CHAPTER 4: PLANNING BICYCLE AND PEDESTRIAN IMPROVEMENTS

TARGETING DIVERSE USERS

BICYCLISTS

The skill and comfort level of bicycle users is an important factor in designing bicycle facilities that meet their needs. Safety, convenience and comfort play a large role in whether someone chooses to ride a bicycle for transportation purposes. Several studies have looked at this issue. The studies have shown that the public can be broken into four categories based on risk-tolerance and comfort with bicycling: strong and fearless, enthused and confident, interested but concerned, and unable/not interested. These categories are commonly referred to as the four types of cyclists.

**Strong and Fearless:** People willing to bicycle in nearly any environment, including within fast-moving or congested mixed-traffic. These bicyclists can ride faster than the other user types, prefer direct routes and typically ride on the road. They are very comfortable bicycling without bike lanes.

**Enthused and Confident:** People willing to bicycle if some bicycle-specific infrastructure is in place. They are comfortable sharing the roadway with automotive traffic, but they prefer to do so operating on their own facilities. They will typically deviate from a more direct route in favor of a preferred facility type. This group is comfortable bicycling in bike lanes, and most of them bicycle regularly for transportation.

**Interested but Concerned:** People who are curious about bicycling but are afraid to ride because of safety concerns. They may be willing to bicycle in places where there is high-quality bicycle infrastructure and limited or no interactions with automobiles. They perceive significant barriers to their increased use of cycling, specifically traffic and other safety issues. Very few of these people ride regularly, but they may become more confident with encouragement, education and experience.

**Unable/Not Interested:** People who are unwilling to bicycle regardless of the quality of infrastructure. This could be because of topography, inability, or simply a complete and utter lack of interest. Some people in this group may eventually become more regular cyclists with time, education and experience.

Figure 4 illustrates the distribution of the four types of cyclists, based on Dill and McNeil’s national survey of the 50 largest metropolitan areas. The “strong and fearless” and “enthused and confident” categories make up less than 15% of the overall population, while the interested but concerned category is just over half. When designing bicycle infrastructure, the goal is to create an environment the “interested but concerned” group will be willing to utilize. By doing this, a majority of the population will find the facility safe and comfortable and be inclined to use the facility.

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PEDESTRIANS

A transportation network should accommodate a variety of pedestrians, from children to seniors and people with disabilities. Safety of pedestrians, who are often unprotected and the most vulnerable to traffic, is of utmost importance. A safe, high-quality pedestrian environment includes a separate network of facilities that provide some degree of protection to the user, is free from impediments, is visible to traffic and provides reasonable crossing opportunities and appropriate pedestrian amenities (benches, shade, water fountains, etc.). Pedestrian improvements, wherever possible, should be planned and designed for those with the lowest level of ability. This removes access barriers for individuals with disabilities (such as ambulatory impairments, hearing impairments, and vision impairments), and ensures pleasant, convenient routes that are beneficial for all pedestrians.

Community outreach and information programs are crucial to any community determined to develop safe walking conditions. Automobile traffic is the largest threat to pedestrians; both educational and physical improvements should include drivers as well as pedestrians.

BICYCLE LEVEL OF STRESS ANALYSIS

A bicycle level of stress analysis is a method of rating road segments by how accessible they are to cyclists. This analysis is based on the comfort level of a cyclist in the “interested but concerned” user group.

The level of stress analysis rates each segment on a scale from one to four, with four representing an environment that is not recommended for cycling, and one representing a low-stress environment. Most of the public would likely choose to bicycle on segments rated as a one. This analysis utilizes a simple methodology to overcome limitations in roadway data. The variables included in the analysis are: posted speed limit, number of travel lanes, and annual average daily traffic (AADT) for each road segment were data is available). Note that it does not consider other cycling safety concerns such as the slope of the road, presence or absence of a shoulder, and the number of curb cuts. Hopefully in
the future some of this data may be included, as it becomes available, to give a clearer picture of expected cycling experiences in the Region.

Table 6 outlines the rubric used to assign a score based on the aforementioned variables. Roads that receive a score of one are considered suitable for the “interested but concerned” group of cyclists. These roads have slow traffic speeds and low volumes, making them conducive to bicycling in mixed traffic. A score of four emphasizes roads with the greatest level of stress. Due to high speeds and large traffic volumes, only a small segment of the population (approximately 1%) is willing to bicycle along these links. A segment automatically receives a level of stress of “1” if it is a bicycle path or a road segment that contains a separated bicycle path.

