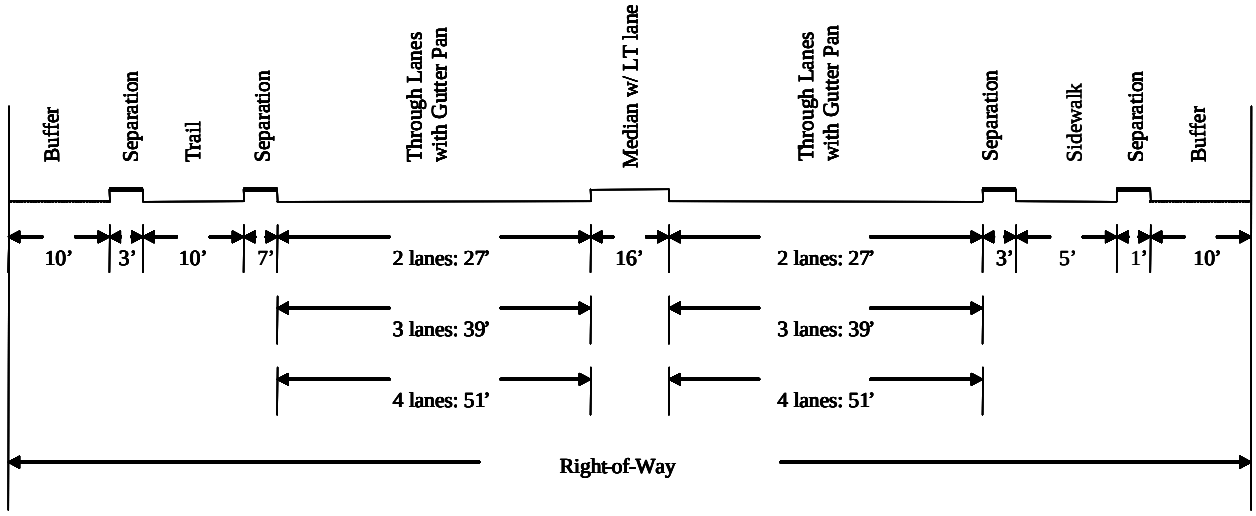
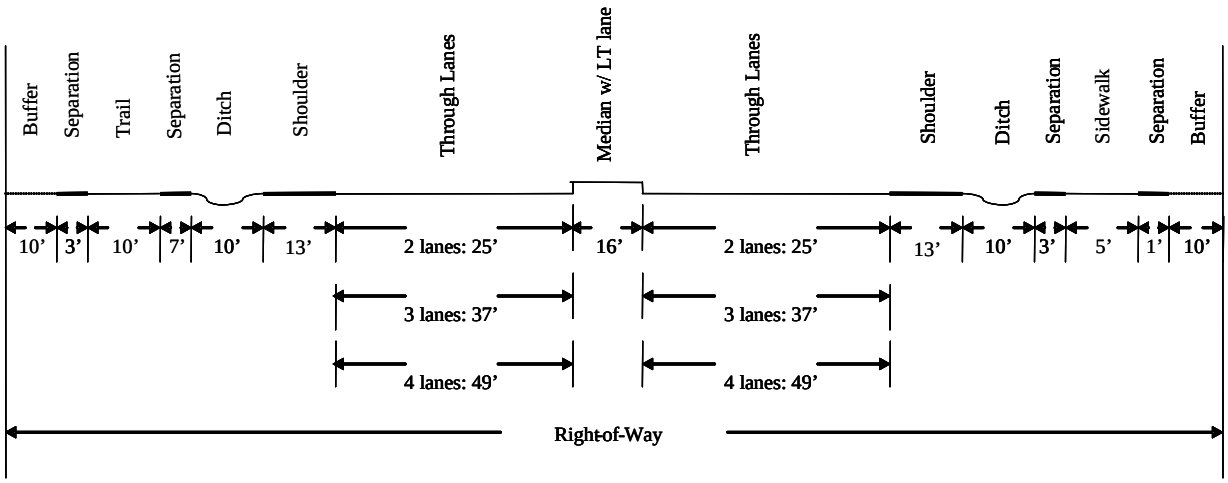


FIGURE 6

Cross Section Illustration of a Typical Shoulder Section
(Measurement in Feet)



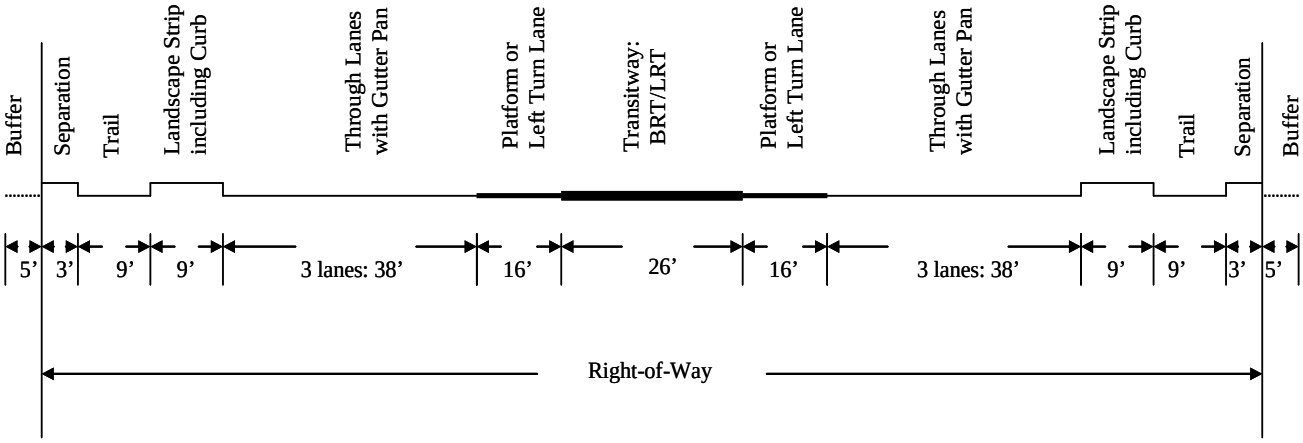
Roads in Revitalization Areas

The right-of-way requirements outlined above (Figure 5 and Figure 6) are generally applicable for improvements in a typical suburban setting. The county is comprised of diverse communities and development patterns, some of which have more urban features, higher land use densities, and more pedestrian activities and transit services. To preserve communities' characteristics and support economic vitality, this Plan allows flexibility and variation in right-of-way requirements for the planned arterial improvements. The planning and design of individual roadways need to fit with the surrounding land use and community, while enhancing mobility and safety for all road users.

The county has designated several Revitalization Districts and Areas to encourage economic development in the older commercial and residential areas. Special incentives and policies are provided for these areas, such as flexibility within certain zoning regulations and urban design measures. The Plan emphasizes that road improvement policies within the Revitalization Districts and Areas be in concert with the adopted land use, urban design and economic and administrative policies formulated to foster a sense of place and to support successful revitalization. Figure 7 serves as a guideline for such variation and flexibility. It is important to recognize that land use, transit and travel patterns differ among these areas. Area Plans of the Comprehensive Plan provide specific guidelines for right-of-way requirements and cross sections in the Revitalization Districts and Areas.

FIGURE 7

Richmond Highway Cross Section
Including At-Grade Transitway in Center
(Measurement in Feet)



APPENDIX 5

FAIRFAX COUNTY BICYCLE MASTER PLAN

Appendix 5 is comprised of Chapters 1 through 4 of the *Bicycle Master Plan.* Chapter 5, Bicycle Program Recommendations and Chapter 6, Implementation, were adopted by reference only, and can be viewed by contacting the Fairfax County Department of Transportation.

Fairfax County Bicycle Master Plan

October 2014

COUNTY OF FAIRFAX 1742 VIRGINIA

bikefairfax bikesafe.bikesmart

Toole Design Group

CAMBRIDGE SYSTEMATICS

Fairfax County Bicycle Master Plan

prepared for

Fairfax County Department of Transportation

with support from

Cambridge Systematics, Inc. 4800
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Bethesda, MD 20814

and

Toole Design Group
8484 Georgia Avenue, Suite 800
Silver Spring, MD 20910

date

October 2014

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Bicycle Advisory Committee

Sharon Baum, Town of Vienna

Peter Christenson, Fairfax County Trails and Sidewalks Committee

Joan Clark, Lee District

Brett Coffee, Springfield District

Michael Coyle, Sully District

Elizabeth Cronauer, Fairfax County Park Authority

Paul Davis, Jr, Hunter Mill District

Randy Dittberner, P.E., PTOE, Virginia Department of Transportation Brandice

Elliott and Mark Duceman, Town of Herndon

Cindy Engelhart, Virginia Department of Transportation Aaron

Frank, Mason District

Latrice Hall, Mount Vernon District

Jeffrey Hermann, Fairfax County Department of Transportation

Micha Himmel and Alison Antonowics, Providence District

Julie Ide, Dranesville District

Anne Mader, The Bike Lane

Clara Pizana, Mason District

Fionnuala Quinn, Fairfax Advocates for Better Bicycling (FABB)

Ann Sharp, Braddock District

Steve Still, Fairfax County Transportation Advisory Commission

Charlie Strunk, Fairfax County Department of Transportation

Mark Thomas, County Chairman Sharon Bulova

Bruce Wright, FABB

Acknowledgements, continued

Jeff Palmer, Spokes Etc.

Erik Backus, George Mason University

Dennis Frew, Citizen Representative

Focus Groups

Five focus groups were conducted to gather input and provide guidance on policy matters. Representation of the agencies and organizations involved in the focus group is listed below.

Bicycling and Economic Development

American Diabetes Association, ADA Tour de Cure

Fairfax Advocates for Better Bicycling

Fairfax County Chamber of Commerce

Paul's Ride for Life

Virginia Department of Transportation

School Transportation

Fairfax Advocates for Better

Bicycling Fairfax County Public

Schools George Mason University

Kilmer Middle School

Vienna Elementary School

Wolf Trap Elementary

School

Public Health and Biking

Department of Neighborhood and Community Services Fairfax

Advocates for Better Bicycling

Fairfax County Executive Office

Northern Virginia Health Kids Coalition, Inova Health System Northern

Virginia Regional Commission

Trails for Youth

Acknowledgements, continued

Bicycling Safety Education

Fairfax Advocates for Better Bicycling

Fairfax County Public Schools

Fairfax Police Department, Operational Support Bureau Traffic Division/Traffic Safety

George Mason University

Graham Road School

Inova Health System

Spokes Etc.

Wolf Trap Elementary School

Law Enforcement

Fairfax Advocates for Better Bicycling

Fairfax Police Department, Operational Support Bureau Traffic Division/Traffic Safety

George Mason University Police Department

Northern Virginia Regional Commission

Virginia Department of Transportation

Virginia State Police

Stakeholder Interviews

Two technical stakeholder interviews were conducted to gain insights and inform the development of the recommendations included in this Plan. The participants in these interviews are listed below.

Fairfax Park Authority

Elizabeth Cronauer

Sandra Stallman

Virginia Department of Transportation

Randy Dittberner, P.E., PTOE Fatemeh

Allahdoust

Rob Wilson

Khalil Askaryar

Dic Burke

Tom Folse
Mary Lou Pagano

Acknowledgements, continued

Municipalities

Within the County there are cities and towns with councils, administrations, and in some cases independent planning authorities. Implementing the Bicycle Master Plan will involve coordination with these entities to improve connectivity and expand the bicycle network. To discuss challenges and opportunities, meetings were held with city and town administrators and staff. Participating agencies and departments are listed below.

Town of Clifton

Town Planning Commission

Town of Herndon

Community Development

Public Works

Town of Vienna

Planning and Zoning

Public Works

City of Fairfax

Community Development and Planning Public

Works, Transportation Division

City of Falls Church

Development Services

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Executive Summary

Executive Summary

Introduction

The Fairfax County Bicycle Master Plan (the Master Plan) is a planning initiative of the Fairfax County Department of Transportation (FCDOT). The Master Plan was developed through a two-part bicycle transportation planning process initiated by the FCDOT's Bicycle Program staff. Part One focused on bicycle transportation issues in Tysons. Part Two addressed the full County. The reason for structuring the planning process in two parts was to ensure that bicycle transportation planning for Tysons could be integrated in to the Tysons Urban Center Comprehensive Plan Amendment (2010).

The Fairfax County Bicycle Master Plan supports the 2011 Transportation Policy Plan, and Board of Supervisors' goal, which states, in part:

> *"A keystone policy for future planning and facilities includes achievement of a multimodal transportation system to reduce excessive reliance upon the automobile. Regional and local efforts will focus on planning and developing a variety of transportation options. Sidewalks, trails, and on-road bicycle routes should be developed as alternate transportation facilities leading to mass transit, high-density areas, public facilities, and employment areas."*

The purpose of the Fairfax County Bicycle Master Plan is to provide policies, programs, and physical facility recommendations that support the associated comprehensive plan amendments (see below) and can serve as a guide for county leadership, planning and engineering practitioners, bicycling advocates, and all citizens of Fairfax County. Project components developed as part of the Bicycle Master Plan process include the following:

- **Comprehensive Plan Amendments,** including: a) updated language for the County Transportation Policy Plan; b) minor changes to the Countywide Trails Plan map (2002); c) changes to *Appendix 3: Bicycle and Trail Classification and Definitions*; and d) a new *Appendix 5: Bicycle Master Plan Overview*.

- **The Fairfax County Recommended Bikeway Network Map** covers the entire county and is referred to throughout the Master Plan as the *Bicycle Network Map*. This map provides the long-term vision for a connected network of bikeways and will guide the selection of bicycle facilities as a part of ongoing and future road improvement projects and private developments.

- **The Master Plan** narrative includes a detailed discussion of the recommended Bikeway Network, and a set of policy, programmatic, and implementation recommendations.

The following pages highlight key elements of each chapter in the Fairfax County Bicycle Master Plan:

Fairfax County Bicycle Master Plan Vision and Goals

The Master Plan articulates the vision, goals and objectives for bicycling in Fairfax County. The vision for bicycling in Fairfax County is:

> *Meeting the safety, access, and mobility needs of bicyclists today, while encouraging more people to bicycle in the future…making Fairfax County bicycle friendly and bicycle safe.*

In order to attain this vision, the Master Plan includes the following goals:

1. Develop a safe and connected network of on-road and off-road (shared-use paths and trails) bicycle route options, and other supporting infrastructure, that serve all communities and destinations. This network will consist of shared-use paths, select sidewalks, park trails, neighborhood streets, and collector, arterial, and primary roadways as well as signed routes, bicycle parking facilities, and integration with public transit.

2. Plan, develop, design, construct, and maintain new facilities and accommodations, and upgrade existing facilities to safely and comfortably serve all bicyclists from 8 to 80+ years of age when cycling for transportation or recreation purposes.

3. Increase bicycle use for transportation, especially for non-commute trips, which account for approximately 75 percent of all transportation trips.

4. Establish and track annual progress towards goals for bicycle travel demand and provision of bicycling infrastructure as identified in the Plan.

5. Increase actual bicycling safety and the perception of safety for bicycling on roads and trails in Fairfax County.

The goals are supported by 11 related objectives, as described in Section 1.3: Vision, Goals, and Objectives of the Plan.

The planning process included public involvement, engagement with the offices of County Supervisors, coordination with agency staff and other stakeholders, review of existing plans and field investigation, and compiling of geographic-based data.

Broad public outreach was conducted as part of plan development. The outreach included: a series of eight public meetings in different areas of the County in fall 2011 through spring 2012, a pre-workshop planning meeting held in each of the eight outreach areas involving Supervisor staff and Supervisor District representatives on the Trails and Sidewalks Committee, and two countywide public meetings held in spring 2012. Stakeholder involvement also included: regular meetings with a Bicycle Advisory Committee (BAC) formed specifically for the Master Plan development process; a series of focus group meetings covering economic impacts, biking and health, bike safety education, school transportation, and law enforcement issues; and technical outreach meetings with key stakeholders, including the Virginia Department of Transportation (VDOT) and the Fairfax County Park Authority. For the Tysons Plan (Phase I), a Tysons-specific outreach plan accompanied the planning process.

Bicycling Conditions

Since the turn of the century the County has seen an increase in bicycling activity on county trails, sidewalks, and roads; and residents are bicycling more for both recreation and transportation.[1] The County has many qualities that make it a great place for bicycling, but there are substantial challenges as well. There is great potential for improving and expanding bicycling facilities, optimizing the project programming and implementation process, and enhancing the overall environment for cycling. Physical conditions have a pronounced effect on an individual's choices about where and when to ride. Throughout the planning process, physical conditions were evaluated and considered from four perspectives, including: landscape and development patterns; roadway conditions; trail conditions; and barriers to bicycle travel. These conditions ultimately informed the recommended Bikeway Network, and the policy and program recommendations.

The Recommended Bikeway Network

The Bikeway Network includes both existing bikeways (more than 350 miles) and proposed bicycling improvements (more than 1,100 miles). Recommended facilities include bicycle lanes and other on-road bicycle facilities and treatments, shared use paths, cycle tracks, bicycle/pedestrian bridges and underpasses, intersection improvements, trail access improvements, and other accommodations that will make bicycling a more realistic option throughout the County, and will serve the needs of current and potential future cyclists.

Specific facility types are recommended for specific roadway segments (as indicated on the Bicycle network Map). These recommendations are a direct response to existing conditions and user needs. They also are based on national standards and guidelines, VDOT standards and policies, proven best practices, and the experiences of other jurisdictions in the Washington DC region and around the country.

Bicycle Policy Recommendations

The Master Plan proposes a Bicycle Facility Development Policy that is organized into the following categories: principles, on-road facility selection and design, intersection and interchange policy recommendations, new facilities and accommodations, and transportation trails. Brief summaries of the policy topics are included with a selection of key recommendations. Full descriptions of the topics and all recommendations are included in Chapter 4 of the Master Plan.

Principles - The Master Plan includes a set of seven principles that will help govern the decision making process with regard to implementing Bicycle Network improvements and help ensure that each incremental project is viewed as a contributor to the overall goal of improving bicycling conditions for bicycle travel in Fairfax County. Key principles include the following:

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[1] Bicycling mode share for work commute trips has increased from 0.1 percent (Census 2000) to 0.3 percent (Census 2010).

- The bicycle facility recommendations shown on the Bikeway Network Maps typically represent the facility type that should be installed if action to improve bicycling conditions is to be taken within a five year period from plan adoption.

- Evaluate every roadway development project and land development proffer for its contribution toward achieving the goal of creating a connected network that is safe and functional for bicyclists from ages 8 to 80+.

- While flexibility is needed in bikeway design, flexibility should not be used by developers or transportation agencies for the purposes of providing "lowest cost" facilities at the expense of cyclist safety and comfort and/or network continuity and connectivity.

On-Road Facility Selection and Design – The Master Plan offers general principles governing on-road facility selection and design. Key recommendations include the following:

- In general, bicycle accommodation with some type of striping or markings (i.e., bike lanes, striped/paved shoulders, or shared lane markings in wide outside lanes) are often preferred over unmarked wide outside lanes. Exceptions include roadways without pavement markings or low volume/low speed residential streets.

- When sections of primary arterial roads are resurfaced or reconstructed in revitalization areas, and other areas seeking a traditional main street or urban downtown setting, they should be retrofitted with bicycle facility striping or pavement markings appropriate to the context.

Intersection and Interchange Policy Recommendations – Improving bicyclists' safety and providing accommodations at intersections and interchanges is critical for the County to reach its goals for increased levels of bicycling. The recommendations in this section are also intended to improve safety for motorists. A selection of recommendations from this section includes:

- VDOT should implement bicycle detection (or bicyclist accessible actuation) at all signalized intersections in the designated Bikeway Network, unless they provide green time for each leg on a routine traffic signal cycle (to ensure that bicyclists are able to get a green signal to cross major roadways).

- VDOT should coordinate with the NVRPA and Fairfax Park Authority to ensure clear, consistent and effective safety treatments at signalized and unsignalized mid-block trail/roadway crossings along the W&OD and other major trails.

New Facilities and Accommodations – The network of bicycle facilities recommended in this Master Plan is composed primarily of treatments found the AASHTO Guide for the Development of Bicycle Facilities and VDOT's design guidelines and policies; however, there are two treatments recommended in the Master Plan for a variety of locations that are not yet included in the AASHTO or VDOT guidance, but are being implemented in locations around the Washington, DC region and the country. They are shared roadways with safety treatment and cycle tracks. Additional information on the design and recommended application of all bicycle treatments is included in Chapter 4.

Transportation Trails – Fairfax County's trail and off-road network has over 1,000 miles of multi-modal pathways; however many cyclists seeking to travel for transportation purposes avoid using some or all of the trails along their route due to lack of continuity and connectivity, unsafe path conditions and/or trail conditions that dictate significant speed reductions. To address this issue, the Master Plan identifies a select set of trails, both existing and proposed, for inclusion in the Bicycle Network as Transportation Trails. This designation will enable the county to begin prioritizing existing trails for maintenance and capital improvements and investments in new trails that will serve both transportation and recreation needs. A selection of recommendations from this section is listed below:

- Where sidepaths (a shared use path adjacent to a roadway) are provided along roads where *there are no on-street facilities*, they should be provided on both sides of the street.

- As funding is made available, Transportation Trails should be considered a priority for upgrades, treatments, and management policies that will increase their safety and functionality for transportation use.

Bicycle Program Recommendations

The Master Plan establishes program recommendations that fall into five program categories, including: Develop an Encouragement Program; Bicycle Safety Education; School Transportation; Law Enforcement; and Maintenance. These recommendations are included in Chapter 5 of the Plan.

Implementation

Two topic areas are identified as essential to Master Plan implementation, which are summarized below. As part of the Master Plan, Fairfax County has set aggressive yet achievable targets for Master Plan implementation and overall performance for the ten year period 2015-2024. A summary of each section within Chapter 6 is included below with a selection of key recommendations.

Bicycle Program – Since the early 2000s, the FCDOT has increased its emphasis on bicycling, walking and access to transit by providing staff to address infrastructure and other needs in these areas. To strengthen the FCDOT bicycle program to support implementation of the Master Plan, four key issues should be addressed: staffing, funding, public participation, and division of labor. Several actions are recommended, over a period of five years, to support Master Plan goals, including:

- Explore ways to strengthen the Bicycle Program.

- Allocate an annual budget dedicated to bicycle planning and programming initiatives, and small scale capital projects.

- Establish a permanent Countywide Bicycle Advisory Committee that reports to the Board of Supervisors through the Transportation Advisory Commission.

- Establish a bike parking installation program.

Bicycle Facility Implementation Policy – The VDOT State Bicycle Policy Plan (adopted 2011) addresses a wide range of bicycle transportation and roadway design issues.

During the planning process the consultant team conducted a series of meetings with VDOT staff to better understand these existing policies and practices and VDOT staff attended every BAC meeting and public workshop. As a result the Plan includes a set of recommendations for modifications to current VDOT policy and practice that are consistent with the recommendations made in the new State Bicycle Policy Plan. A selection of recommendations from this section is included below:

- As a part of every resurfacing project, VDOT and Fairfax County should consult the Bikeway Network Plan for potential upgrades to bicycling conditions.

- Fairfax County will identify and prioritize stand-alone shoulder paving projects to be undertaken primarily for bikeway improvements; VDOT should consider paving such shoulders independent of repaving the entire street.

- Request VDOT to consider speed limit reductions where roadway and traffic conditions warrant. Where speed limits are reduced to 35mph or below on bicycle network routes, shared lane markings may be feasible.

Coordination – The Master Plan discusses how coordination is needed regarding the Bikeway Network development and makes recommendations to achieve these ends.

- Within and between FCDOT and VDOT, improved coordination is needed between capital project managers, right-of-way staff, road designers, traffic engineers, pedestrian and bicycle facility planners, resurfacing program managers and roadway maintenance staff, to ensure that the safety and travel needs of bicyclists are met in all aspects of the project development and implementation process, as well as the ongoing maintenance of public transportation infrastructure.

- To ensure network continuity, FCDOT should coordinate bicycle facilities, street design, signed bike routes and other bicycle transportation related activities with the other political jurisdictions within and surrounding Fairfax County.

1 Introduction

1.0 Introduction

1.1 OVERVIEW OF THE PLAN

The Master Plan is organized into six chapters. Following the introduction and background explained in Chapter 1, Chapter 2 provides an overview of the context for the planning effort, briefly describing existing conditions and identifying barriers to bicycle travel in Fairfax County.

Chapter 3 introduces the Bikeway Network with sections on the planning approach and criteria for developing network recommendations. Each of the facilities recommended in the Bikeway Network is presented with a definition and a brief description on its contribution to the Network. The chapter includes the Bicycle Network Map and a summary of facilities organized by supervisor district.

Subarea public meeting
Source: Toole Design Group

During the planning process several policy Briefs were developed to address topics related to bicycle transportation policy, programming and implementation. Each policy brief defines the topic, includes a brief summary of the relevant issues and concludes with recommendations. The policy briefs were adapted into the content presented in Chapters 4, 5, 6:

- Chapter 4 includes the policy briefs that comprise bicycle transportation policy recommendations for the county.
- Chapter 5 includes policy briefs that comprise recommendations for the bicycle program.
- Chapter 6 addresses implementation of the bicycle program.

1.2 PROJECT BACKGROUND AND CONTEXT

The Fairfax County Bicycle Master Plan is a planning initiative of Fairfax County and is managed by the FCDOT Bicycle Program staff of the Fairfax County Department of Transportation (FCDOT).

In 2006, the Fairfax County Board of Supervisors approved the comprehensive bicycle initiative, a program committed to making Fairfax County bicycle friendly. The four primary components of this initiative include:

Creating a county bicycle route map (as of March 2014 three editions have been published);

a) Establishing a full-time staff position devoted to bicycle facility coordination, planning, and implementation;

b) Examining roads and streets that may accommodate on-road bike lanes with minimal reconstruction; and

c) Establishing a pilot program for an interconnected bicycling network.

FCDOT believed that the best way to undertake components c) and d) above was to create a comprehensive, countywide bicycle transportation master plan. Development of the Fairfax County Bicycle Master Plan began in 2010.

Framework for the Plan

The Fairfax County Bicycle Master Plan was designed to address bicycling as a means of transportation throughout the County; for access to bus and rail transit, for commuting to work and school, and for daily transportation needs. It also addresses recreational bicycling to the extent that it takes place on roads and trails that also are used for bicycle transportation. The Master Plan addresses the five Es of bicycling: Engineering, Education, Encouragement, Enforcement, and Evaluation.

The scope of the Master Plan includes consideration of both on-road and off-road bicycling facilities and accommodations. In Fairfax County, bicyclists are legally allowed to ride on all roads except limited-access highways, whether or not the road has a designated bicycle facility. Bicyclists also are permitted to ride on sidewalks.

The Transportation section of the Fairfax County Comprehensive Plan acknowledges that the design and function of a transportation system has the ability to influence growth patterns and lead to more efficient land use in the County. The Comprehensive Plan also states: "roadway improvements cannot be relied upon to provide unlimited transportation capacity for the future, measures to bring about less demand for roadway capacity should be a focus of the County's Comprehensive Plan. It will be impossible to meet travel demand solely by roadways."

The 2013 Fairfax County Transportation Policy Plan, a component of the County Comprehensive Plan, identifies 13 objectives and supporting policies that provide the framework for the future development of the County's transportation system in the face of changing community characteristics and continued population and employment growth. The Fairfax County Bicycle Master Plan supports the 2011 Transportation Policy Plan, and Board of Supervisors' goal, which states, in part:

> *A keystone policy for future planning and facilities includes achievement of a multimodal transportation system to reduce excessive reliance upon the automobile. Regional and local efforts will focus on planning and developing a variety of transportation options. Sidewalks, trails, and on-road bicycle routes should be developed as alternate transportation facilities leading to mass transit, high-density areas, public facilities, and employment areas.*

The purpose of the Master Plan is to provide policies, programs, and physical facility recommendations to aid in the implementation of Comprehensive Plan Amendment PA 2013-CW-T2, as may be adopted by the Board of Supervisors, and serve as a guide for county leadership, planning and engineering practitioners, bicycling advocates, and all citizens of Fairfax County. When implemented, the investments in bicycling infrastructure and programs will make Fairfax County more livable and can help the County and its resi- dents achieve the many benefits of bicycling.

Bicycles parked at Springfield Metro Station
Source: Toole Design Group.

Development of the Master Plan was divided into two distinct steps: Phase I being a bicycle planning effort undertaken for Tysons; and Phase II being a planning effort that addressed bicycling countywide.

Phase I: Tysons

Phase 1 focused solely on the greater Tysons area because of the need for a Tysons Bicycle Plan due to the adoption of the Tysons Urban Center Comprehensive Plan Amendment in 2010, the Silver Line (Metrorail extension), and the numerous rezoning applications.

The Phase I: Greater Tysons Corner Bicycle Master Plan[2] was completed in April 2011 and published as a separate document. This document has been adapted and integrated as part of this Master Plan and is available as a stand-alone reference.[3]

The Phase I document provides detailed bicycle facility, policy, and program recommendations. The goal of the plan is to identify opportunities for integrating bicycling for transportation into redevelopment activities and roadway and trail development initiatives. Enabling bicycling as a transportation choice in Tysons will support transit use and help make greater development densities possible without leading to significantly more traffic congestion. Supporting bicycling as a convenient way to access the new Metrorail stations also will help the Fairfax community maximize its return on investment in the Silver Line. These four new Metrorail stations provide either no or minimal vehicle parking, further supporting both bicycling and walking as viable transportation choices.

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[2] During the planning process this area was known as Tysons Corner. As of 2014 it has become more commonly known as Tysons.

[3] The Greater Tysons Corner Area Bicycle Master Plan can be found online here:http:// www.fairfaxcounty.gov/fcdot/bike/tysonsbikeplan/tysons_final_bike_master_plan.htm.

Phase II: Countywide

The Fairfax County Bicycle Master Plan provides a strategic and multidimensional approach for making bicycle travel a viable transportation alternative for County residents and visitors. It addresses the same bicycling issues taken up in the Tysons phase on a countywide scale.

This Master Plan provides detailed bicycle infrastructure recommendations and describes how bicycle planning and design can be integrated into all transportation improvements and private-sector developments. It identifies and prioritizes both on- and off-road bicycle facilities and provides recommendations for bike parking and other support facilities. The Master Plan provides detailed policy and program recommendations that address bicycle safety education, enforcement, and encouragement programs, as well as linkages to public health, economic development, and school transportation. It includes planning and implementation recommendations that address stakeholder and agency coordination. In short, it will foster a culture of bicycle acceptance and use that is widespread.

Project components developed as part of the Fairfax County Bicycle Master Plan process include the following:

- **Comprehensive Plan Amendment PA 2013-CW-T2** including: a) updated language for the Transportation element of the Policy Plan volume of the Comprehensive Plan, 2013 Edition, Amended through 3-4-2014; b) revisions to the Countywide Trails Plan map (2002) to eliminate bicycle route recommendations that are shown on the Fairfax County Bikeway Network Maps; c) revision of the Transportation element of the Policy Plan volume of the Comprehensive Plan, 2013 Edition, Amended through 3-4-2014 *Appendix 3: Trail Classification to include Bicycle Classifications and Definitions*, and d) addition of a new *Appendix 5: Bicycle Master Plan Overview*.

- **The Fairfax County Recommended Bikeway Network Map**. This map covers the entire county and is referred to throughout the Master Plan as the Bicycle network Map. The map provides the long term vision for a connected network of bikeways and will guide the selection of bicycle facilities as a part of ongoing and future road improvement projects and private developments.

- The Master Plan narrative which includes a detailed discussion of the recommended Bikeway Network, and a set of policy, programmatic and implementation recommendations which are organized by topic.

- The **Fairfax County Bicycle Master Plan Phase 1: Greater Tysons Corner Area**. The document created during phase one of the planning process is considered a supportive and complementary document to the Master Plan. The Quadrant Maps in the Master Plan includes facility recommendations made in the Tysons Plan.

1.3 BENEFITS OF BICYCLING

Bicycle transportation will be an integral element of Fairfax County's future mobility, economic development, public health and environmental sustainability. Walkability and bikeability are important in attracting employers, employees and new residents. An investment in bicycling is an investment in safety, public health, a clean environment, quality of life and economic development that positively impacts all residents, bicyclists and non-bicyclists alike.

Benefits are organized below by theme: safety, congestion reduction, improved air quality and reduced energy consumption, reduced transportation costs, expanded transportation choice, recreational opportunities for enjoyment and health, improved economic competitiveness, and the encouragement and facilitation of mixed-use Transit Oriented Development (TOD).

Enhancing safety for all County residents: Improving the safety of current and future bicyclists in Fairfax County is a fundamental and core element of the Fairfax County Bicycle Master Plan. Safe, clear and consistent accommodations for cyclists enhance safety for all road users, for example, by reducing speeding, delineating roadway space, and encouraging safe interactions between all modes. Physical improvements to roadways including on-road bicycle facilities, bicycle detectable traffic signals, improved and expanded bicycle parking, improved signage combined with education, encouragement and outreach will support and reinforce bicycling as a viable transportation mode. Research undertaken by the Alliance for Biking and Walking shows that areas with more bicycling trips per capita have a lower frequency of bicycle/motor vehicle crashes[4]. As bicyclists are encountered more frequently on roadways, motorists become more accustomed to sharing the road with them.

Addressing transportation congestion: In Fairfax County, approximately one-third of all daily trips are less than three miles in length, a distance easily covered by bicycle in 15 to 20 minutes. Most of these trips are made by automobile, in part due to a lack of safe walking and bicycling facilities. Improved bicycling conditions can play a role in mitigating automobile traffic congestion by providing residents with the option to travel by bicycle. There is little difference in the time it takes to make a short trip by bicycle or by car. Improvements to the on-road bikeway network also have the potential to alleviate bicycle congestion along major shared use paths such as the Washington and Old Dominion Trail (W&OD) and Mount Vernon Trail.

Improving air quality and reducing energy consumption: Increased levels of bicycling can play an important role in reducing fuel consumption, air pollution and carbon emissions. By substituting a bicycling trip for some of these short auto trips, for example to the nearby grocery store, the library, or workplace, residents can reduce the amount of pollutants generated by automobiles. Short trips can have high levels of per-mile emissions, as research shows that an estimated 60 percent of the pollution created by automobile emissions is emitted in the first few minutes of operation.

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[4] *Bicycling and Walking in the United States Benchmarking Report 2010*. Washington, D.C.: Alliance for Bicycling and Walking, 2010. Print.

During summer months, Fairfax County has experienced days where the health-based Clean Air Act standard for ozone has been exceeded. Drivers in densely developed areas tend to experience more congestion, operate at low speeds, and experience extended periods of idling, all of which contribute to inefficient operating conditions for motor vehicles.

Reducing transportation costs: Bicycling offers a lower-cost transportation option, which is particularly important in a time when fuel costs are highly variable. The cost of owning and operating a bicycle for transportation is estimated to be less than four percent of the average cost of car ownership and use. Every motor vehicle mile shifted to bicycle results in a significant cost saving for the individual, which can make a big difference given increasingly tight household budgets.

In 2007, all Fairfax Connector Buses were equipped with front mount bike racks
Source: FCDOT

Providing transportation options: Improving bicycle conditions in Fairfax County will expand transportation choices for the entire community. It will allow those with cars to opt to travel by bike if they so choose, as well as to provide another option for those without access to automobiles. Many people in Fairfax County are dependent on non-auto modes of travel, including children, students, low-income households, people with disabilities, and people who cannot drive for health reasons.

Expanding recreational opportunities for enjoyment and health: The most recent Needs Assessment Study conducted by the Fairfax County Park Authority found that 65 percent of the respondents use trails. Creating a countywide network of bikeways will increase the opportunities for close-to-home and affordable recreation opportunities for people of all ages, and enhance access to the County's many public parks, trails, and other recreational venues. These include the W&OD Trail, Mount Vernon trail, Cross-County Trail, and mountain bike parks at Lake Fairfax, Laurel Hill, Wakefield, and Fountainhead Regional Park. Recreational bicycling also fulfills residents' needs for improving and maintaining their health through routine exercise. The Center for Disease Control and Prevention recommends 30 minutes of moderate physical activity daily. Expanded and improved bicycle facilities and associated support programs will encourage and promote bicycling as transportation, recreation, and exercise.

Improving economic competitiveness: The Fairfax County economy is largely based on companies and government agencies that provide knowledge or information-based services. These firms compete globally for highly educated and skilled workers, who make quality of life a critical criterion when deciding where to live and work. As a result, firms deciding where to locate or expand their activities are increasingly concerned about the lifestyle and amenities that their locale can offer. The transportation and recreational options that a robust bikeway network provides can enhance the attractiveness of Fairfax County, and subsequently increase competitiveness, for these highly mobile firms and their employees.

Encouraging and facilitating mixed-use transit-oriented development (TOD): Investing in bicycle infrastructure and programs will enable Fairfax County to capitalize on its investments in mixed-use transit oriented development. For example, a cohesive and integrated network of on- and off-road bikeways throughout Tysons will enable residents living three miles or less away to access the new Silver Line stations without having to drive to and park at the station. This can increase ridership at the station, while obviating the need to build structured parking garages, Kiss N' Ride lots, and other costly automobile-oriented infrastructure around stations. Over time, shifting the way that people access the stations will influence road designs that in turn will encourage more people to bike, walk and use transit; thereby completing a positively reinforcing cycle.

1.4 VISION, GOALS, AND OBJECTIVES

In the fall of 2011, Fairfax County Department of Transportation Bicycle Program staff and the Bicycle Advisory Committee were charged with developing a vision to provide a concise statement of objectives, policies, and guidelines for implementing the County's goals for improving bicycling as a transportation option as they relate to the future development pattern of the built environment in Fairfax County.

The Vision

The vision statement for bicycling in Fairfax County is:

> *Meeting the safety, access, and mobility needs of bicyclists today, while encouraging more people to bicycle in the future…making Fairfax County bicycle friendly and bicycle safe.*

The Goals

In order to attain this vision, the following goals are established:

1. Develop a safe and connected network of on-road and off-road bicycle route options (shared-use paths and trails), and other supporting infrastructure, that serve all communities and destinations. This network will consist of shared-use paths, select sidewalks, park trails, neighborhood streets, and collector, arterial and primary roadways as well as signed routes, bicycle parking facilities and integration with public transit.

2. Plan, develop, design, construct, and maintain new facilities and accommodations, and upgrade existing facilities, to safely and comfortably serve all bicyclists from 8 to 80+ years of age when cycling for transportation or recreation purposes.

3. Increase bicycle use for transportation, especially for non-commute trips, which account for approximate 75 percent of all trips.

4. Establish and track annual progress towards goals for bicycle travel demand and provision of bicycling infrastructure as identified in the Fairfax County Bicycle Master Plan.

5. Increase actual bicycling safety and the perception of safety for bicycling on roads and trails in Fairfax County.

The Objectives

The goals are supported by the following objectives:

1. Improve safety for bicyclists and transportation system users.

2. Make bicycle travel a viable transportation choice expanding the numbers and variety of people bicycling for transportation.

3. Convert short (less than three miles) single-occupancy vehicle trips to bicycle trips.

4. Enhance bicycle access and connectivity countywide and to neighboring jurisdictions in the Washington metropolitan region.

5. Encourage healthy lifestyles and physical activity through regular bicycle use for transportation and recreation.

6. Ensure that all elements of bicycling are routinely accommodated in the planning and project development, design, right-of-way, and construction phases.

7. Support congestion mitigation and emission reductions. Increase conservation of energy resources and reduce carbon footprint.

8. Encourage public/private partnerships.

9. Foster widespread acceptance of bicyclists as rightful and respected users of the road and encourage the development of bike culture in Fairfax County.

10. Implement the Fairfax County Bicycle Parking Guidelines in order to insure adequate, safe, and convenient bicycle parking for both public and private buildings/sites.

11. Enhance recreational opportunities and promote bicycle oriented tourism.

1.5 THE PLANNING PROCESS

The planning process included a variety of activities including review of existing plans, engagement with the offices of Fairfax County Board of Supervisors, engagement with agency staff and other stakeholders, field investigation, compiling GIS data, and involving the public. A Bicycle Advisory Committee (BAC) was formed specifically for this project and consisted of 26 members including representation from the Chairman of the Board of Supervisor's office, each of the nine supervisory districts within Fairfax County, the Towns of Herndon, Clifton, and Vienna, representation from various departments and agencies, industry representatives, advocacy groups, and citizen representation. This section provides a brief summary of planning activities.

Plan Review

A review of existing plans, policies, maps, as well as visions and goals already established for the County.

Field Data Collection and Data Analysis

An analytical process used to identify recommended improvements that integrated local knowledge with the expertise of professional bicycle transportation planners and engineers who conducted field observations on over 1,000 miles of roadway and trail. Local knowledge was gathered from the project's Bicycle Advisory Committee (BAC), county and Virginia Department of Transportation (VDOT) staff,
existing planning documents and maps, the bicycling public, and the general public at special forums and meetings held throughout the County.

Field work conducted on multilane road
Source: Toole Design Group.

Field observations were gathered via automobile (windshield survey), on bicycle, and on foot. Measurements of existing roadway cross-sections were taken in the field as well as using web-based aerial photography. This data was supplemented by roadway data gathered previously, in 2008, for the purposes of creating the County's first comprehensive bicycle route map.

Public Outreach

Extensive public outreach was conducted as part of plan development. This outreach included the following:

- Eight subarea public meetings were held from fall 2011 through spring 2012.
- A pre-workshop planning meeting was held in each of the eight outreach areas involving Supervisor staff and Supervisor District representatives on the Trails and Sidewalks Committee.
- Four countywide public meetings were held: two in spring 2012 and two in summer 2014.

Stakeholder Involvement

In addition to public outreach, thematic meetings were held throughout the planning process focusing on special topics. This included the following:

- A BAC was specifically formed for this project and met throughout the duration of the process.
- A series of focus group meetings were conducted covering the following topics: economic impacts, biking and health, bike safety education, school transportation, and law enforcement issues.
- Technical outreach meetings were held to engage stakeholders such as VDOT and the Fairfax County Park Authority.

Outreach for Phase I: Tysons

Key elements of the Tysons bicycle network planning process included the following:

- A BAC was established for the project to provide additional guidance and ongoing citizen and agency input throughout the development of the Phase I Plan.
- A public meeting was held in September 2010 to present and gather feedback on the draft bicycle network, bicycle access improvements to future Silver Line stations, and corridor and spot improvements. Feedback from a second public meeting held in February 2011, after the draft Phase I Plan was made available to the public also is incorporated into the Master Plan.
- Additional stakeholder input was gathered through one-on-one and small group meetings with a range of stakeholders.
- The project team engaged and gathered input from various committees throughout the development of the Phase I Plan, including the Tysons Metrorail Station Access Management Study (TMSAMS), Fairfax Transportation Advisory Commission (TAC), Fairfax County Trails and Sidewalks Committee, and the Planning Commission's Transportation Committee.
- The project team and members of FABB participated in a bicycle tour of Tysons in October 2010 to supplement its understanding of existing biking conditions and to discuss proposed recommendations.