Table 6: Scoring Rubric for Road Segment Level of Stress

<table>
<thead>
<tr>
<th>Posted Speed Limit (MPH)</th>
<th>Number of Travel Lanes</th>
<th>Mixed Traffic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>≤3000 AADT*</td>
<td>3000-6000 AADT</td>
</tr>
<tr>
<td>≤25</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>≥5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>&gt;25 to ≤35</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>≥3</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>&gt;35</td>
<td>≥1</td>
<td>4</td>
</tr>
</tbody>
</table>

*B or no AADT data available

BICYCLE DEMAND ANALYSIS

A bicycle demand analysis helps determine where people are likely to bicycle. The analysis uses 16 measures which typically correlate with cycling. These measures capture a diverse range of factors related to bicycle ridership and, when viewed together, provide a comprehensive picture of the demand for bicycling. Table 7 summarizes the measures used in the analysis, the rationale behind them, the weight given to each and the source of data. The weighting is based on the perceived importance of the factor.

The points for each block group were tallied to produce a composite score. Point values for the block groups ranged from zero around Lake Anna to nearly 165 in Downtown Fredericksburg. Of the 178 block groups in the Region, only nine received more than 100 points. Therefore, block groups with more than 100 points received the highest category of demand. The results of both the demand and level of stress analyses can be seen in Map 4.

There are two goals of the bicycle level of stress and bicycle demand analyses:

1. to determine what roads need bicycle infrastructure improvements, and
2. to provide a method of prioritizing those improvements based on where the greatest demand for bicycling exists.

Answering these questions helps to figure out where improvements should be targeted to get the biggest bang for the buck.
Table 7: Bicycle Demand Analysis Methodology

<table>
<thead>
<tr>
<th>Factor</th>
<th>Rationale</th>
<th>Weight (points)</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential Density</td>
<td>Most trips start or end at a home, job or retail location, making residential and employment clusters the major indications of the demand for bike travel.</td>
<td>0 to 30</td>
<td>U.S. Census: 2015 American Community Survey (ACS) 5-year estimates</td>
</tr>
<tr>
<td>Employment Density</td>
<td></td>
<td>0 to 30</td>
<td></td>
</tr>
<tr>
<td>Hospitality and Retail Employment Density</td>
<td></td>
<td>0 to 30</td>
<td></td>
</tr>
<tr>
<td>Density of Bicycle Commuters</td>
<td></td>
<td>0 to 10</td>
<td></td>
</tr>
<tr>
<td>Density of Population with Income Below 150% of the Poverty Line</td>
<td>Households in poverty are limited to a shorter radius of travel compared to higher income households. They have the lowest rates of single occupancy vehicle use and the highest usage of less costly travel modes: carpool, transit, bike and walk.</td>
<td>0 to 30</td>
<td>U.S. Census: 2015 ACS 5-year estimates</td>
</tr>
<tr>
<td>Through Trip Demand</td>
<td>This factor captures the desire to travel between activity centers.</td>
<td>0 to 15</td>
<td>GWRC GIS and StreetLight Data®</td>
</tr>
<tr>
<td>Proximity to a VRE Station</td>
<td></td>
<td>0 to 15</td>
<td></td>
</tr>
<tr>
<td>Proximity to a FRED Bus Stop</td>
<td>Cycling is a solution to the &quot;last mile&quot; problem, the distance between one's home or work and a transit stop.</td>
<td>0 to 5</td>
<td>GWRC GIS</td>
</tr>
<tr>
<td>Density of Bicycle Boardings at Bus Stops</td>
<td></td>
<td>0 to 10</td>
<td></td>
</tr>
<tr>
<td>Proximity to a Trail</td>
<td>Those destinations generate demand for people to bicycle.</td>
<td>0 to 10</td>
<td>GWRC GIS</td>
</tr>
<tr>
<td>Proximity to a Recreation Center</td>
<td></td>
<td>0 to 1</td>
<td></td>
</tr>
<tr>
<td>Proximity to a Library</td>
<td></td>
<td>0 to 1</td>
<td></td>
</tr>
<tr>
<td>Proximity to an Elementary School</td>
<td>Students that live close to a public school are more likely to bicycle, and school bus service is typically only provided to students living more than one mile from school.</td>
<td>0 to 1</td>
<td>GWRC GIS</td>
</tr>
<tr>
<td>Proximity to a Middle School</td>
<td></td>
<td>0 to 2</td>
<td></td>
</tr>
<tr>
<td>Proximity to a High School</td>
<td></td>
<td>0 to 3</td>
<td></td>
</tr>
<tr>
<td>Proximity to a University</td>
<td>College students tend to bicycle more than any other group. Many students lack cars; others do not wish to pay for parking.</td>
<td>0 to 10</td>
<td>GWRC GIS</td>
</tr>
</tbody>
</table>
Bicycling Demand and Level of Stress

Map 4: Bicycle Demand and Level of Stress

Legend:
- High Demand
- Level 4 - Not Recommended/Unsafe
- Level 3 - High Stress
- Level 2 - Moderate Stress
- Level 1 - Low Stress
- VRE Stops

City of Fredericksburg

Map 4: Bicycle Demand and Level of Stress
FACILITY TYPES

BICYCLE FACILITIES

Many factors go into choosing a bicycle facility, including the targeted user group, corridor conditions (urban, suburban and rural), and costs. The descriptions contained on the next several pages provide an overview of each facility and general design standards.