2 Bicycling Conditions

2.0 Bicycling Conditions

In line with most jurisdictions in the greater Washington, D.C. metropolitan region, during the first decade of the 21st century, Fairfax County has experienced a significant increase in bicycling.[5] Increased bicycling activity is seen on county trails as well as roads and residents are bicycling more for both recreation and transportation.

2.1 THE BICYCLING EXPERIENCE

As with other suburban jurisdictions in Northern Virginia, Fairfax has a number of qualities that make it a great place for bicycling. The County's extensive network of shared-use paths and mountain bike parks are major draws, and trails like the Washington and Old Dominion Rail Trail (W&OD) and Mount Vernon Trail attract hundreds of thousands of cyclists annually. At the same time, the County's Interstates and major highways can make it hard to bicycle from one neighborhood to the next. Six- lane arterials with 45- to 55-mile per hour traffic present a challenge to even the most skilled and confident riders. Nonetheless, public desires to stay healthy and active, drive less, and enjoy the County's neighborhoods and parks are continually motivating more residents and visitors to bicycle more in Fairfax County.

Bike lane on George Mason University campus
Source: Toole Design Group.

2.2 WHO IS INVOLVED IN BICYCLING

In Fairfax County, cycling involves every sector of the community, from children to the elderly, from Mason Neck to Great Falls. People of all incomes, backgrounds, and educational levels are choosing to bicycle, including construction or service industry workers who ride to their jobs; corporate lawyers who commute by bike to Washington, D.C.; and elementary and middle schools students who ride to school in Vienna, Reston, or Burke.

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[5] Bicycling mode share for work commute trips has increased from 0.1 percent (Census 2000) to 0.3 percent (Census 2010).

Families, youth, young adults and novice cyclists of every age are attracted to cycling on stream valley trails such as along Cub Run, Sugarland Run, Long Branch, Accotink Creek, Burke Lake, and South Run.

Many employers have bike commuter support groups and offer rides for employees. Mountain bicyclists are active in many parks in Fairfax County, including Wakefield Park (FCPA) and Fountainhead Regional Park (NVRPA). Parks like these attract cyclists from other counties as well as local residents, many of whom choose to access the parks by bike rather than driving.

Fairfax County bicyclists (including those in Fairfax City and Falls Church) support more than 30 bicycle shops, not counting the big box department store retailers. More than six bicycle clubs sponsor regular rides in the County while the annual Tyson Grand Prix bicycle race attracts thousands of riders.

Advocacy for bicycling is led by the Fairfax Advocates for Better Bicycling and the Washington Area Bicyclist Association. The Virginia Bicycling Federation, a coalition of groups and individuals that are active at the state level as well as BikeWalk Virginia have a presence throughout Northern Virginia including Fairfax County. The Mid-Atlantic Outdoor Recreation Enthusiasts (MORE) are the leading mountain bicycling support group active in Fairfax County. Vienna, Reston, Herndon, and Fairfax City all have active bicycling advisory groups that encourage bicycling, organize Bike-to-Work Day events, and advocate for road and trail improvements.

Group ride in Springfield
Source: Fairfax Advocates for Better Bicycling.

2.3 PHYSICAL CONDITIONS

Physical conditions have a great effect on bicycling and largely determine who will ride and where. This section summarizes general bicycling conditions on a countywide level. The general landscape, development patterns, roadway conditions, trail conditions and barriers to bicycle travel are considered. This assessment is based upon field observations, map study by the project team (staff and consultants) and input from the Bicycle Advisory Committee (BAC) and public workshop participants.

Landscape and Development Patterns

Fairfax County straddles the fall line that divides the piedmont region from the coastal plain. As such it is crisscrossed by numerous streams that drain both north and south into the Potomac River. This creates a relatively hilly landscape with only a few areas of

plateaus, ridges, or other highlands that are relatively level. The natural areas (mostly park lands) and older communities are fairly heavily forested. The largest wetland areas include Huntley Meadows, Fort Belvoir, and parts of Mason Neck.

The County is more densely developed on its eastern half where the Fairfax communities of McLean, Annandale, Bailey's Crossroads, Springfield, Franconia and Mount Vernon border Arlington, Falls Church, and Alexandria. Vienna and Herndon are older communities which originally developed along the Washington and Old Dominion Railroad line. Tysons is a largely commercial area offering a high density of office employment in a classic suburban setting bordered on two sides by limited-access highways.

Reston is a 20th century-planned community. Fairfax City is in the middle of the County, but is politically autonomous.

The greater Clifton and Great Falls areas are mostly comprised of low-density residential development. The suburban residential developments around Chantilly, Centerville, Fair Lakes, Burke, and West Springfield are low to medium density, with curvilinear street patterns and many cul-de-sacs. These neighborhoods are dotted with schools, parks, and churches. The Lorton/Laurel Hills area is one of the newest residential neighborhoods in the County.

These neighborhoods are served by a variety of neighborhood, community, and regional retail/commercial centers.

General Roadway Characteristics and On-Road Facilities

Most commercial and retail development, as well as multifamily residential is aligned along the historic cross-county arterials, such as U.S. 1, Braddock Road, U.S. 50, Centreville Road, Little River Turnpike, VA 7, U.S. 29, Old Dominion Drive, Columbia Pike, and VA 123. These roadways carry large volumes of traffic and generally do not have bicycle accommodations along them.

Newer cross-county roadways such as the Fairfax Parkway, Reston Parkway, and southern portions of Ox Road are designed with access controls, reverse frontage, and limited intersections. Many sections of these roadways have parallel trails along one side.

Most local residential streets are not laid out in a grid and do not connect with the adjacent development. In parts of Herndon, Vienna, and Springfield there is a semblance of a grid, but it is not extensive. Neighborhood-to-neighborhood connectivity is typically dependent upon collector and minor arterial roadways which may or may not be bicycle friendly depending on traffic volumes, right-of-way width, the era in which the roadway was initially built, and the nature of more recent upgrades.

Multilane road with relatively narrow shoulder
Source: Toole Design Group.

As of 2014, roadways (or segments of roadways) with bicycle lanes include the following:

- Dranesville Road north of Herndon;
- Soapstone Drive;
- Lawyers Road;
- Wakefield Chapel Road;
- Westmoreland Street;
- Gallows Road;
- Huntsman Boulevard;
- Lorton Road;
- Telegraph Road;
- Beulah Street;
- Old Chesterbrook Road;
- Old Courthouse Road;
- Courthouse Road;
- River Birch Drive;
- Oak Street;
- Sully Park Drive;
- Sherwood Hall Lane; and
- Lewinsville Road.

Trail Characteristics and Facilities

Fairfax County has an extensive park trail system that includes paved shared-use paths, crushed stone paths, hiking trails, and mountain bike trails. The Cross-County Trail traverses the entire county from the Potomac River to Mason Neck, and many sections are paved and useful as transportation trails. The W&OD Trail is one of the premier rail trails in the nation, attracting more than 2 million visits a year. The W&OD Trail is heavily used by bicycle commuters due to its connectivity between Herndon and Reston and Arlington and Washington, D.C. Also, the W&OD Trail's level grade and separated crossings of major highways like I-495 make it a popular trail for transportation and recreation.

Bicyclist using fair-weather crossing
Source: Toole Design Group.

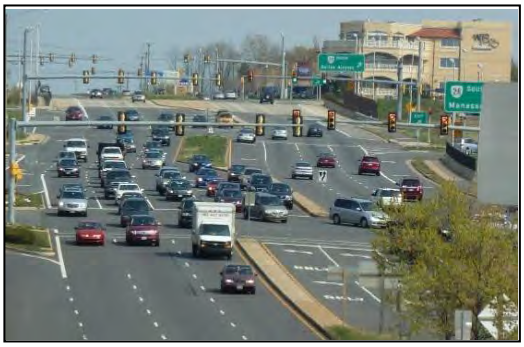
The County also has many miles of sidepaths (asphalt shared-use paths built in the right-of-way adjacent to roadways). Many of these sidepaths are too narrow to serve both pedestrians and bicyclists; others are built to meet the absolute minimum width (6 to 8 feet). Only the newest sidepaths, such as along Ox Road in Springfield, are built to 2012 standards for width (10 feet). A fair amount of the sidepath system has deteriorating surfaces due to age and weathering. Roadway crossings are typically not designed for bicycle safety.

This Bicycle Network plan identifies shared use paths that are most important for bicycle transportation and overall network connectivity. These are covered in more detail under Bicycle Policy Recommendations in Chapter 4. These transportation trail recommendations can be used by the county to prioritize investments in trail rehabilitation projects that will serve both transportation and recreational purposes.

Barriers to Bicycle Travel

Barriers to bicycle travel take various forms, including:

- Interstate and state limited-access highways, including I-66, I-495, I-95/I-395, VA 28, and VA 267 (Dulles Toll Road);
- Railroads, including the Norfolk Southern Line to Manassas and the CSX Line to Richmond, due to infrequent crossing locations;
- Major streams and creeks such as Difficult Run, Holmes Run, Cub Run, Pohick Creek, and Accotink Creek, due to steep and heavily forested ravines or large protected wetlands;



Multilane arterial
Source: Toole Design Group.

- Rivers such as the Potomac River on the north and eastern boundaries of the County, the Occoquan River to the south, and Bull Run; and
- Dulles Airport on the west.

In addition to these major barriers, the large arterial roads that crisscross the County (such as VA 7, U.S. 50, and U.S. 29) can create barriers to bicycling because they are both difficult to cross and difficult to travel along.

Barriers to bicycling have a major impact on the viability of bicycle use for daily transportation because, when faced with the options of going far out of one's way to reach an accessible bicycle route or bicycling across multiple six- or eight-lane arterial roads, people may be compelled to drive instead.

Barriers do not have the same impact on recreational bicycle trips because they are discretionary and routes and destinations are somewhat flexible. However, barriers do reduce overall recreational route options and encourage many people to drive to their favorite bicycling areas rather than bicycle there.

Following is a sample of important community linkages for which bicycle travel is limited or precluded:

1. Access to Tysons is severely limited, especially from neighborhoods to the west, north and east.
2. The W&OD Trail has emerged as a vital bicycle transportation link between Herndon and Reston to the west and Vienna, Tysons, Arlington, Alexandria and Washington, DC to the east, because it is the only viable crossing of the Difficult Run.
3. The Burke and West Springfield neighborhoods south of the Norfolk Southern Railroad and west of Accotink Creek are cut off from Fairfax City, central Fairfax County, Orange Line Metro Stations, Annandale and the Franconia-Springfield Metro Station and the surrounding commercial town center.

4. The Mount Vernon area is cut off from the Franconia/Springfield area by Huntley Meadows and Fort Belvoir.

5. The Centreville/Chantilly area is isolated from much of the rest of the county because of barriers created by US 50, I-66 US 29 and Rocky Run.

6. The Fairfax Center Area including Fair Oaks Mall and the County Government Center are in the center of the County, yet hard to access by bicycle from most of the surrounding neighborhoods, including Fairfax City, which is only 1.5 miles away.

7. Annandale, which is inside the Beltway, is largely cut off from the other parts of the county to the west and south; the W&OD Trail being the only good crossing to the west.

8. Vienna and Fairfax City are separated by I-66 and linked only by one circuitous route through a series of parks and residential developments.

Barriers to bicycle travel can be addressed in a variety of ways, including the following:

- Prioritizing improvements along roads that cross limited-access highways at locations where there is not an interchange;

- Improving bicycling conditions and ramp crossings (on-road, off-road, or both) through interchanges;

- Providing grade-separated bicycle and pedestrian crossings (bridges, underpasses, or tunnels) of highways, railroads, streams, and rivers to make crossing safe and direct;

- Improving at-grade crossings of major arterials that are not limited-access;

- Providing wayfinding bike route signs along neighborhood routes that lead to preferred crossing locations or provide other options for circumventing barriers.

It should be noted that progress is being made to address many of these barriers. The FCDOT, the Fairfax County Park Authority, and the Virginia Department of Transportation have begun including both pedestrian and bicycle facilities on new and rehabilitated bridges. New bridges spanning small streams and short extensions of sidewalks and trails that historically have isolated neighborhood from neighborhood are being added countywide in order to eliminate these barriers.

Trail crossing in Centreville
Source: Toole Design Group

New Wolftrap Road bike-pedestrian bridge connecting neighborhoods.
Source: FCDOT

3 The Bikeway Network

3.0 The Recommended Bikeway Network

Chapter 3 discusses how a recommended bicycle route network and set of roadway and trail improvements were identified as part of this planning process. The proposed network includes bikeway facilities, treatments and other infrastructure components that address current bicycling conditions in the county, including barriers to bicycling, development of transportation trails, on-road bikeways and integration with existing and future development patterns and land uses. The planning process resulted in the facility recommendations identified on the Bikeway Network Maps including the criteria used to select streets and trails for inclusion in the Bicycle Network.

A description of the bicycle facilities and treatments included in the Bikeway Network is provided using the Bicycle Facility Design Toolbox developed for the project. It defines each facility type, describes types of conditions where it is most applicable, describes the role it plays in the overall network, and discusses the extent to which it is recommended throughout the county.

3.1 PLANNING THE BIKEWAY NETWORK

The Recommended Bicycle Network includes both existing bikeways (353 miles) and proposed bicycling improvements (1,130 miles). Recommended facilities include bicycle lanes, other on-road bicycle facilities, shared-use paths, cycle tracks, bicycle/pedestrian bridges and underpasses, intersection improvements, trail access improvements, and other accommodations that will make bicycling more feasible and safer. The Bikeway Network will make bicycling throughout the County a more realistic option for a wider range of people in meeting their daily travel needs.

As indicated on the Bikeway Network Map, specific facility types are recommended for specific roadway segments. These recommendations are a direct response to existing conditions and user needs. They also are based on national standards and guidelines, Virginia Department of Transportation (VDOT) standards, proven best practices, use of emerging designs and technologies, and the experiences of other jurisdictions in the Washington metropolitan region.

Bicycle Facility: a general term denoting improvements and provisions to accommodate or encourage bicycling, including bicycle parking and storage facilities, and shared roadways not specifically defined for bicycle use.

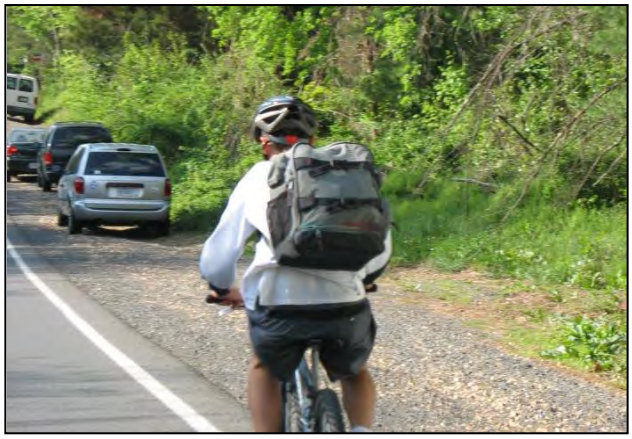
AASHTO Guide for the Development of Bicycle Facilities 2012

Planning at Bicycle Trip Scale

Similar to other counties in the Washington, D.C. metropolitan region, Fairfax County is a large jurisdiction that features many different types of neighborhoods and districts.

Development patterns in Fairfax include: a) areas of high density and mixed land uses; b) areas of low and medium density that are predominantly residential with suburban street layouts; c) areas of light industrial and commercial use; and d) low-density residential and rural landscapes. The opportunities and needs for cyclists are not the same throughout these varied environments. Bicycle trips, especially those made for transportation, are typically local trips, meaning they are usually three to five miles in length.[6] For these reasons, this planning process divided the County into the following nine subareas, which were used to focus fieldwork activities, facilitate public outreach, and address bicycling at the local level:

1. Great Falls/McLean
2. Tysons[7]
3. Herndon/Reston
4. Centreville/Chantilly
5. Central Fairfax
6. Annandale
7. Clifton
8. Burke/Springfield
9. Mt. Vernon



Cyclist riding on road with narrow shoulder
Source: Toole Design Group.

One public workshop was conducted in each subarea. A single fieldwork team was assigned to each subarea as well, allowing them to become familiar with important local destinations and assess conditions and needs at the neighborhood level.

It is important to note that the boundaries of the subareas do not correspond to the supervisory districts but were generally drawn based upon known barriers to bicycle travel and a general understanding of the natural and cultural boundaries between various neighborhoods and communities. They do not align with formal planning areas or supervisor districts. The subareas were established primarily for fieldwork planning and public outreach purposes and are not intended to be used for future planning purposes.

Criteria for Creating a Network

As has been noted, the recommended Bicycle Network is designed to meet the needs of people already riding as well as the needs of potential and future cyclists. The BAC placed a

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[6] Some bicycle commuters make much longer trips, 5 to 15 miles; however, it is expected that the majority of new, future bicyclists in Fairfax County will be making shorter trips.

[7] As mentioned in earlier sections of the Plan, the evaluation of existing conditions and needs for improving bicycling in Tysons was developed separately in the Tysons Corner Bicycle Master Plan project completed in 2010. For the purpose of the countywide planning effort, Tysons was considered a subarea but public meetings and fieldwork were completed during Phase I of the project.

high value on developing a network that will serve the needs and comfort of a variety of cyclists, including children and senior cyclists, novice and experienced cyclists, regular and occasional commuters; students, visitors, tourists, and recreational riders.[8]

As the bicycling population grows in Fairfax County, it is important to recognize that some cyclists will only venture onto busier roads if they are provided with a facility that clearly delineates space in which they can operate, or offers a significant degree of separation from traffic. Some cyclists will avoid roadways with high speeds and heavy volumes, regardless of the accommodations. Some will seek only quiet local streets, and some experienced cyclists will actually prefer arterials because arterial traffic is given priority at minor intersections and arterials typically provide the most direct route.

Source: Toole Design Group.

To address the goals of comfort needs for all cyclists, this plan recommends both improving arterial and collector roadways to accommodate bicyclists and providing trails, sidepaths, and parallel routes along local streets.

Streets and trails were selected for inclusion in the recommended Bikeway Network to create direct, convenient, and logical connections throughout Fairfax County. The Bikeway Network includes streets and trails that cyclists currently use as well as streets they would like to use.

Dividing the County into subareas enabled field data collectors to study three important factors at the same time:

- Specific road segments and their bicycling conditions;
- The location of important destinations and their bicycle accessibility; and
- Potential alternative routes on low-volume streets.

Citizens who participated in the public meetings provided insights into motorist behavior, bicyclist behavior, desire lines to key destinations, favored and challenging routes to specific destinations, gaps in the network and locations of unsigned trails and neighborhood links that were not widely known.

Roadways were evaluated based on total roadway width, number of travel lanes, lane width, road surface, speed limit, presence of a shoulder and surface conditions, surrounding land uses, evaluation of existing bicycle facilities (if present) and overall bicycling conditions. Public and staff input was central to fieldwork efforts, which also

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[8] The BAC used the phrase "from 8 to 80" to suggest that in the long run, riders of all ages and abilities should feel comfortable and welcome to bicycle in Fairfax County.

included mapping and verifying the extent of recent bikeway and trail improvements and noting projects that were under construction. Trails were evaluated based on surface material, surface condition, terrain and grades, width, access, connectivity and navigability. Throughout this study, the professional judgment of the consulting team conducting the fieldwork played an important role in making recommendations.

In general, the recommended Bikeway Network is intended to encourage maximum use and comfort, while fostering safe and responsible riding. While bicycling is legal on all public streets and roads (other than limited-access highways) this Master Plan establishes route development priorities to guide decisions about the types of roadway and trail improvements that are recommended. Specifically, the routes selected for the recommended Bikeway Network were chosen using the following criteria:

- Routes that facilitate bicycle access to important destinations and create overall connectivity are recommended.
- Improvements along various routes are recommended where they will benefit the greatest numbers of people, and/or reduce or eliminate the deterrent effect of poor and unsafe existing conditions.
- Non-arterial routes that parallel arterials are included in the network as alternatives that may serve one set of cyclists, while an improvement on a parallel arterial will serve others.
- Arterial roads and corridors identified as part of the Bikeway Network have recommendations for both on-road and off-road facilities, to ensure that these routes offer appropriate options for all types of cyclists.
- Wayfinding signs are frequently needed to help cyclists find and follow routes that may be preferred for cycling but need guidance to get through neighborhoods built with curvilinear street patterns, to provide guidance to the destinations served by the route and to help cyclists find the best intersections for crossing major arterials, or the bridges and tunnels that provide access across major highways.

3.2 CLASSIFICATIONS FOR BICYCLE FACILITY RECOMMENDATIONS

The bicycle facility recommendations shown on the Quadrant maps are organized by facility type or other classification category to assist map readers. The following section defines each facility type, discusses their application and how they help cyclists, and explains generally where in the County they are located.

It should be noted that most of the major arterial highways upon which bicyclists are not prohibited have been classified as Policy Roads. On the Quadrant maps, a single pre-determined bicycle facility type is not indicated for Policy Roads. The types of facilities that are appropriate on Policy Roads vary based upon the roadway's design and the nature and design of roadside land uses. Policy Roads and the process that should be used to design streets to be comfortable for bicyclists are explained in Section 3.3.

Bicycle Lanes

Definition: Bicycle lanes are pavement markings (lane stripes, directional arrow (optional), and bicycle symbol) that designate a portion of the roadway for the preferential or exclusive use of bicycles. They vary in width from four to six feet; however, the VDOT standard is five feet (four feet if adjacent to a gutter pan).

Contribution to the Bikeway Network: Bicycle lanes are the most prevalent facility recommendation in the countywide bicycle network. This recommendation is found in every portion of the County and is applicable on a wide variety of roadway types, including collectors and minor arterials. Based upon an assessment of existing conditions and the potential for future development along each roadway segment, a variety of actions may be employed to achieve bicycle lanes, including:

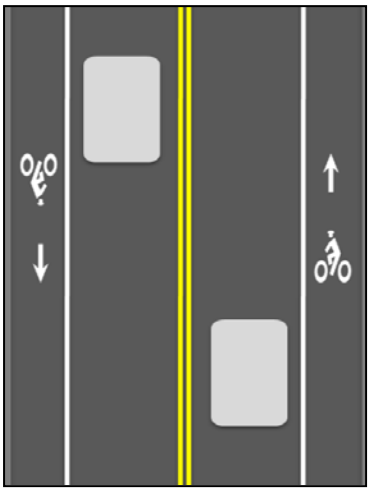


Figure 1: Bicycle lane concept
Source: Toole Design Group.

- Adding striping and bicycle symbols to existing pavements without impacts to motor vehicle travel;
- Reducing lane widths for motor vehicle travel lanes;
- Eliminating one or more motor vehicle travel lanes;
- Reducing on-street parking capacity; or
- Widening the roadway.

In general, many streets and roadways throughout Fairfax County were found to have excess pavement width available to reallocate to bicycle lanes.

Buffered Bike Lanes

Definition: Buffered bicycle lanes are standard bicycle lanes with the addition of a striped buffer zone between a bike lane and the adjacent travel lane. Buffered bicycle lanes provide cyclists added comfort and safety where traffic speeds are higher, 35 to 45 miles per hour. They are recommended along arterials and major arterials, or other high-speed roads where adequate pavement width can be made available for these wider facilities, typically 8 to 11 feet.

Contribution to the Bikeway Network: In addition to buffered bicycle lanes indicated along road segments throughout the County, this facility will be appropriate along many Policy Roads which tend to have higher speeds and more available right-of-way. Opportunities for buffered bicycle lanes are evenly distributed around all parts of the County.

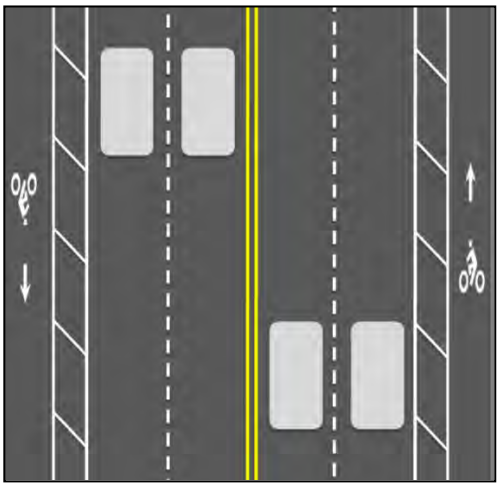


Figure 2: Buffered bike lane concept
Source: Toole Design Group.

Shared-Lane Markings

Definition: Shared-lane markings (sharrows) are pavement markings that help position bicyclists in the most appropriate location to ride in order to safely share the travel lane with motor vehicles. The markings also provide a visual cue to motorists that bicyclists have a right to use the street, and that the limited space available in the marked travel lane must be shared by motorists and bicyclists.

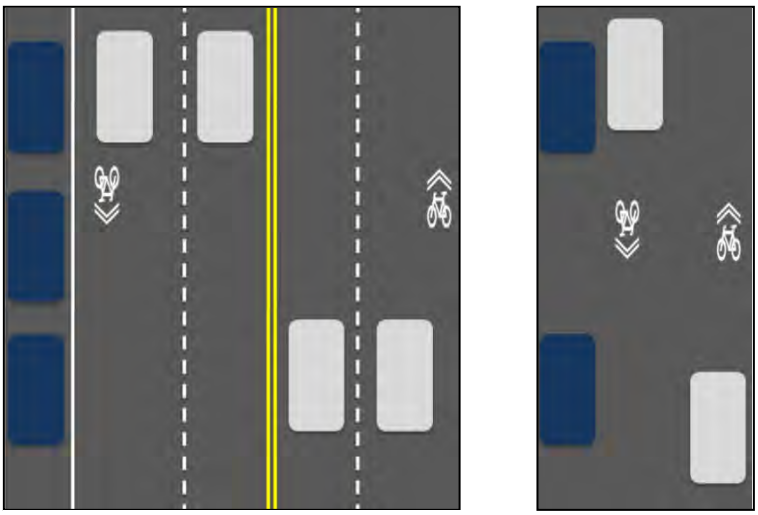


Figure 3: Shared lane marking concepts
Source: Toole Design Group.

Contribution to the Bikeway Network: While shared lane markings are recommended in some locations, especially on collector roadways with more than 3,000 motor vehicles per day, bicycle lanes may be more appropriate. This treatment should be viewed primarily as a retrofit facility that is used when climbing lanes or bicycle lanes are not feasible, rather than a facility type that is optimal in its own right. Shared lane markings should only be considered an optimal treatment on residential collector streets where low traffic volumes make bicycle lanes unnecessary and the placement of shared lane markings can help cyclists avoid traveling in the door zone of parked cars.

Climbing Lanes

Definition: A climbing lane incorporates two facilities on the same roadway segment; a standard bike lane (climbing lane) is provided on the uphill direction to accommodate slow moving bicyclists and a shared-lane marking is provided in the downhill direction, where bicyclists can typically travel at speeds close to motor vehicles.

Contribution to the Bikeway Network: Climbing lanes are typically recommended when:

- The slope of the road segment is significant (greater than three percent) creating a long or steep incline in one direction, or the roadway has an undulating profile over a significant distance, going up and down across a number of stream drainages; and

- There are factors that limit the opportunity to have bicycle lanes in both directions, such as the need to retain parking, the overall limit of curb-to-curb pavement width, or roadside conditions that make roadway widening costly or infeasible.

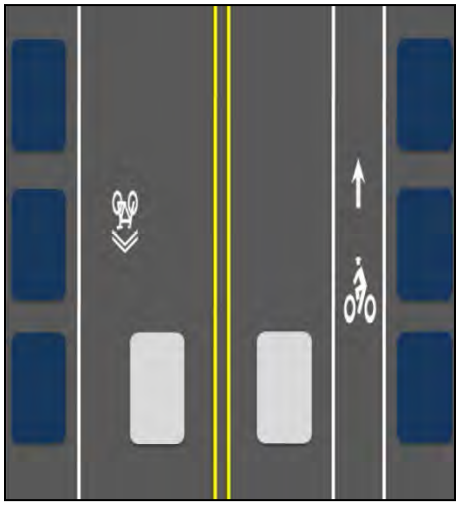


Figure 4: Climbing lane concept
Source: Toole Design Group.

These conditions are found most frequently along collector roadways that traverse large residential developments, especially in the Sully, Springfield, Braddock, and Mason Districts.

Striped Paved Shoulders

Definition: Striped and paved shoulders should be at least three feet wide to provide enough space outside of a travel lane to be beneficial and safe for bicyclists.

Contribution to the Bikeway Network: In Fairfax County, striped and paved shoulders are typically the best treatment along uncurbed roadways (open section) that serve lower density residential communities and pass through undeveloped landscapes. Volumes of bicyclists are typically lower in these settings and bicycle use may be more oriented to recreational and fitness riding than daily transportation. Striped shoulders provide a variety of benefits to all roadway users, whereas designated bicycle lanes are for the exclusive or preferred use by cyclists, which may be unwarranted in these locations. Striped and paved shoulders are also recommended in locations where it appears that roadway widening to achieve 5-foot bicycle lanes on both sides may be too costly or infeasible, and only low volumes of cyclists are expected. In these situations research has shown that three to four feet of striped paved shoulder is more beneficial to the cyclist than simply creating a wide outside lane for cyclists and motorists to share.

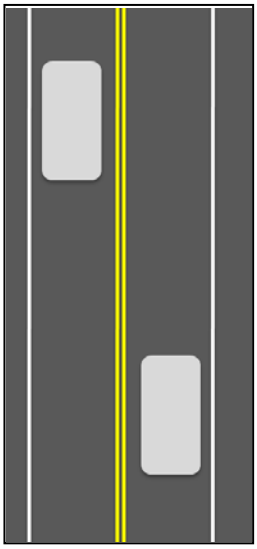


Figure 5: Striped paved shoulders concept
Source: Toole Design Group.

Shared Roadways

Definition: While all on-road bicycle facilities require some level of roadway sharing amongst bicyclists and motorists, the shared roadway is a discrete bikeway type indicating that no special striping, marking or signs are necessary to improve conditions for cyclists.

Contribution to the Bikeway Network: Shared roadways are typically recommended along low-volume residential streets that have been selected for the Bicycle Network because of their contribution to local or countywide route connectivity. Bicycle route signs may be all that is needed to help cyclists understand how these streets can be useful to make a variety of connections while avoiding major arterials or high-traffic roadways.

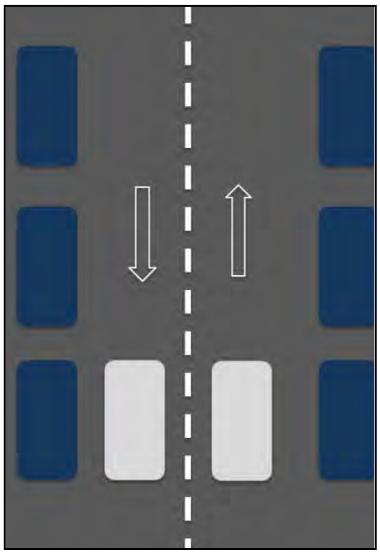


Figure 6: Shared roadways concept
Source: Toole Design Group.

Shared Roadways with Safety Treatments

Definition: Special treatments that are installed along specific sections of narrow, hilly, and/or curving roadways to enhance bicyclists' safety. See below for greater detail.

Contribution to the Bikeway Network: While not a formal bicycle facility type, this treatment is an important one for the Fairfax County Bicycle Network. It is typically recommended along two-lane roadways that lack curb and gutter and have travel lanes of 10 to 12 feet wide, with little or no shoulder. Road sections traverse steep inclines and frequent curves where sight distances are limited. Speed limits may range from 35 to 50 miles per hour except for situational postings at sharp curve or other locations with very poor sight distances. Adjacent land uses are predominantly residential and densities are usually low. The potential to widen these roads is low due to high costs, engineering and environmental issues, lack of right-of-way, and/or the development restrictions resulting from zoning status and/or other factors.

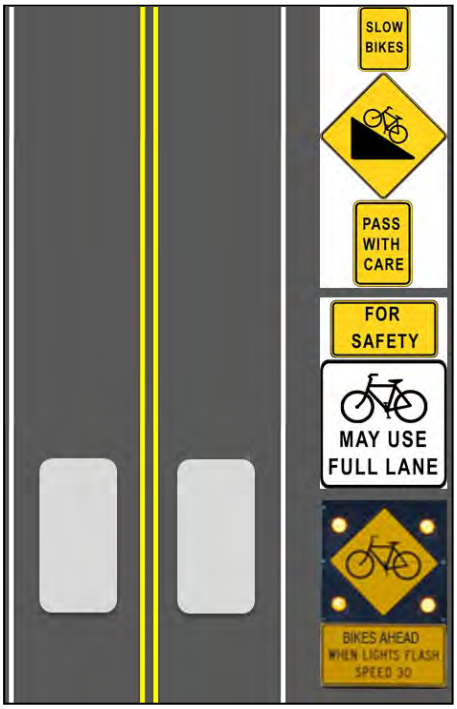


Figure 7: Shared roadways with safety treatment Concepts. Source: Toole Design Group.

To address these conditions the shared roadway with safety treatment may include any of the following design elements:

- Adding one or more short shoulder sections on the uphill section of road (not a continuous shoulder) to provide select locations for a slowly moving cyclist to pull over to the right without stopping and let motorists that may be waiting behind them pass. The bicyclist can then safely merge back into the travel lane where the shoulder ends.

- Installing special signs that alert motorists that they may suddenly come upon slow moving cyclists in the middle of a travel lane, due to limited sight lines and the significant speed differential between a cyclist on a hill and a motor vehicle.

- Installing special signs to remind motorist to pass cyclists with care due to narrow travel lanes and lack of shoulders.

- Installing bicyclist-actuated flashing lights and signs at the base of long, curving, uphill road segments to warn motorists that bicyclist may be present, moving slowing due to steep grades, and hard to see due to curves.

Despite the less than optimal bicycling conditions in many locations throughout the County, hilly and curvy roads remain popular for recreational cyclists, especially in the Great Falls and Clifton areas. Other key locations with these conditions include roads that cross the Difficult Run stream valley and key connecting roads in the Providence, Dranesville, Mason, Lee, and Mount Vernon Districts. In these areas alternative routes

with better cycling conditions may not exist or may add considerable distance to one's trip. In some locations the shared roadway with safety treatment may only be needed along a single segment of road that links other road segments that have adequate or easily improvable bicycling conditions. Examples include:

- Hunter Mill Road and Lawyers Road between Reston and Vienna;
- Beulah Road and Old Courthouse Road between Tyson/Vienna and Great Falls/ Wolf Trap; and,
- Waples Mill/Fox Mill Roads and Oakton Road between Reston/Chantilly and Vienna/Fair Lakes/Fairfax City.

Shared-Use Paths

Definition: Shared-use paths include paved and crushed stone paths and trails that are to be used by both pedestrians and bicyclists. In Fairfax County, these paths are found in a variety of settings, including stream valley trails, rail trails, trails in developed park and recreation facilities, trails around lakes and reservoirs, sidepaths along major roadways, and connected trail systems in residential communities.

Contribution to the Bikeway Network: Recommendations for new and upgraded shared-use paths are distributed throughout the County. Trail system expansion and upgrade recommendations are geared to closing key gaps, improving access to major trails from their surrounding neighborhoods, improving trail linkages to rail transit stations, and otherwise maximizing the utility of the trail system for transportation. Frequently, the trail system provides the only, or best, crossing of a major barrier to cycling, such as the I-495, I-95 and I-66, U.S. 29, Little Hunting Creek, Difficult Run, and other stream valleys.

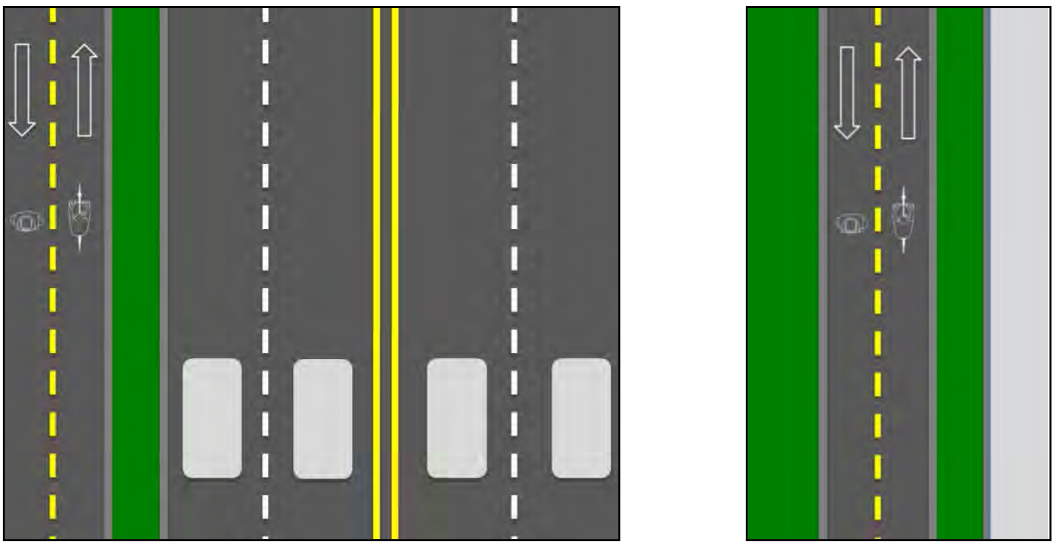


Figure 8: Two concepts for shared-use pathways
Source: Toole Design Group.

Recommendations for upgraded sidepaths along major roadways focus on providing a smooth surface on which to ride or walk that is devoid of bumps and potholes, adding

the standard 5-foot buffered separation from travel lanes and increasing the sidepath width (10 feet preferred, 8 feet minimum).

In addition to the 125 miles of specific shared-use path recommendations, Policy Roads represent key locations where shared-use paths will be the optimum facility, such as along VA 7, both east and west of Tysons.

Cycle Tracks (Separated Bike Lanes)

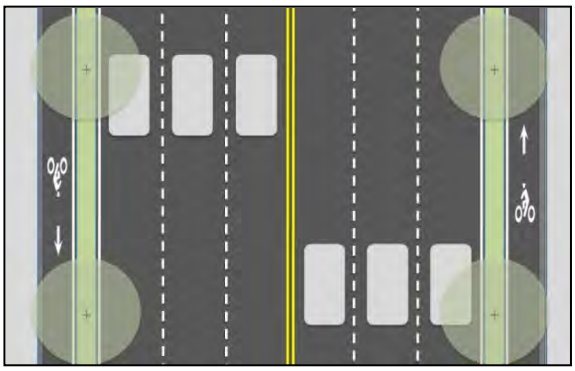


Figure 9: Cycle track concept
Source: Toole Design Group.

Definition: A cycle track is a bicycle facility that is physically separated from both the roadway and the sidewalk. A cycle track may be constructed at the roadway level using roadway space or at the sidewalk level using space adjacent to the road. Cycle tracks separate bicyclist from motor vehicle traffic using a variety of methods, including curbs, raised concrete medians, bollards, on-street parking large planting pots/boxes, landscaped buffers (trees and lawn), and other methods. Cycle tracks that are adjacent to the sidewalk should provide a vertical separation between the bicyclists and pedestrian as well as a different surface/color treatment to delineate the bicycle from the pedestrian space. Cycle tracks can be one-way for bicyclists, and as such, should be provided on each side of a road; or two-way and installed on one or both sides of the road.

Contribution to the Bikeway Network: Cycle tracks provide cyclists with a higher level of comfort relative to motor vehicle traffic. They are typically appropriate on large multilane arterials where higher vehicle speeds and volumes exist. They also may be appropriate on high-volume but low-speed streets where pedestrian volumes also may be significant, such as in a commercial downtown or main street setting.

In Fairfax County, cycle tracks are facilities that are most appropriate for certain Policy Roads especially in mixed-use areas and along road segments that serve high-density development. In these areas, such as along VA 7 and VA 123 in Tysons, along U.S. 1 in Mount Vernon, and along Policy Roads through Bailey's Crossroads, Seven Corners, and Annandale, separation from both pedestrians and high-speed/high-volume motor vehicle traffic is important for bicyclists' safety and comfort.

Grade Separation

Definition: Grade separations include bicycle/pedestrian bridges, tunnels, or underpasses. They are necessary for crossing railroads, streams and rivers and other features of both the built and natural landscape. They are the preferred way to address bicycling barriers created by major highways.

Contribution to the Bikeway Network: Six of the new grade separation recommendations identified in this plan are relatively small in nature and can be

achieved through routine engineering and design efforts at modest or low cost. Approximately 26 are major facilities that will need to be planned and budgeted for in strategic fashion. Grade separations provide a significant safety, convenience, and efficiency benefit for both bicyclists and pedestrians, for recreational uses and transportation trips.

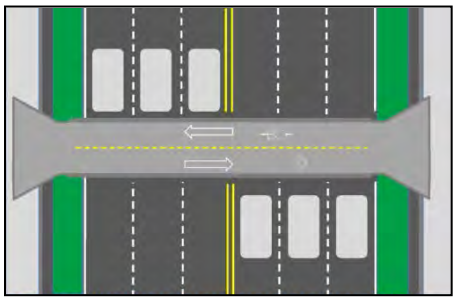


Figure 10: Grade separation concept
Source: Toole Design Group.

Figure 11: Grade-separated rendering
Source: Toole Design Group.

Bicycle Links

Definition: Bicycle Links are spot improvements such as the following:

- Installing short path segments;
- Installing new or improved curb ramps to serve wheeled users;
- Modifying fencing, bollards or other barriers to improve access for all types of cycling equipment while preserving the lack of access for motor vehicles;
- Improving access through/around school or other parking lots; or
- Installing stairways with bicycle rolling trays for locations with steep grades.

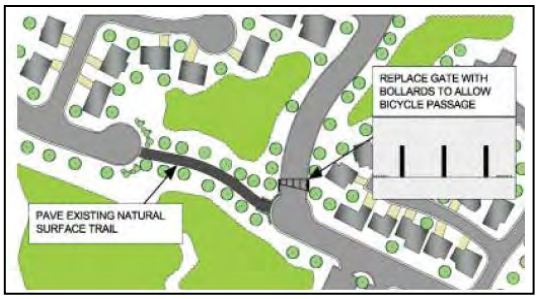


Figure 12: Bicycle link concept
Source: Toole Design Group.

Figure 13: Rolling tray rendering
Source: Toole Design Group.

Contribution to the Bikeway Network: These types of spot improvements are distributed throughout the County, however many are clustered in and around Tysons due to the need to improve access to the new Silver Line Metrorail stations and this major employment and retail hub.