Shared-Use Path

A shared-use path is a bicycle and pedestrian facility that is physically separated from motorized vehicle traffic by a barrier, buffer or open space. Shared-use paths are designed to accommodate bicyclists, pedestrians and other non-motorized users. They can be used for short connections, such as a neighborhood to a school, or as a key corridor spine through an entire community or region (the Virginia Central Railway corridor). The availability of public right-of-way is often the key factor when considering a shared-use path. If public right-of-way is not available, shared-use paths will require more funding and land coordination than on-road accommodations.

Under most conditions the recommended width of a bi-directional shared-use path is 10 feet. However, there are certain conditions that warrant an increased width of 12 to 14 feet (high non-motorized traffic volume, use by large maintenance vehicles, steep grades, etc.). Since bicyclists and pedestrians do not have to contend with motorized vehicles (excluding intersections with roads), they are safer and more popular with less advanced riders. Often, they connect places otherwise inaccessible to bicyclists and pedestrians via the existing road network.

Shared-use paths should not frequently cross roads; when they do, they often require special consideration. Bicyclists and motorists should be warned of an oncoming intersection, and the intersection should be designed with features to make crossings safer. Such improvements include crosswalks, stop signs, stop lights, hawk signals, or in some cases, an overpass or underpass. Shared-use paths are also referred to as Multi-Use Trails or Greenways. When adjacent to roadways, they are sometimes called Sidepaths.

Paved Shoulder

Paved shoulders refer to the portion of the roadway contiguous with the travel lanes that accommodates stopped vehicles, emergency vehicles, and reduces the frequency of pavement maintenance. Roads with paved shoulders function similarly to roads with bike lanes. The shoulders on the outermost lanes are paved to a width of at least four feet. Appropriate signage ought to be in place to alert drivers to the potential of bicyclists along the roadway. Paved shoulders can be one of the most feasible and effective ways of accommodating bicyclists in rural areas, and are sometimes used by pedestrians where a sidewalk is not present. In areas where motor vehicle speeds exceed 45 MPH and/or there is a high percentage of heavy truck traffic, shoulder widths exceeding four feet are more appropriate.
Shoulders also serve as a margin of error for drivers and will often contain “rumble strips” to warn the motorists of lane departure. The presence of rumble strips does not automatically disqualify bicycle use, but there should be a minimum of four feet of smooth pavement beyond the strips for bicycles to operate. There should also be periodic breaks in the rumble strips to allow for safe ingress and egress of bicyclists to and from the shoulder.

**Separated Bike Lane**

A separated bike lane is a bicycle-only facility located within or directly adjacent to the roadway and physically separated from motor vehicle traffic with a vertical element. Separated bike lanes are differentiated from standard and buffered bike lanes by the vertical element, which helps make them a less stressful facility when compared to the previous two. They enhance safety for all road users, encourage more bicycling and are preferred by bicyclists and motorists alike.

Separated bike lanes can operate as one-way or two-way facilities; their designs can integrate with turning automobile traffic at intersections or can be more fully separated; they can be designed at roadway grade, at sidewalk grade or at an intermediate grade; and they can be separated from the adjacent roadway or sidewalk with a variety of treatments including but not limited to on-street parking, raised curbs or medians, bollards, concrete barriers or landscaping/planters. Separated bike lanes are also sometimes called Cycle Tracks or Protected Bike Lanes.

**Bike Lane**

A bike lane is an on-road facility specifically installed for the exclusive use of bicyclists. Typically, they are found in urban and suburban settings. Bike lanes are intended to delineate the right-of-way (ROW) designated for bicycle travel. According to AASHTO and VDOT standards, the minimum width for a bike lane is four feet from the edge of the gutter pan and five feet from the face of the curb without a gutter pan. On roads with no curb and gutter, the minimum width of the bike lane should be four feet. Bike lanes are intended for one-way travel, usually in the same direction as the adjacent traffic lane, unless it is marked and designated as a Contra-Flow Bike Lane.