Trail Access Improvements

Definition: This class of spot improvement is similar to bicycle links, however the purpose is always to improve access to or along the County's major paved trail and pathway systems. Trail access improvements can include the following actions:

- Constructing short path segments;
- Paving short unpaved path segments;
- Repairing damaged pathway segments;
- Upgrading existing paths that connect neighborhoods and trail systems;
- Installing small bridges or culverts to cross-feeder streams; also conversion of fair weather stream crossings to all weather crossings;
- Installing curb ramps; and
- Installing rolling trays along stairways that provide trail access.

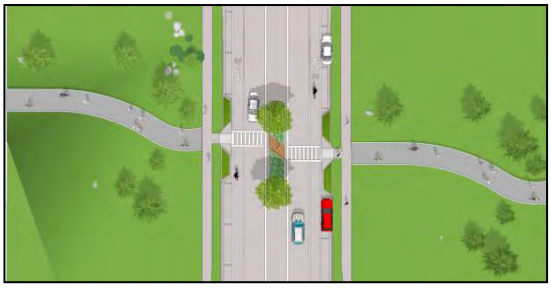


Figure 14: Trail crossing concept Source: Toole Design Group.

Contribution to the Bikeway Network: Recommendations for trail access improvements are found throughout the County.

Transit Station Improvements

Definition: Recommendations to improve bicycle access to rail transit stations and park-and-ride lots address issues such as the quantity, quality, and security of bicycle parking, as well as on-road and off-road access issues in and around station areas.

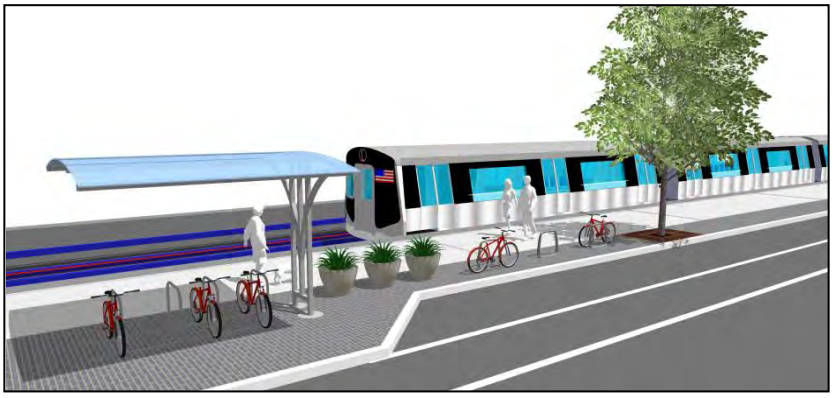


Figure 15: Rendering of covered bicycle parking at a transit station
Source: Toole Design Group.

Contribution to the Bikeway Network: Recommendations for transit station improvements are found throughout the County. Examples of recommended improvements include the following:

- Installing bicycle parking racks or lockers – this may be installing equipment where none exists or adding equipment to increase service capacity;
- Replacing equipment that is damaged or unusable, or moving equipment to a more convenient location;
- Installing covered bicycle parking to replace or complement uncovered bike parking equipment;

- Installing new equipment to offer a higher grade of security;
- Installing high-capacity, high-security bike parking similar to the Wiehle-Reston East Metrorail Station Bikeroom, WMATA's Bike-and-Ride Centers, or a multiservice, staffed, bicycle parking station;

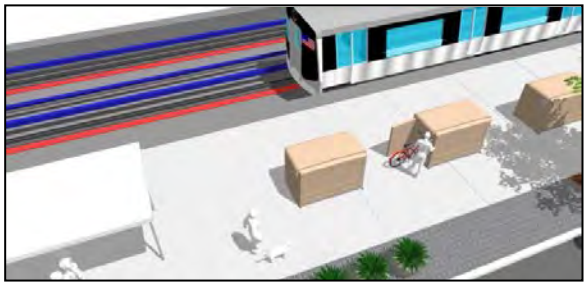


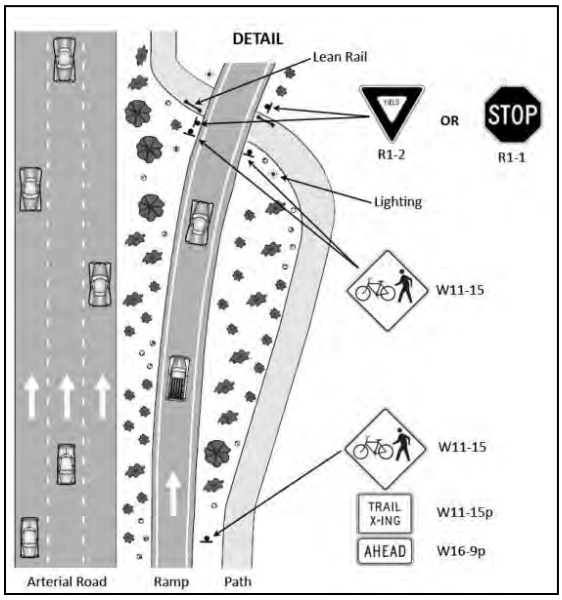
Figure 16: Rendering of bicycle lockers at a transit station
Source: Toole Design Group.

- Improving access to the station with short path improvements, crosswalks, curb ramps, on-road bikeways along station access roads or through parking lots, or other facilities to enhance safety and accommodation for cyclists; and
- Install bicycle wayfinding signage and include distance and/or times to the destination.
- Providing pedestrian and bicycle railroad crossing accommodations to facilitate rail station access from both sides of the tracks.

Interchange Improvements

Definition: Interchange improvements include on-road or off-road improvements to enhance safety for cyclists that must cross free-flow on- and off-ramps. These improvements can include enhanced crosswalks, installation of curb ramps, warning signs for motorists, and/or installation of green bicycle lanes through the potential conflict zones.

Contribution to the Bikeway Network: Improvements are recommended at a majority of the locations where Bicycle Network roadways, including Policy Roads, pass through interchanges with limited access or other major highways.



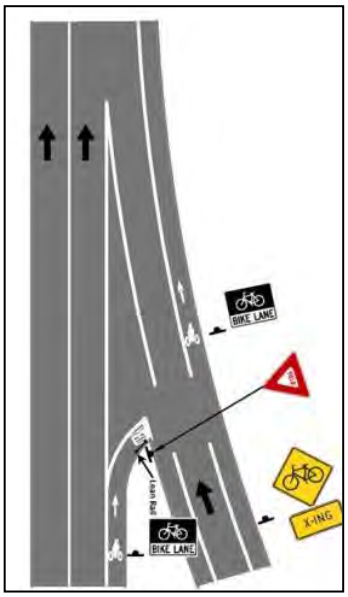


Figure 17: Concept drawings for bicycle facility improvements at interchanges
Source: Toole Design Group.

Intersection Improvements

Definition: Intersection improvements include a wide range of treatments, including on-road bicycle lanes through intersections, installation of new or upgraded facilities for midblock trail crossings, enhancement of trail crossings through already signalized intersections, bicycle boxes for left turn movements, and queue boxes for two-stage left turns.

Contribution to the Bikeway Network: There are 436 locations along the Bicycle Network where on-road treatments may be warranted, many of these are standard signalized intersections. Typically, improvements at intersections should be made at the time that on-road bicycle facilities are installed; however, they also can be made independently.

There are 60 locations where transportation trails cross arterial or collector roadways and improvements for bicycle and pedestrian trail traffic are needed. It should

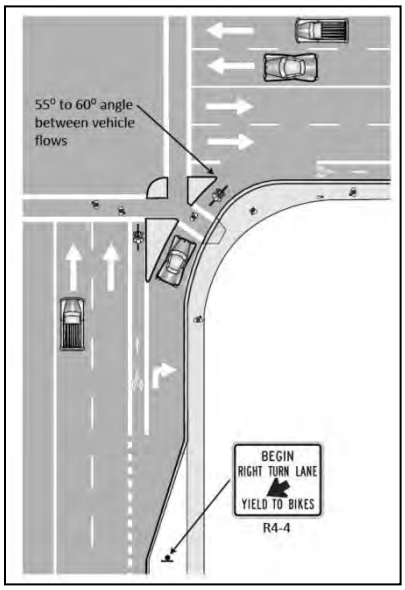


Figure 18: Concept of intersection improvement
Source: Toole Design Group.

be noted that many intersections in Fairfax County are deficient in some way, such as a lack of crosswalks marked on each leg of the intersection, signal actuators that do not detect bicyclists or are not convenient for cyclists to activate, or a lack of curb ramps to enable safe navigation. It also is important to note that due to the practice of laying out minor neighborhood streets so that they are offset where they meet arterial roads, and the practice of using medians to prohibit crossings between signalized intersections, many Bicycle Network crossings must be improved simply to make it legal and possible to cross at the location that is most logical and convenient.

3.3 POLICY ROADS (ROADS REQUIRING FURTHER STUDY)

This plan identifies a set of primary arterial roadways that are considered part of the Bicycle Network as "Policy Roads." On the Fairfax County Bicycle Network Map, these roads may not have specific bicycle facility recommendations because the facilities selected for these roads must be made in conjunction with other roadway planning and land development factors (e.g. Area Plan updates and amendments, Transportation Corridor/Multi-Modal Studies).

In general, these roads are multilane highways and/or have relatively high posted speed limits (greater than 40 miles per hour). Other than the limited-access highways in the County, they carry the largest volumes of daily traffic, including buses and trucks. They also have a wide range of characteristics that other roads in the county usually do not have, such as large interchanges, service roads, lengthy merge lanes, large numbers of commercial entrances, and/or intersections with multiple right and/or left turn lanes. These roads traverse a wide variety of land use contexts. In most cases, these roads provide the most direct connection to and between major destinations in the County. Future upgrades to these roads will be driven primarily by traffic management needs and opportunities and needs created by major development or redevelopment in the corridor.

Safe bicycle travel will need to be accommodated on these roads as they are considered to be part of the Bicycle Network. Selection of facility or facility combinations should be coordinated with other key planning decisions made regarding the roadway's capacity and operation and the development that occurs along it; specifically the type and configuration of the development and the size and type of roadway selected. At the time of developing the Bicycle Master Plan, these choices are difficult to predict. As a result, guidance contingent on these other factors has been developed.

Recommendations

- Transportation planners and engineers at FCDOT, VDOT, and developers should use the maps and Table 3.1 to determine how best to accommodate safe bicycle travel on a select set of roads designated as Policy Roads. Facility and design recommendations in Table 3.1 include options which are contingent upon the choices that will be made regarding overall roadway and corridor design, adjacent and surrounding land uses, and development form.

- Project reviewers should refer Table 3.1 when identifying the appropriate bicycle facility type for a Policy Road.

Table 3.1 Facility Selection and Design Table for Policy Roads

Predominant Development Character Adjacent to Road and in Road Service Area	Predominant Policy Road Zoning Categories	Condition 1: Facility Recommendation	Condition 2: Facility Recommendation
Residential – Low Density	R-A through R-E; R-1 through R-8; PDH, PRC	Housing faces street with frequent driveways: • Sidewalks and standard or buffered bike lanes depending on speed limit. Where curb and gutter and sidewalks are not provided, a three- to six-foot striped/paved shoulder (depending on speed limits) may be sufficient for cyclists and pedestrians.	Housing does not front on main road; predominantly oriented to and accessed by side streets: • Eight-foot shared-use paths on both sides of the road, and – Minimum six-foot shoulders if speed limit is ≥40 miles per hour; or – Minimum three-foot shoulders if speed limit is <40 miles per hour. • On two-lane open sections, where paths are not feasible due to terrain, forest cover and/or right-of-way constraints, shoulders may be the only bicycle accommodation.
Residential – Medium to High Density	R-12 to R-30; PRM. PDH, PRC	If service roads are present or planned: • On-road bike lanes or shared-lane markings in service road. • Ensure that service roads are connected with curb ramps and trail segments.	Without service roads: • Speed limit of 25 miles per hour – standard bike lanes or shared-lane markings. • Speed limit of 30 or 35 miles per hour – standard bike lanes. • Speed limit >35 miles per hour – cycle tracks or buffered bike lanes.
Mixed Commercial and Residential	A mix of any of the commercial, residential, industrial, and/or mixed-use zoning categories.	Using the principles for Bikeway Network development set forth in this Plan, and applicable Plan guidance regarding facility selection (including applicable guidance provided in this table) planners and engineers may provide a mix of facility types as conditions change over the course of the roadway segment. Issues that should be considered in facility selection and design include making best use of existing facilities, the need to upgrade existing facilities, availability of right-of-way, roadway geometry, presence of transit service, character and speed of traffic, character and conditions of the road edge and existing/planned land uses immediately adjacent to each roadway segment. Providing continuity for bicycle travel is required and transitions between facility types must be well designed. Bicyclists and pedestrians must be accommodated on both sides of the road.	

Predominant Development Character Adjacent to Road and in Road Service Area	Predominant Policy Road Zoning Categories	Condition 1: Facility Recommendation	Condition 2: Facility Recommendation
Commercial	C-1 through C-9; PDC, PTC; I-1 through I-6	If service roads are present or planned: • On-road bike lanes or shared-lane markings in service road. • Ensure that service roads are connected with curb ramps and trail segments.	Without service roads: • Where short-term on-street parking is provided, consider bike lanes or shared-lane markings (risk for "dooring" is a key factor). • Speed limit of 25 miles per hour – standard bike lanes or shared-lane markings. • Speed limit of 30 or 35 miles per hour – standard bike lanes. • Speed limit >35 miles per hour – cycle tracks or buffered bike lanes.

3.4 THE RECOMMENDED BIKEWAY NETWORK MAPS

The Fairfax County Recommended Bikeway Network Map covers the entire county and is referred to throughout the Master Plan as the Bicycle Network Map. The map provides the long-term vision for a connected network of bikeways and will guide the selection of bicycle facilities as a part of ongoing and future road improvement projects and private developments. Due to the size of the map, it can be viewed on the FCDOT website.

On the following pages, figures 19 – 28 show the Recommended Bikeway Network Maps by each of the Supervisor Districts plus Tysons.

Figure 19: Recommended Bikeway Network Map
Braddock Supervisor District

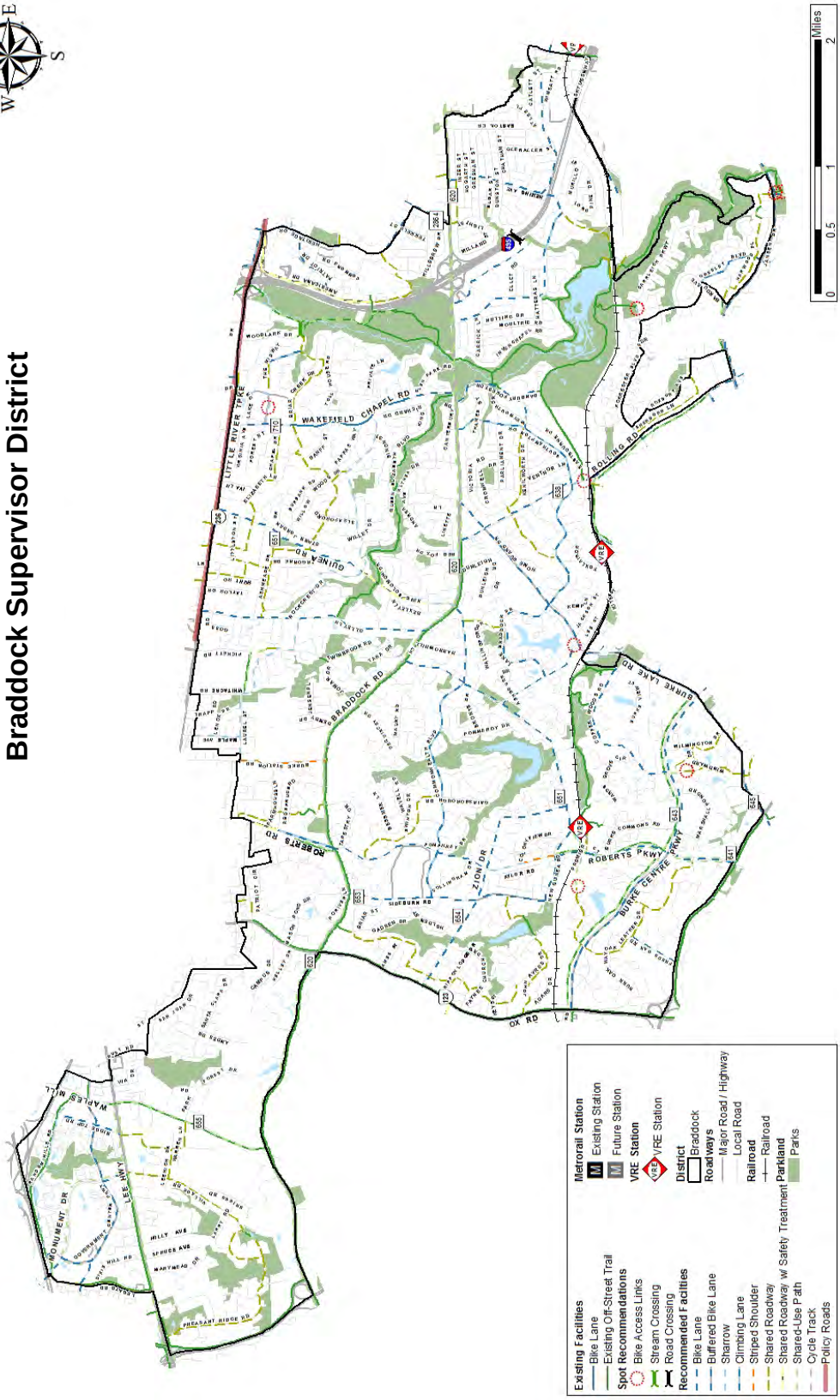


Figure 20: Recommended Bikeway Network Map
Dranesville Supervisor District

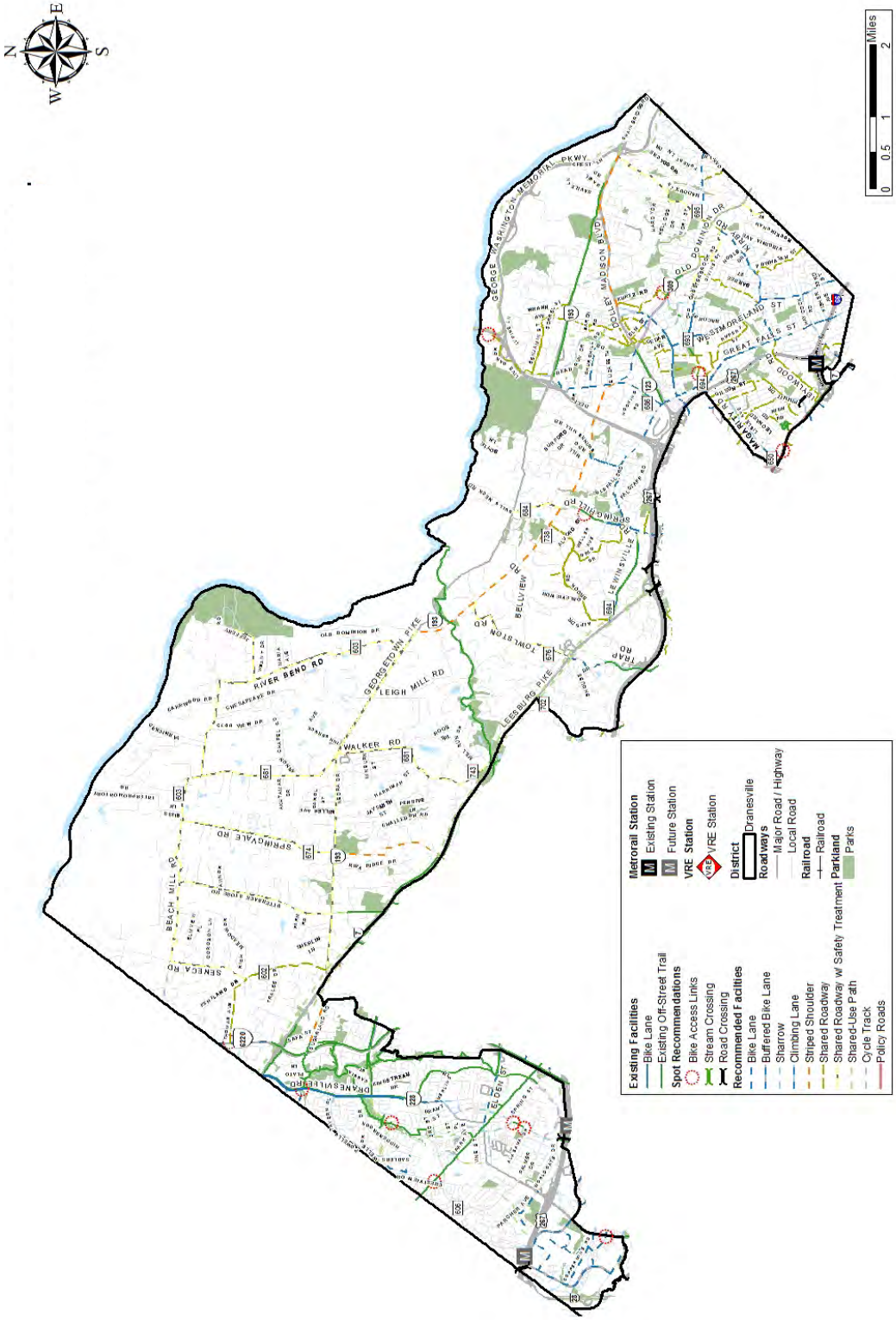


Figure 21: Recommended Bikeway Network Map
Hunter Mill Supervisor District

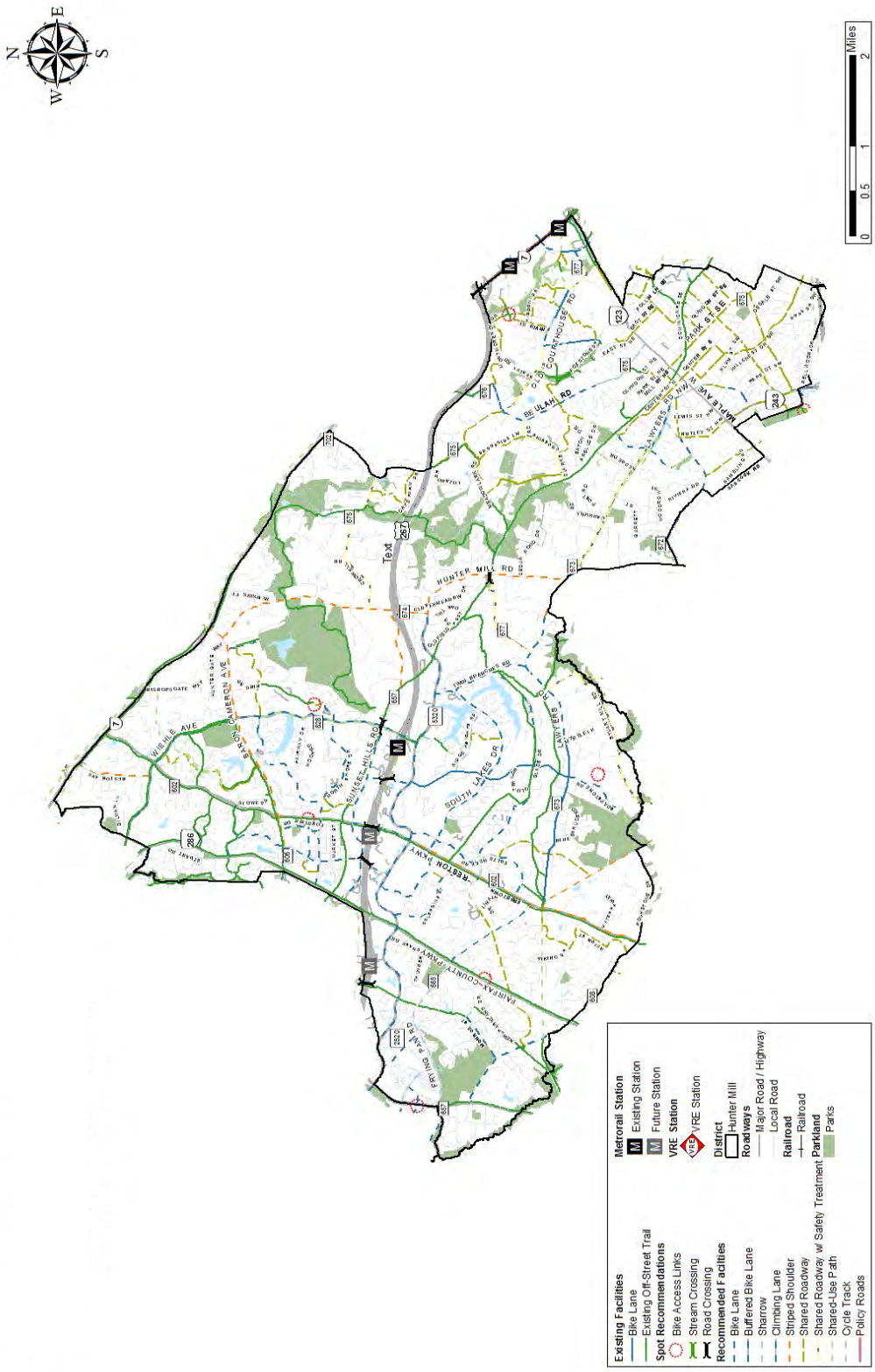


Figure 22: Recommended Bikeway Network Map
Lee Supervisor District

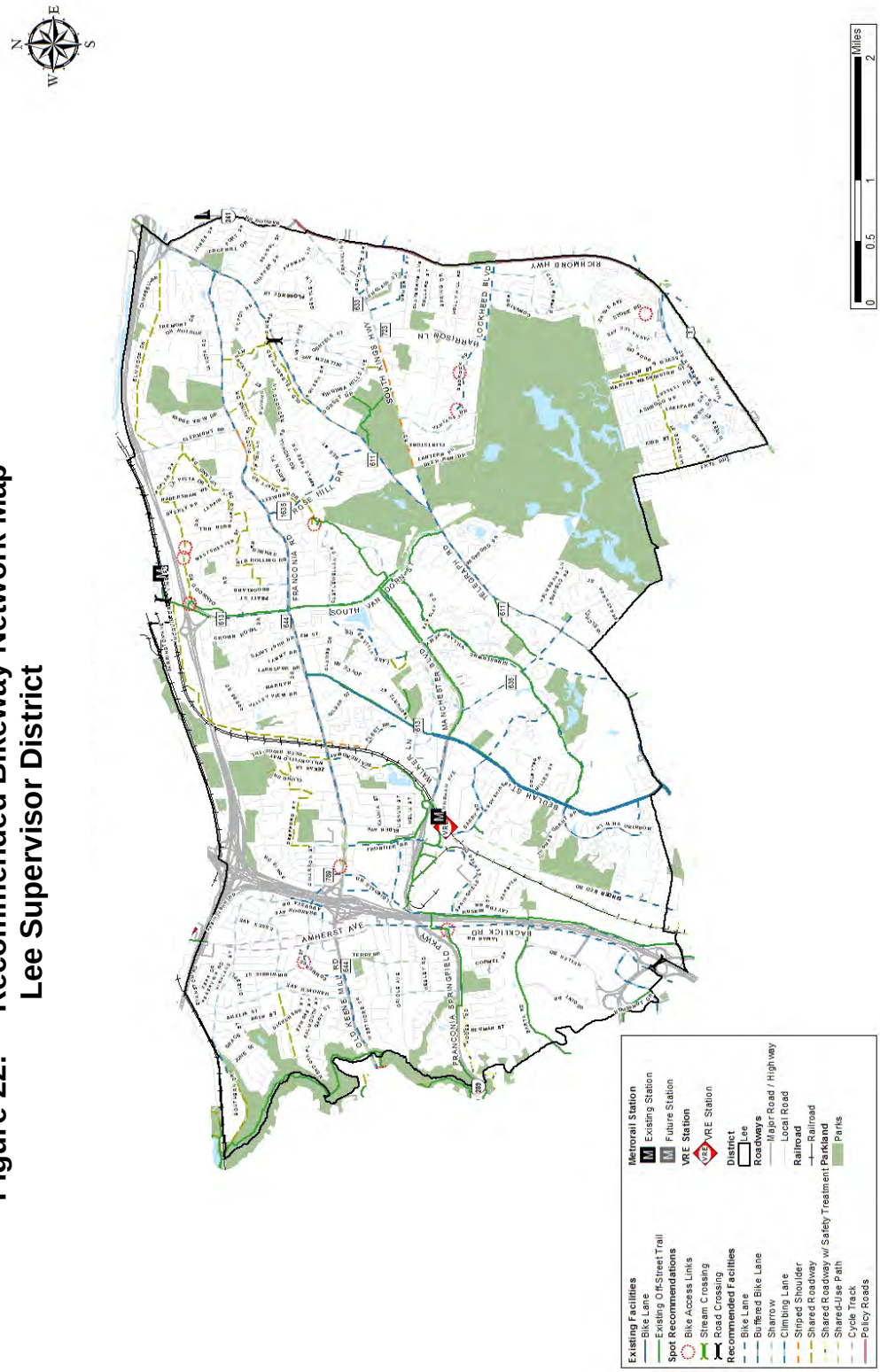


Figure 23: Recommended Bikeway Network
Mason Supervisor District

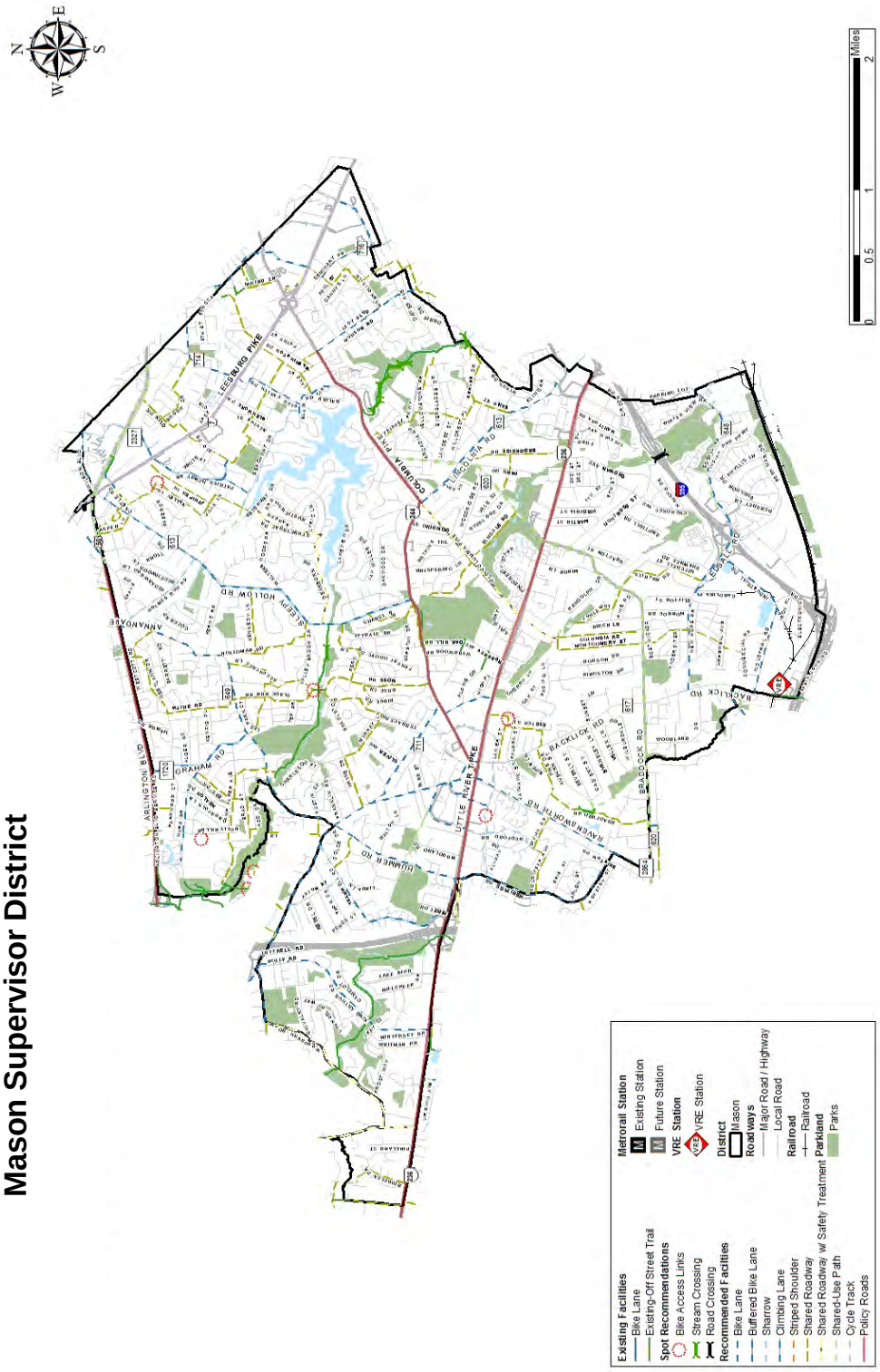


Figure 24: Recommended Bikeway Network Map
Mount Vernon Supervisor District

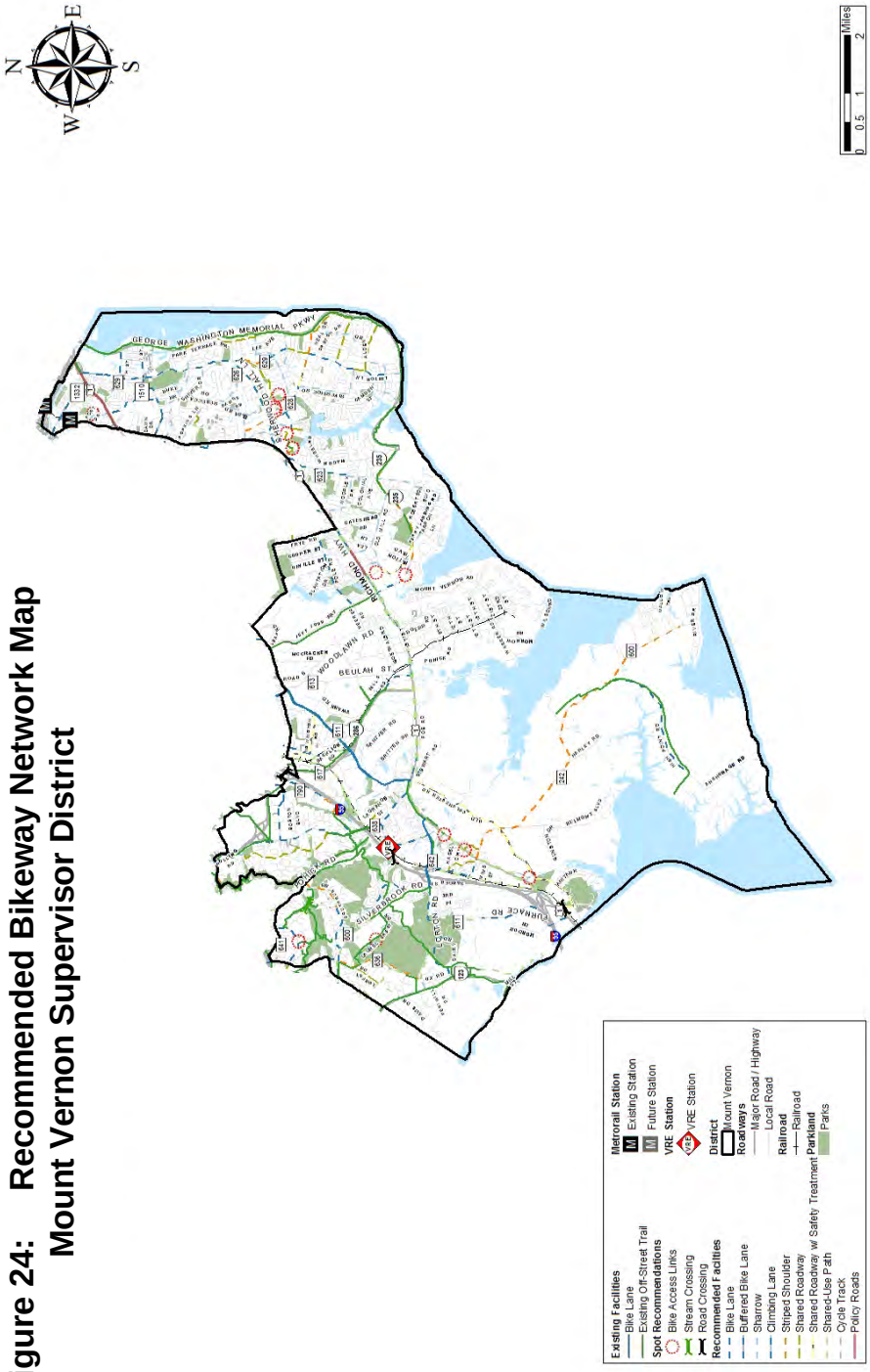


Figure 25: Recommended Bikeway Network Map
Providence Supervisor District

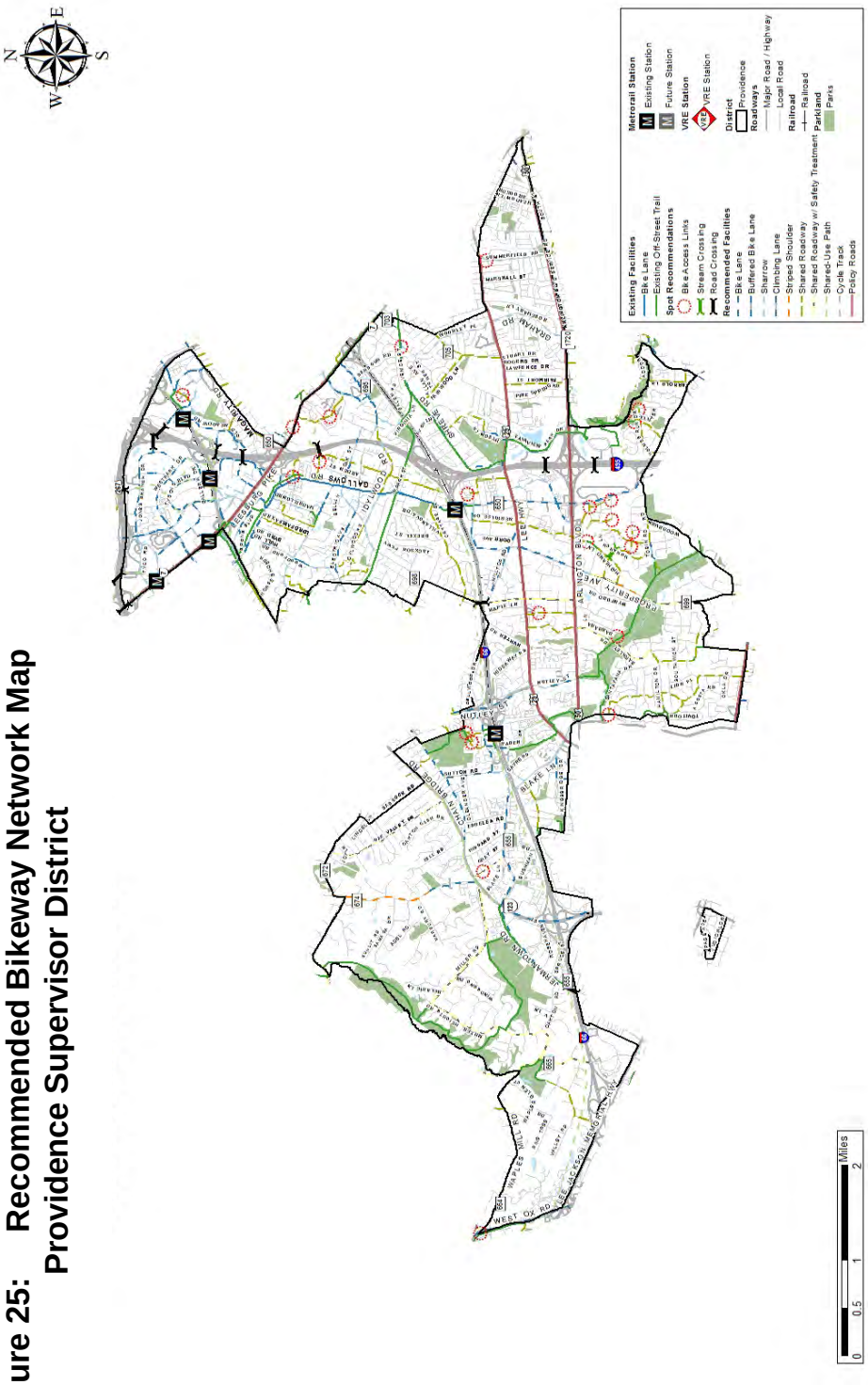


Figure 26: Recommended Bikeway Network Map
Springfield Supervisor District

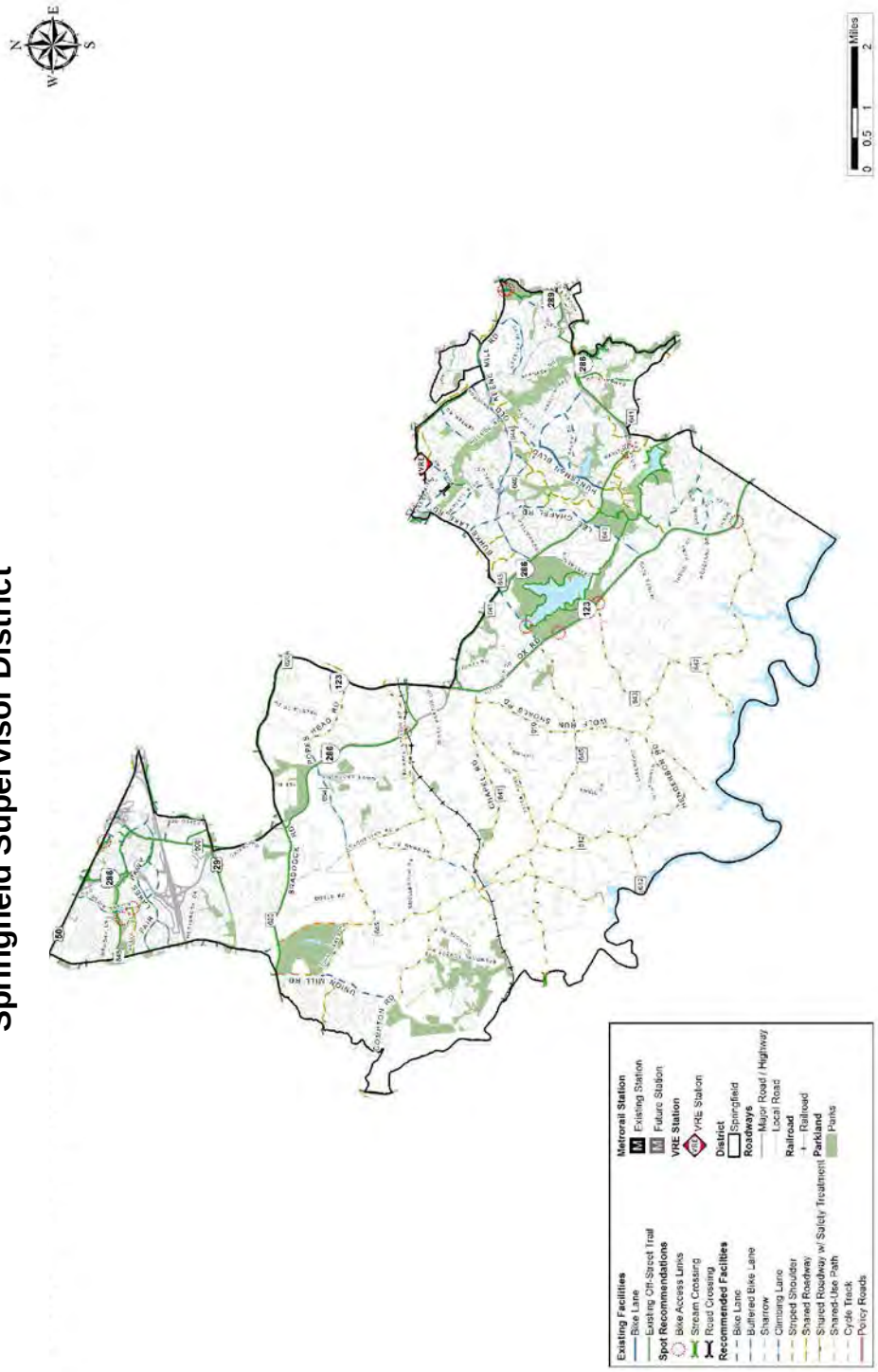


Figure 27: Recommended Bikeway Network Map
Sully Supervisor District

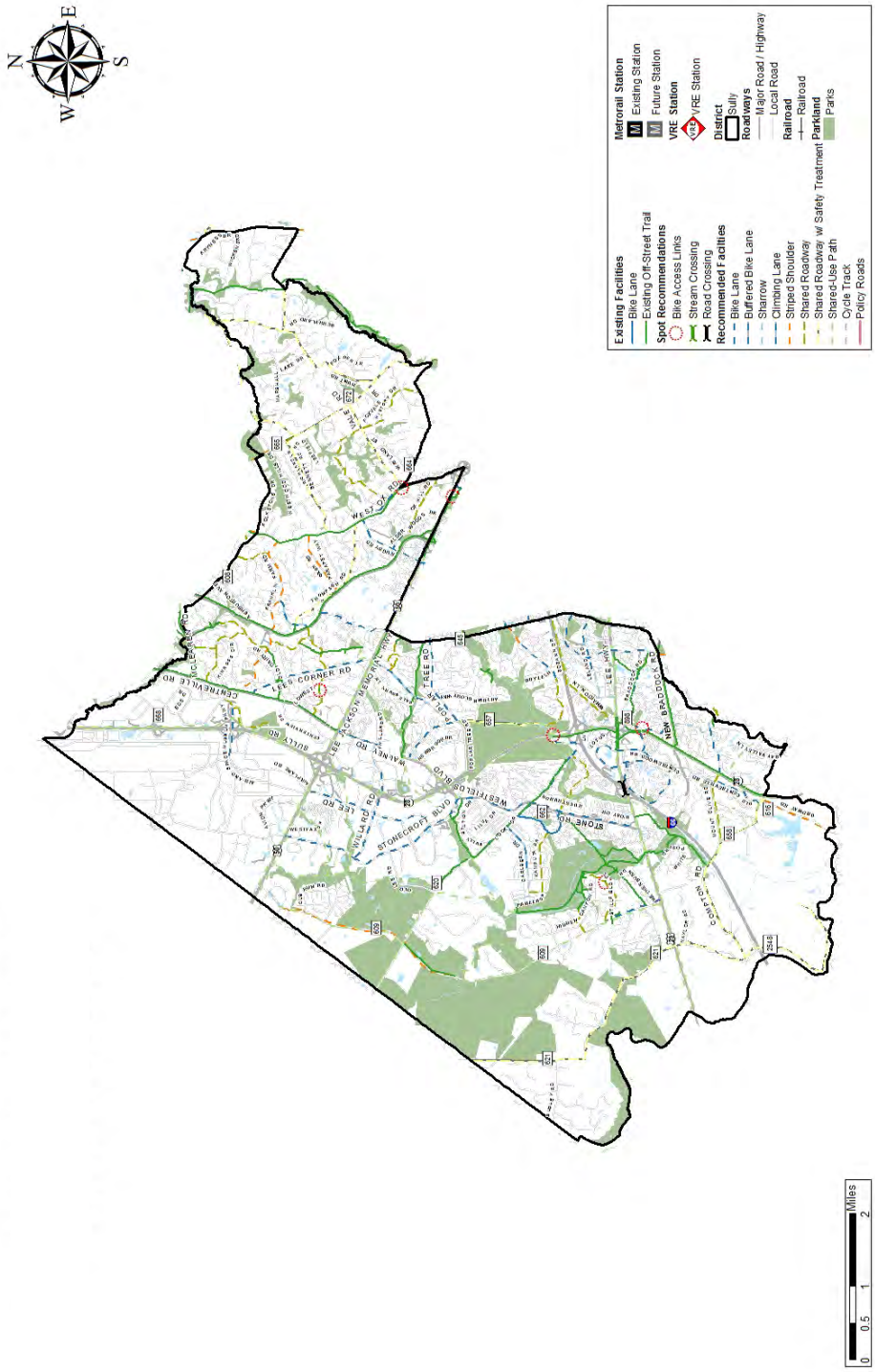
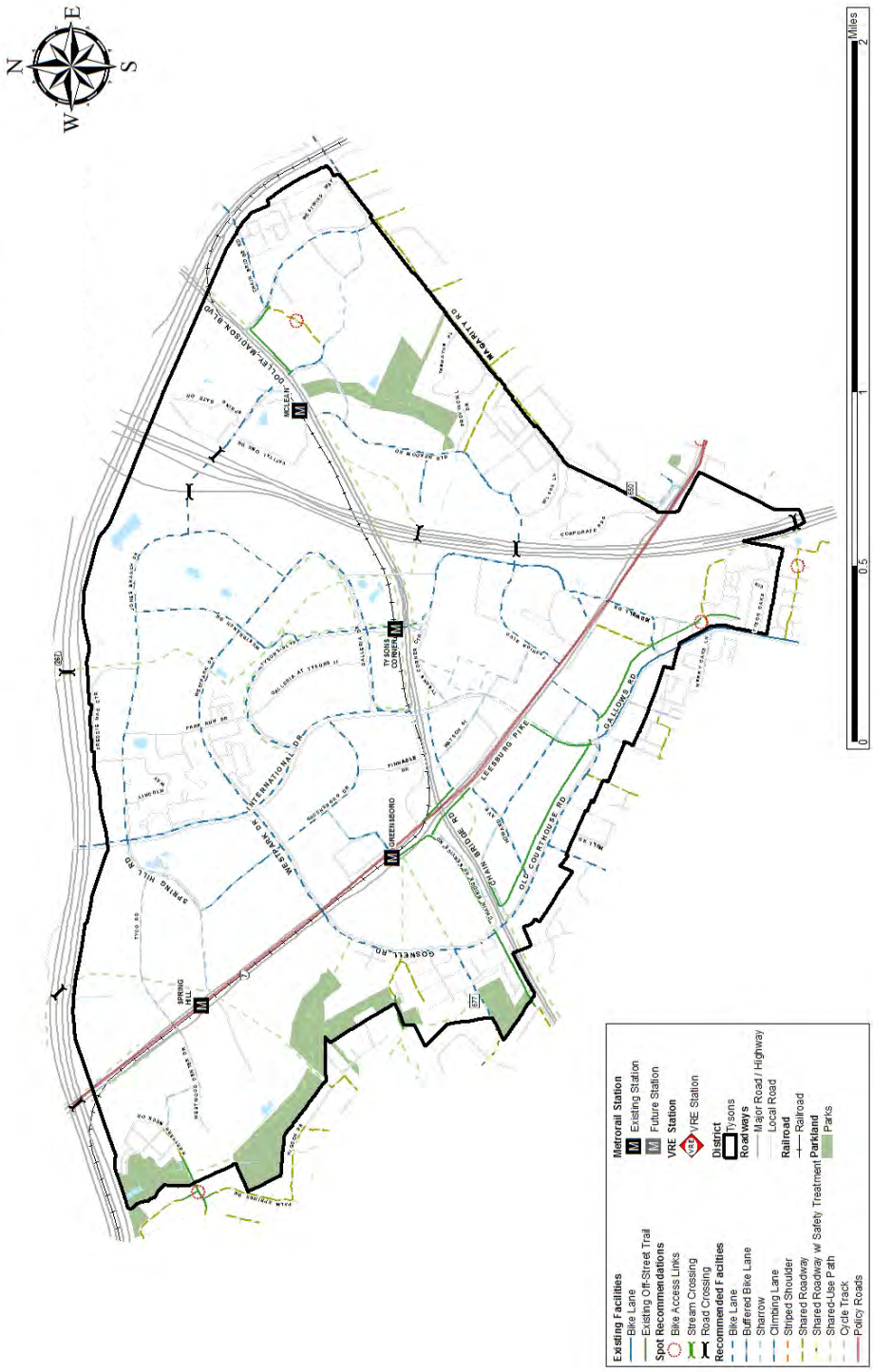


Figure 28: Recommended Bikeway Network Map
Tysons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E
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Existing Facilities
Bike Lane
Existing Off-Street Trail
Spot Recommendations
Bike Access Links
Stream Crossing
Road Crossing
Recommended Facilities
Bike Lane
Buffered Bike Lane
Sharrow
Climbing Lane
Striped Shoulder
Shared Roadway
Shared Roadway w/ Safety Treatment
Shared-Use Path
Cycle Track
Policy Roads
Metrorail Station
Existing Station
Future Station
VRE Station
VRE Station
District
Tysons
Roadways
Major Road / Highway
Local Road
Railroad
Railroad
Parkland
Parks
0
0.5
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SPRING HILL
GREENSBORO
TYSONS CORNER
MCLEAN
COLLEGE MADISON BLVD
MARKET ST
CORPORATE
OLD LEESBURG PIKE
GALLOWS RD
LEESBURG PIKE
OLD COURTHOUSE RD
CHAIN BRIDGE RD
GOSNELL RD
INTERNATIONAL DR
WESTPARK DR
SPRING HILL RD
FINNEY ST
MITTON ST
FINNEY ST
FINNEY ST
FINNEY

3.5 Bicycle Facility Summary Table

All of the existing bicycle facilities (as of 2013) and bicycle facilities recommended as part of the Bikeway Network, are totaled countywide and by Supervisor District in the table below.

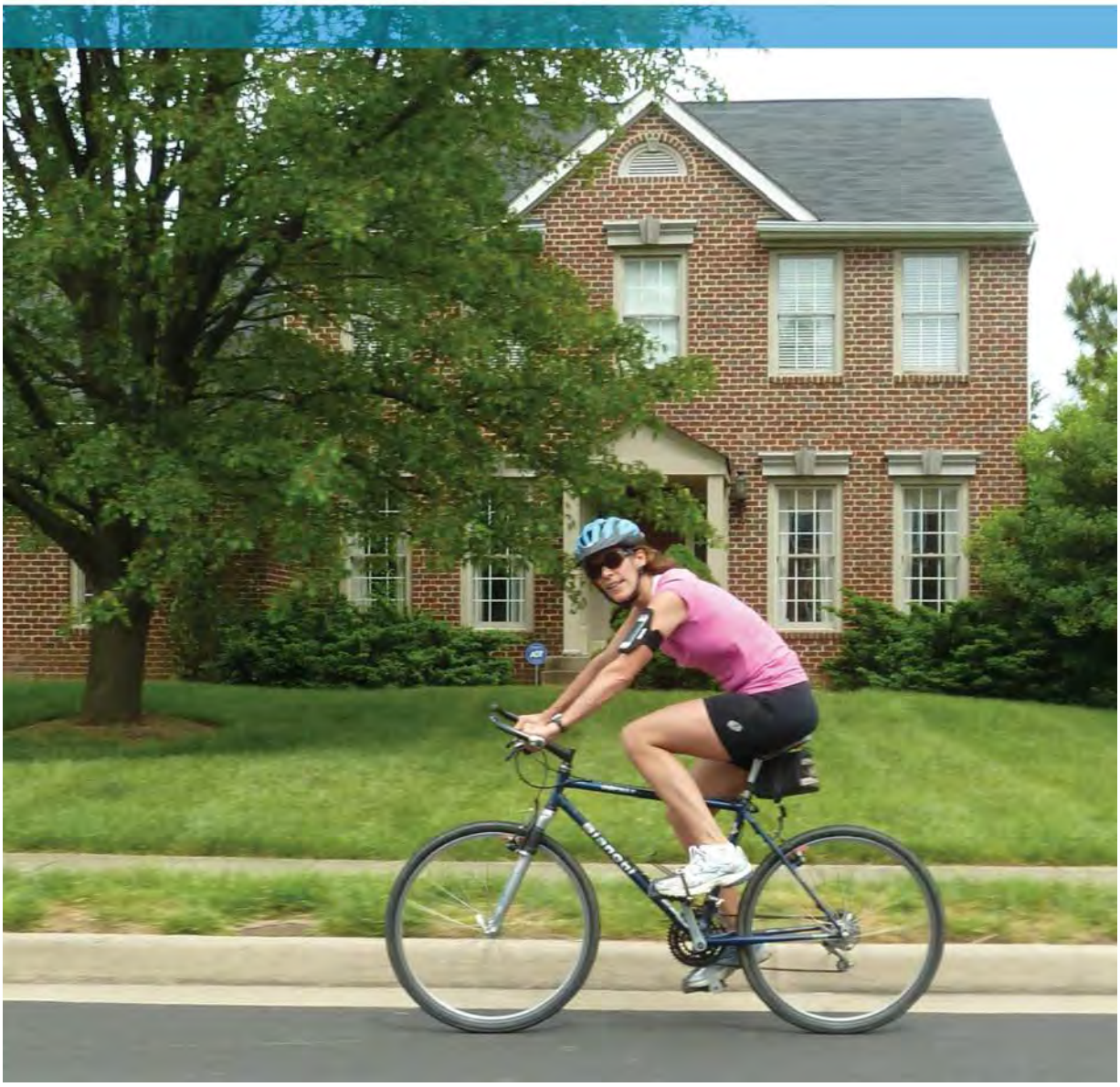
Table 3.2 Bicycle Facility Summary Table

	Supervisor Districts									
	Braddock	Dranesville	Hunter Mill	Lee	Mason	Mt. Vernon	Providence	Springfield	Sully	Countywide Total
Existing Facilities (as of 2013)	Units in Miles									
Bicycle Lanes	1.78	5.39	4.44	5.14	0.00	7.29	3.68	2.57	0.90	31.19
Shared-Use Paths	32.32	33.38	58.72	24.12	7.08	47.11	21.17	56.63	41.09	321.62
Major Bike/Pedestrian Bridges	0.00	0.00	1.00	0.00	0.00	0.00	2.00	0.00	0.00	3.00
Major Underpasses/Tunnels	1.00	0.00	2.00	0.00	1.00	1.00	0.00	0.00	0.00	5.00
Subtotal:	**34.10**	**38.77**	**63.16**	**29.26**	**7.08**	**54.40**	**24.85**	**59.20**	**41.99**	**352.81**
Recommended Bikeway Improvements	Units in Miles									
On-Road Facility Types										
Bicycle Lanes	26.08	23.46	43.40	26.65	20.17	33.48	29.98	23.24	29.80	256.26
Buffered Bicycle Lanes	6.07	0.54	0.07	1.37	0.00	0.30	1.88	8.41	1.28	19.92
Climbing Lanes	5.92	3.81	2.86	2.30	6.61	1.47	3.58	6.00	2.14	34.49
Paved and Striped Shoulders	0.93	7.08	11.59	1.68	0.00	13.41	0.30	5.02	9.45	49.46
Shared-Lane Markings	9.69	18.17	8.66	17.58	7.21	23.88	18.93	7.48	4.18	115.78
Shared Roadway with Safety Treatments	2.02	28.46	9.49	0.68	4.04	6.57	9.75	45.16	23.34	129.51
Shared Roadway	23.17	28.78	31.15	13.78	29.06	10.64	23.20	10.90	16.28	186.96
Subtotal:	**73.88**	**110.10**	**107.22**	**64.04**	**67.09**	**89.75**	**87.62**	**106.21**	**86.47**	**792.38**
Off-Road Facility Types										
Shared-Use Paths, New	4.65	16.64	6.13	7.39	4.36	12.53	17.04	11.16	24.72	104.63
Shared-Use Paths, Upgrade Existing	8.23	9.37	20.77	5.89	4.90	11.20	6.51	16.01	6.47	89.36
Cycle Tracks	0.00	1.07	0.00	0.05	0.00	0.00	1.54	0.00	0.00	2.66
Subtotal:	**12.88**	**27.08**	**26.91**	**13.33**	**9.26**	**23.73**	**25.09**	**27.17**	**31.19**	**196.65**
Policy Roads Subtotal:	**11.14**	**19.21**	**6.75**	**16.84**	**21.56**	**11.03**	**23.16**	**10.23**	**21.46**	**141.38**

Table 3.2 Bicycle Facility Summary Table (continued)

	Supervisor Districts									
	Braddock	Dranesville	Hunter Mill	Lee	Mason	Mt. Vernon	Providence	Springfield	Sully	Countywide Total
Recommended Spot Improvements	Units in Number of Locations									
Bridges, Underpasses, and Tunnels										
New Grade Separations (Major)	0	5	3	0	7	0	8	2	1	26
New Trails Bridges over Streams (Minor)	1	2	0	1	1	1	0	0	0	6