Bike lanes provide a safe route for bicyclists and reduce interaction between automobiles and bicycles. Bike lanes should not terminate suddenly, leaving bicyclists with no place to go forward safely. Additionally, intersections should be appropriately marked, sometimes with green-colored pavement, to reduce dangerous interactions between motorists and bicyclists.

**Bike Boulevard**

A bike boulevard is a segment of street, or series of contiguous street segments, that has been modified to accommodate through-bicycle traffic and minimize motor vehicle traffic. There are a variety of facilities that can be used to designate a boulevard, including: signage, shared-lane markings, partial- or full-street closures, mini traffic circles, traffic calming measures, green infrastructure and other streetscape improvements to prioritize bicyclists. Another term for a bike boulevard is a Neighborhood Greenway.

**Advisory Bike Lane**

Advisory bike lanes define a preferred space for bicyclists and motorists to operate on narrow streets that would otherwise be a shared roadway environment. The shoulder is delineated by pavement marking and optional pavement color.
Roads with advisory bike lanes accommodate low to moderate volumes of two-way motor vehicle traffic and provide a prioritized space for bicyclists with little or no widening of the paved roadway surface. Motorists may only enter the shoulder when no bicyclists are present and must overtake these users with caution due to potential oncoming traffic. Because of their reduced cross section requirements, advisory bike lanes have the potential to open more roadways to more comfortable bicycle travel, especially in rural areas.

Advisory shoulders are a new treatment type in the United States and no performance data has yet been collected to compare to a substantial body of international experience. To install advisory shoulders, an approved Request to Experiment is required as detailed in Section 1A.10 of the MUTCD. Advisory bike lanes are also known as Dashed Bike Lanes or Advisory Shoulders.

**Shared-Use Roadway**

Shared-use roadways are routes that do not feature a designated bike lane. Nearly any road can be a shared-use road, but some are better suited than others. High speeds, high traffic volumes, high truck traffic, and poor visibility can reduce the suitability of a road for bicycle and pedestrian traffic. By signing a road as a shared-use road, it indicates to bicyclists that the road provides advantages which are not present on other roads (lower speeds, lower traffic volumes, attractions, connectivity, etc.).

Bicycles are susceptible to surface irregularities, so road surfaces should be smooth and regular. Bridges, overpasses and tunnels must be sufficiently wide for cyclists to safely use them. Places for bicycles and cars to enter and exit the road safely must be planned. “Bicycle May Use Full Lane” and “Bicycle On Road” signs help alert motorists to the presence of bicycles along shared-use roadways.

**Bicycle Route**

A bicycle route is a segment of road identified as a path of travel for bicyclists between destinations. Bicycle routes may have directional and informational signage, but generally do not have pavement markings. While these routes are identified for use by bicyclists, they are not necessarily exclusive to bicycle transportation. Bicycle routes may exist at the national, state, county and local level. U.S. Bicycle Route 1 is an example of a bicycle route through the GW Region.
Signs, Signals, and Pavement Markings

Signs, traffic signals, and pavement markings all provide important information to pedestrians, bicyclists, and motorists. Signing and marking bicycle routes and crosswalks encourages their use by bicyclists, helps indicate a preferred bicycle route and sends a visual cue to motorists about the function of a street. Traffic signals and timing optimization make it safer to cross a street without having to wait for a vehicle to activate the light cycle. Shared lane pavement markings are also called “sharrows.”

Bicycle Support Facilities

Bicycle support facilities compliment the bicycle network and include infrastructure such as bicycle parking (short- and long-term), repair stations, wayfinding, water fountains, showers and restrooms. Providing this infrastructure ensures that bicycling can serve as a viable transportation mode in addition to a viable form of recreation.

PEDESTRIAN FACILITIES

A comprehensive pedestrian network is crucial for the success of any transportation network. Pedestrian facilities are predominantly located parallel to, and buffered from, the street. There are many factors to consider when planning and designing the location and amenities associated with sidewalks and other pedestrian infrastructure, such as: sidewalk width, aesthetics, construction materials, street crossings, transit stop locations and street furniture. The follow are brief descriptions and general design standards for some typical pedestrian facilities and accompanying amenities.

Sidewalks

As previously mentioned, sidewalks are generally located within the public right-of-way and are separated from the street by means of a buffer strip. Sidewalks improve mobility and encourage people to walk more often by providing safe, crucial links from residential areas to commercial and employment areas, parks, schools, transit stops, and historical and cultural attractions.