Upgrade Existing Bicycle/Pedestrian Bridges	0	0	1	0	0	0	2	0	0	3
Upgrade Existing Underpasses and Tunnels	1	0	2	0	1	1	0	0	0	5
Subtotal:	**2**	**7**	**6**	**1**	**9**	**2**	**10**	**2**	**1**	**40**
Access Improvements										
Small Bicycle Links	3	5	2	7	5	9	15		2	48
Trail Access Improvements	3	7	5	3		4	5	11	3	41
Transit Station and Park-and-Ride Improvements	3	2	6	5	1	5	6	2	7	37
Subtotal:	**9**	**14**	**13**	**15**	**6**	**18**	**26**	**13**	**12**	**126**
Intersection Improvements										
On-Road Intersection Improvements (Intersection Improvement; On-Road Crossing; and Policy Improvements, including Standard, Signal and Complex)	25	49	37	43	70	31	75	50	51	436
Trail Crossing Improvements (Midblock, Trail Sidepath Crossing)	6	5	14	10	3	6	1	10	5	60
Interchange Crossing Improvements	1	6	4	1	3			2	3	20
Subtotal:	**32**	**60**	**55**	**59**	**76**	**37**	**76**	**62**	**59**	**516**

4 Bicycle Policy Recommendations



4.0 Bicycle Policy Recommendations

The field of bicycle transportation is evolving at a rapid pace. Many facility types introduced within the last decade have been adopted as best practices and are included in professional manuals and guides. This chapter includes the five sections developed to address topics and issues related to bicycle facility selection, implementation, and maintenance that incorporate best practices and professional standards.

4.1 PRINCIPLES

General principles governing development of the planned Bikeway Network.

This is Fairfax County's first comprehensive and detailed bicycle transportation plan. Nationwide, bikeway facility types and practices for designing bicycle accommodations into road and street infrastructure are undergoing rapid change. American cities are developing and adopting their own guidelines and standards for facility design through the National Association of City Transportation Officials. The American Association of State Transportation Officials (AASHTO) regularly revises and expands its bikeway planning and design guidelines to respond to evolving practices. Updates to the Manual on Uniform Traffic Control Devices (MUTCD) have adopted new bikeway signing and pavement marking options for use by state and local agencies. Moreover,U.S. communities are now implementing long-successful bikeway designs from Europe such as the cycle track, bicycle box, and bicycle-exclusive signals.

Fairfax County, while largely characterized as a suburban community is increasingly becoming urbanized. There is increasing demand to bicycle within many parts of the County where residential, retail, recreational, and employment land uses are in close proximity. However, large arterial roadways that provide direct access to and through these areas are not typically bicycle friendly. Many changes are needed on these facilities, but they cannot happen all at once. Additionally, there are many competing interests to balance in the process of allocating space for bicycle travel. While it cannot predict every need, or the best approach for balancing competing interests in every location, this plan sets a course for the change that needs to happen to make Fairfax County a bicycle-friendly community.

In this context, the following principles provide a solid foundation upon which a successful Bikeway Network can be developed:

1. The bicycle facility recommendations shown on the Recommended Bikeway Network Maps represent the facility type that should be installed. It is expected that the Bicycle Network will be updated on a five-year schedule and recommendations will be revised based upon existing conditions and the state of the practice at the time.

2. Fairfax County will build upon and take full advantage of VDOT's Bicycle Policy Plan.

3. To provide overall guidance regarding Bicycle Network development, Fairfax County will utilize the most current editions of the following guidance documents:

   - AASHTO Guide to the Planning and Design of Bicycle Facilities;
   - Manual on Uniform Traffic Control Devices (MUTCD);
   - VDOT's 2011 MUTCD Supplement;
   - VDOT's Road Design Manual – Volume I, Appendix A, Section A-5; and
   - The National Association of City Transportation Officials (NACTO) Urban Bikeway Design Guide

4. Given county law that permits bicycling on all sidewalks and paths, it is understood that whether or not a sidewalk or path is considered part of the Bicycle Network, it likely will be used by children/youth cyclists to get to and from school, and/or by other cyclists as a link to the Network. As such, it is recommended that the owning agency or entity be attentive to basic maintenance and its general condition.

5. Evaluate every roadway development project and land development proffer for its contribution toward achieving the goal of creating a connected network that is safe and functional for bicyclists from ages 8 to 80+.

6. Routinely consider and use new bicycle facility designs and treatments where appropriate; where prudent, formal experimentation should be undertaken when implementing new designs.

7. While flexibility is needed in bikeway design, flexibility should not be used for the purposes of providing "lowest-cost" facilities at the expense of cyclist safety and comfort and/or network continuity and connectivity.

In total, these principles help govern the decision-making process with regard to implementing bicycle network improvements and help ensure that each incremental project is viewed as a contributor to the overall goal of improving bicycling conditions for bicycle travel in Fairfax County.

Prior to and part of implementing bicycle network improvements, FCDOT, as part of their public involvement process, will coordinate with impacted neighborhoods on the design and implementation of these improvements.

4.2 ON-ROAD FACILITY SELECTION AND DESIGN

General principles governing on-road facility selection and design.

For on-road bikeways, facility selection and design are key decisions that will determine the overall character of the Fairfax County Bicycle Network. In most cases, this master plan has made specific facility recommendations. These recommendations are based on a planning-level assessment of what facility is generally feasible, and what facility is optimal based upon road and traffic conditions and likely levels of bicycle usage. Other factors such as maintaining continuity of a single facility type through connecting road segments, whether or not the road segment is part of a longer route, and the types of destinations served also factored into the recommendation.

Each facility recommendation is accompanied by an action or set of actions that are necessary to achieve the facility. These actions include the following: lane diet, road diet; widening the road; modifying on-street parking, and implementing traffic calming treatments in addition to the bikeway.

Extensive study of newer VDOT roadways revealed that there are many collector and minor arterial roads that are median divided 4-lane roads with curb and gutter. The cartway (curb-to-curb road space) for each direction of travel is normally 27-feet wide. Currently, these roads are striped with two 12-foot travel lanes; this includes a 1-foot inside lane offset (shy area) from the median, and a 2-foot gutter pan.

With a lane diet, these roads could be restriped to provide bike lanes, which would clearly indicate that cyclists are accommodated on the road and may be an important action to attract more cyclists. National research has shown that most bicyclists feel more comfortable in the road with a white line demarcating space that they can use. However, some cyclists also report that cars pass them more closely when there is a bike lane stripe than when they are sharing a wide outside lane. It also is true, that due to a lack of regular sweeping by VDOT, existing bike lanes in Fairfax tend to gather debris while shared lanes tend to be kept clear by motor vehicle use.

In the Master Plan, most of the roadways with this cross-section are recommended for bicycle lanes. However, due to the issues discussed above, Recommendation 4 below suggests that some experimentation with different cross-sections be undertaken. The results can be used to inform the development of criteria to guide utilization of a single solution, or variable solutions depending on road context and other factors.

In addition to the situation described above, reevaluation and reconsideration of the facility recommendations in this plan may be necessary due to any number of factors that could not be taken into consideration during the master plan process. This is to be expected. If facility selections need to be modified, the following recommendations should guide any changes made to the initial facility recommendations shown on the maps:

Recommendations

1. In general, bicycle accommodation with some type of striping or markings (i.e., bike lanes, striped/paved shoulders, or shared-lane markings in wide outside lanes) are preferred over unmarked wide outside lanes.

2. At a minimum, buffered bike lanes or wide (6- to 10-foot) shoulders should be evaluated on Bikeway Network roads with heavy volumes and/or speed limits at or above 40 miles per hour).

3. Removing on-street parking can be an appropriate action to provide an on-road bicycle facility, especially on streets which have greater vehicular parking capacity than demand.

   - Facilities that require modification to on-street parking in residential areas should be vetted with the affected property owners; in almost all cases the bikeway recommendation requires only a reduction in capacity, not elimination of all on-street parking; alternating the side with parking block-by-block can both calm traffic and mitigate inconveniences.

4. VDOT and FCDOT should experiment with alternative typical sections: at least two bicycle facility design options for four-lane divided roadways with 26- to 27-foot cartways:

   – A 10- to 11-foot inside lane and 13- to 14-foot outside lane with a shared-lane marking; or

   – A 10-foot inside lane, 10-foot outside lane and a 5- to 6-foot bike lane providing 3- to 4-feet of asphalt, exclusive of the gutter pan.

5. When sections of primary arterial roads are resurfaced or reconstructed in revitalization areas, and other areas seeking a traditional main street or urban downtown setting, they should be retrofitted as follows:

   – Posted speed limit of 25 miles per hour – Standard bike lanes or shared-lane markings;

   – Posted speed limit of 30 or 35 miles per hour – standard bike lanes;

   – Posted speed limit > 35 miles per hour – cycle tracks or buffered bike lanes; or

   – Continuous service roads with standard bike lanes or shared-lane markings.

   New, resurfaced, and reconstructed streets (collector and local) in revitalization or urban centers should have a speed limit of 25 to 30 miles per hour and accommodate bicycles using unmarked shared roadways, shared-lane markings, or standard bicycle lanes as is appropriate given their overall function in the Bicycle Network and roadway system.

   In all situations, if short-term (i.e., high turnover) parking is provided, due to the potential problem of cyclists being hit by a driver's side door being opened into the roadway, consideration should be given as to whether shared-lane markings or bike lanes may be the safest and best facility option.

6. The County will continue to develop a system of signed bicycle routes. As conditions on roads and trails along the route are determined to be consistent enough to support a signed route, future routes can be established.

4.3 INTERSECTION AND INTERCHANGE POLICY RECOMMENDATIONS

Policy recommendations for accommodating bicycles at intersections and interchanges on VDOT roads in Fairfax County.

Public feedback gathered during the master plan public outreach process continually emphasized that intersections of arterial roadways in Fairfax County are often difficult for bicyclists to navigate. The Bicycle Advisory Committee (BAC) for the project emphasized this issue as well, and field work confirmed that very few intersections of multilane roads have any type of bicycle accommodations.

Interchanges, where arterial roadways cross limited-access highways, present an even greater challenge for cyclists. It is extremely difficult for cyclists using the arterial roadway to cross entrance and exit ramps. Cyclists using the sidewalks also have difficulty crossing the ramps at pedestrian crossings due to high vehicle speeds and long waiting periods for a safe gap.

Many intersections and interchanges in Fairfax have become barriers to today's bicyclist, as well as those who might choose to bicycle in the future. Improving bicyclists' safety and providing accommodations at intersections and interchanges is critical for the county to reach its goals for increased levels of bicycling.

Bicyclist attempts to cross at an intersection
Source: Toole Design Group.

Intersection and interchange accommodations also are important to improve safety

for bicyclists and motorists. It is well understood that most bicycle crashes involving motor vehicles occur at intersections, interchanges, or commercial driveways. These are the primary locations where vehicles and bicycles cross paths, and a wide variety of factors contribute to high numbers of crashes and the severity of crashes at these locations. A focus on improving intersections may be the single most important action to take in the effort to achieve the goal of reducing bicycle crash rates and the severity of injuries resulting from crashes.

Deficiencies that are typical at large intersections include the following:

- Right turn-only slip lanes that allow motorists to make right-turn movements at high speeds. It is difficult for motorists to yield to pedestrian and cyclists attempting to cross a ramp when they are traveling high speeds.

- Lack of transition striping and pocket bike lanes (or shoulders) for bicycles to move from the right edge of the road to the left side of a right-turn lane.

- Widened intersections (two-lane roads widen to three to five lanes at intersections) thus requiring left turning cyclists to merge left across one to three lanes of traffic.

- Lack of bicycle detection at actuated intersections with minor roads where signals provide a green light only when a motor vehicle is present and waiting on the minor road, to cross or enter the major road.

- Lack of crosswalks and pedestrian signals at all legs of an intersection.

- A lack of curb ramps or the presence of substandard curb ramps at intersection corners which impact safe bicycle travel.

Extensive dialogue with VDOT traffic engineers took place during the plan development process. It was noted that the MUTCD and AASHTO reference guides include treatments and facilities for bicycle travel and safety that are not yet common practice in Northern Virginia. While there is general agreement among the traffic engineering community, the Master Plan's BAC, current bicyclists and potential bicyclists that intersection improvements are key, it is also understood that it will take time and resources to retrofit the many intersections and interchanges in the county. The following recommendations for addressing the significant bicycle safety issues associated with crossing intersections and interchanges were developed as an outcome of the dialogue with VDOT and the Master Plan's BAC.

1. It is recommended that VDOT implement bicycle detection (or bicyclist accessible actuation) at all signalized intersections in the designated Bikeway Network, unless they provide green time for each leg on a routine cycle.

2. Where feasible, VDOT should upgrade pedestrian signals and crosswalks to include all legs of the intersections on Bikeway Network routes designated by the Master Plan.

3. Bicycle facilities and regulatory/warning signs to improve bicyclist safety through intersections should be provided as a part of all intersection improvement

projects at Bikeway Network intersections or as a part of linear roadway improvement projects, including or approaching a Bikeway Network intersection.

4. VDOT should coordinate with the Northern Virginia Regional Park Authority (NVRPA) and Fairfax County Park Authority to ensure clear, consistent and effective safety treatments at signalized and unsignalized mid-block trail/roadway crossings along the W&OD and other major trails under their respective jurisdictions.

5. As a minimum standard, VDOT should provide appropriate at-grade crossing accommodations for all Transportation Trails that cross free-flow highway entrance and exit ramps. For additional recommendations related to trails and crossings, see Transportation Trails section of this chapter.

6. VDOT should experiment with colored bike lanes to address safety and accommodation at locations creating vehicular conflict; where on-road cyclists must cross free-flow exit and entrance ramps and develop criteria for ongoing application of this treatment.

4.4 NEW FACILITIES AND ACCOMMODATIONS

New Facilities and Accommodations – Shared Roadway with Safety Treatment and Cycle tracks

The network of bicycle facilities recommended in this Plan is composed primarily of standard accommodations and treatments, found in National and state standards and guidelines, including the AASHTO Guide to the Planning and Design of Bicycle Facilities, and the latest Manual on Uniform Traffic Control Devices (MUTCD), VDOT's 2011 MUTCD Supplement, and VDOT's Road Design Manual, the National Association of City Transportation Officials (NACTO) Urban Bikeway Design Guide, Volume I Appendix A, Section A-5.

Some of these treatments, such as the Shared-Lane Marking and colored bike lanes (green), have been added to the national "toolbox" over the past 10 years. While they have been utilized and studied in communities across the country and adopted into national transportation design guidance documents, they are new to Fairfax County.

There are two treatments recommended by the plan for a variety of locations throughout the County that have not yet become standard options in the national "toolbox." These include Shared Roadways with Safety Treatment and Cycle Tracks.

Shared Roadways with Safety Treatment

During the planning process, a new facility category was created called "shared roadways with safety treatment" to address safety needs for cyclists along two-lane roads ways that lack curb and gutter, relatively narrow travel lanes, and little to no shoulder. A roadway where this treatment is recommended typically has a combination of the following design elements:

- Two 10- to 12-foot paved travel lanes;
- No or minimal shoulder, unpaved;
- Double yellow centerline stripe;
- Posted speed limit of 35 miles per hour or greater; advisory speed limits of 30 miles per hour or less on sharp curves;
- Traversing hilly terrain and crossing numerous streams;
- Drainage ditches and mature trees on the edge of the roadway;
- Horizontal and vertical curves contributing to poor sight distances;
- Low-density residential land use; and
- Forested and/or rural residential landscape.

During the planning process, both regular and infrequent cyclists identified roads with these characteristics as uncomfortable and potentially dangerous for cyclists. Moreover, many motorists would concur that they seem dangerous for bicycling. Due to the hills, which slow cyclists down and the periodic curves and poor sight distances, it is easy for a motorist to come upon a cyclist from behind with little or no warning. The lack of a paved shoulder requires cyclists to use the travel lane, and thus motorists must decelerate quickly and determine when it may be safe to pass.

Study of the County's entire road system revealed that there are many roads like this that people would like to use for bicycling, but rarely or never do, due to these safety issues. Due to a lack of overall street connectivity, many of these roads do not have an alternative or parallel route. There are many other roads in this category in very low- density residential areas that are very attractive for recreational cycling, especially during weekday mornings or weekends when traffic volumes are relatively low.

Because these roads are legally open to bicycling and the need for safe bicycle access will only increase, this Plan recommends that new approaches be developed to increase both safety and mutual respect for cyclists and motorists who must share these public thoroughfares. The County recognizes that while some of its roads are rural in character, it has become a fully suburban/urban community where safe multimodal access to all streets and roads is an essential element and that for a variety of important reasons many of these roads will not, or cannot be widened over their entire length. Nonetheless, during this planning process a number of important treatments were identified that can enable all road users to safely and more effectively share these roads.

Recommendations

VDOT should consider developing a new approach for roads indicated in the adopted plan as Shared Roadways with Safety Treatments, including any or all of the following:

- Utilize existing signs, such as the BIKES MAY USE FULL LANE sign, and available flexibility in the MUTCD to develop a proactive approach to bicycle safety on two- lane "rural" roads;

- Ensure that sign messages are unambiguous and have separate messages directed to motorists and cyclists, explaining why and how all users must share the road;

- On hills, in the uphill direction, add passing lanes, i.e., short segments of shoulder where a cyclist can pull to the side and let a line of cars following them to safely pass; and/or

- Implement other strategies to educate the motoring and bicycling public how to drive safely and respect all road users along road segments with "safety treatment" signage.

Cycle Tracks (Separated Bike Lanes)

While Fairfax County is identified as a suburban jurisdiction, it is becoming urbanized in strategic locations, and has consciously chosen to create more traditional urban centers such as Tysons, Merrifield, Reston and others. Because cities across the United States are reorganizing their downtown streets and other urban arteries to more effectively provide space for bicycling, it makes sense for Fairfax County to look to U.S. cities for direction. Fairfax County has a unique opportunity, prior to the full build out of its new urban centers, to plan in advance for the most effective urban style bikeways, which are known as cycle tracks.

Cycle tracks are dedicated bicycle facilities that physically separate bicyclists from motor vehicle traffic and pedestrian traffic. By design, they provide for the efficient movement of large volumes of people regardless of which mode they choose, including bus or rail transit. By providing faster-moving bicyclists their own dedicated space, conflicts with pedestrians on sidewalks are reduced, and by separating bicyclists from motor vehicles, a wider range of cyclists are attracted to this mode of travel. Special designs are used to address potential conflicts with transit vehicles and transit patrons waiting at stops, as well as locations where the modes must cross paths, such as at intersections.

While cycle tracks are still in the experimental stages in the United States, they are well proven in many European cities, and have contributed to creating urban mode splits for bicycle transportation in the 20-40 percent range in Dutch, Danish, German, and other European cities.

In U.S. cities, as in Europe, cycle tracks are being implemented as retrofit projects. Roadway space, formally allocated to moving motor vehicle traffic or parking must be shifted to bicycle space, while at the same time maximizing space for pedestrians and light-rail or bus transit. Fairfax County has a unique opportunity to include these facilities in the initial transformation process from suburban to urban land forms, and not have to retrofit them at a later date, when it will be much more difficult to do so.

Recommendations

The plan has identified a number of large arterial roadway segments in areas where existing or future zoning and other land use and transportation factors suggest that cycle tracks will be the safest, most attractive and most efficient bikeway accommodation possible.

- Cycle tracks will be included in the toolbox of facilities that are provided in Fairfax County.
- Cycle tracks will be the most desirable bicycle facility type for use on roadways such as International Drive in Tysons. They also will be the most desirable facility along arterials in other urbanized and revitalization areas such as U.S. 1 in Mount Vernon, in Annandale, Bailey's Crossroads, Seven Corners, Merrifield, and potentially others.
- Cycle tracks can be configured and designed in a variety of ways. Due to the need to address transit access, driveways, intersections, street trees, adjacent land uses, and right of way impacts, care should be exercised in the design and construction of all cycle tracks.

4.5 TRANSPORTATION TRAILS

General principles governing designation, development and design of the Transportation Trail component of the Bicycle Network.

The Master Plan identifies a select set of trails, both existing and proposed, for inclusion in the Bicycle Network as Transportation Trails. These include major trails along roadways, many stream valley trails, trails within utility corridors or along railroad

rights of way, and many short connecting paths for their potential contribution to a connected Bicycle Network. This designation will enable the county to begin prioritizing existing trails for maintenance and capital improvements, and investments in new trails that will serve both transportation and recreation needs.

Fairfax County has over a thousand miles of shared use paths, park trails, and sidewalks. They are used by bicyclists, pedestrians, people with disabilities, joggers, in- line skaters, equestrians and others for both recreation and transportation. Trails are owned, managed and maintained by any number of agencies within the county including the Department of Public Works and Environmental Services, the Fairfax County Public Schools, VDOT, Northern Virginia Regional Park Authority (NVRPA), Fairfax County Park Authority, homeowner associations, and private property owners. This plan did not complete a comprehensive assessment of all of the trails in the county, nor did it accomplish a formal update of the 2002 approved Countywide Trails Plan. It did however evaluate major trails along roadways, many stream valley trail systems, and many short connecting paths for their potential contribution to a connected Bicycle Network.

Character of the Transportation Trail Network: The Transportation Trail network in the Master Plan includes primarily four types of shared-use paths:

- Sidepaths along roads; these tend to vary considerably in design, age, character, and condition;
- Select park trails within stream valleys and parks managed by the Fairfax County Park Authority or the Northern Virginia Regional Park Authority (NVRPA);
- Short segments of path that may be owned by Homeowner Associations (HOA), municipalities, commercial or residential property owners, or other institutions, but clearly allow public access;
- Select sidewalks that have been identified as key for maintaining continuity in the overall Bicycle Network; and
- Included among these path types are both major and minor bridge and underpass structures providing connectivity to major barriers (for example, I-495, Dulles International Airport Access Road (DIAAR) and Dulles Toll Road, and stream channels).

Field work for this plan, consultations with Fairfax County Park Authority staff, review of GIS data and hundreds of comments from the public identified a number of deficiencies in the trail network. These included the following:

- Unsafe and difficult street crossings;
- Deteriorating trail surfaces;
- Discontinuity of paths and sidewalks and/or neighborhood streets;
- Lack of all-weather surface and all-weather stream crossings;
- Lack of wayfinding signage;
- Lack of buffering from high-speed travel lanes;
- Lack of width to safely accommodate user volumes and mix of users;
- Lack of maintenance of vegetation; and
- Lack of lighting.

Policy, Facility Design, and Program Recommendations

The following policies provide a framework for creation and management of the Transportation Trail network.

- Shared Use Paths (Sidepaths and Park Trails) identified in the Plan are designated Transportation Trails.

- Transportation Trails are eligible for Federal, State and local transportation funding.

- Where sidepaths (a shared use path adjacent to a roadway) are provided along roads where *there are no on-street facilities*, they should be provided on both sides of the street. Where it is infeasible to provide sidepaths on both sides of the road, a single sidepath should be provided consistently on the same side of the road and not alternate in contiguous roadway segments.

- Shared Use Paths in the Transportation Trail network should be designed and constructed to meet VDOT and VDRPT standards. On high volume divided roadways, parallel shared use paths should be evaluated.

- All curb ramps at crossings will be designed and constructed providing the full width of the trail.

- All Transportation Trail crossings at signalized intersections will have countdown pedestrian signal heads or bicycle signals.

- Wayfinding guidance should be included along all Transportation Trails.

- In conjunction with Northern Virginia Regional Park Authority and the Fairfax County Park Authority, VDOT and FCDOT should develop and implement trail/roadway intersection design standards and guidelines that facilitate safe use of intersections, encourage road and trail user compliance with the law, are clear and equitable for trail users and motorists, and enforceable by Fairfax County Police.

- More than 70 trail access and bicycle link improvements are identified in the plan, most of which are low cost improvements. They will address safety and connectivity needs.

- As funding is made available, Transportation Trails should be considered a priority for upgrades, treatments, and management policies that will increase their safety and functionality for transportation use.

- Implementation of specific upgrades to transportation trails will require consideration on a case by case basis.

- Within the framework of Transportation Trails described above, Fairfax County should develop a plan for managing a smaller, very select set of trails for high priority transportation use; which would mean a higher level of maintenance and permission of nighttime use. Development of this plan should involve representatives of all necessary agencies, departments, and jurisdictions including but not limited to; the Fairfax County Department of Transportation, the Fairfax County Park Authority, the Northern Virginia Regional Park Authority, the Towns of Vienna and Herndon, the Virginia Department of Rail and Public Transportation, VDOT, and others as required.

  - The Tysons area could be used as a test case where a select set of transportation trails and pathways can be identified for application of maintenance and management practices that will offer a higher level of

service for cyclists and other trail users. This test case would be coordinated with The Tysons Partnership, the Department of Planning and Zoning, and the Office of Commercial Revitalization.

- A higher level of service could include the following:
  - » Providing lighting to enable trails to be open and safely used before dawn and after dusk, especially in Fall, Winter and Spring months.
  - » Providing snow removal to enable trails to be safe and passable within a few days after a winter storm.
  - » Providing reflective edge striping and supplemental signage ensuring that all potential obstructions and fixed objects (such as bollards) are delineated.