Sidewalks are typically constructed of concrete, asphalt or brick pavers. PROWAG recommends sidewalks be a minimum of five feet wide (VDOT has adopted this standard), which allows for two adults to pass one another, or for two adults to walk side-by-side. In high traffic areas, such as downtowns, transit stops and near schools, sidewalks should be wider than the recommended five feet to accommodate the increased pedestrian traffic. Ideally, sidewalks should be continuous along both sides of the roadway, offer connectivity to important destinations, and be PROWAG compliant.
A four-to six-foot buffer between the roadway and the sidewalk is desirable on busier streets, but smaller buffer zones are acceptable on a case-by-case basis. In downtown areas, wider sidewalks that accommodate sidewalk furniture are more desirable. In urban areas, on-street parking and/or bike lanes act as an acceptable buffer from motor vehicle traffic. In suburban or rural areas, a landscaped strip is generally the most suitable option.

**Curb Ramp**

Curb ramps provide access to the roadway from the sidewalk system for people using wheelchairs, walkers, strollers, and pedestrians with disabilities. Curb ramps are typically installed at intersections, midblock crossings (including trail crossings), accessible on-street parking spaces, passenger loading zones and bus stops. The slope of the curb ramp cannot be greater than 8.3%, and a maximum slope on any side flares of 10%. Where possible, separate curb ramps for each crosswalk at an intersection should be provided as opposed to having a single ramp at the corner for both crosswalks. Separate curb ramps provide improved orientation for persons with disabilities; likewise, tactile warnings will alert pedestrians to the sidewalk/street edge.

**Marked Crosswalks and Enhancements**

Crosswalks are the portion of the roadway intended for pedestrians to use in crossing the street. They may be distinctly indicated for pedestrian crossing by lines or other markings on the surface. At intersections with a sidewalk present, the crosswalk is the marked or unmarked part of the roadway where the lateral boundary lines of the sidewalk would extend across. Crosswalks are usually installed along with other measures such as signage and pedestrian signals.

Many different materials and marking patterns can be used to effectively mark crosswalks. A list of the different types of markings can be found in FHWA’s Manual for Uniform Traffic Control Devices (MUTCD). The MUTCD defines the standards used by road managers nationwide to install and maintain traffic control devices on all streets and highways. Different types of materials to designate crosswalks can include thermoplastics, brick and concrete.

**Raised Crosswalk**

Raised crosswalks serve a dual purpose. First, they provide a marked path for pedestrians to cross. Second, they act as a traffic calming device to slow motor vehicle traffic. Raised crosswalks also negate the need for curb ramps as they let pedestrians cross the street on the same level as the sidewalk. Raised crosswalks can be built from a variety of materials such as asphalt, concrete or pavers, and they are normally 10 feet wide.

**Raised Intersection**

A raised intersection essentially functions as a speed table for an entire intersection. The central portion of the intersection is raised, forcing approaching traffic to reduce its speed. Since vehicles are forced to reduce their speed, it makes the intersection safer for bicyclists and pedestrians to execute a safe crossing. Raised intersections are sometimes modified to be raised crosswalks.
**Median Island**

A median island is a specific type of crossing island in the center of a road that physically separates the directional flow of traffic and may provide pedestrians with a place of refuge, reducing the crossing distance and exposure time between safety points. Median islands can be provided midblock (where blocks are long or where there is pedestrian demand) or at intersections. They should be at least six feet wide and can provide an opportunity to add green space to a community. A median island is also known as a Pedestrian Refuge Island or Center Island.

**Leading Pedestrian Interval**

Leading pedestrian interval refers to programming traffic signals to give pedestrians the WALK signal before motorists are given a green light and allowed to proceed through the intersection. This gives pedestrians a “head start,” which minimizes conflicts between pedestrians crossing a roadway and left- or right-turning vehicles.

**Pedestrian Hybrid Beacon**

A pedestrian hybrid beacon (PHB) is a pedestrian-activated device used to warn and control traffic at an unsignalized location to assist pedestrians in crossing at a marked crosswalk. The system features two “beacon heads” attached to a mast arm pole, for motor vehicle traffic, and pedestrian signals for the person crossing the street. The lights on the “beacon heads” are off until a pedestrian desires to cross the street, at which point they are activated to stop motor vehicle traffic. Once the cycle has concluded, the lights again turn off. PHBs are typically used for larger crossing distances where motor vehicle speeds are high. For midblock crossings at lower speeds and on narrower streets, Rectangular Rapid Flashing Beacons are often used instead. Pedestrian hybrid beacons are sometimes referred to as High-intensity Activated crossWalk (HAWK) Signals.

**Rectangular Rapid Flashing Beacon**

A rectangular rapid flashing beacon (RRFB) is like a pedestrian hybrid beacon in that both are pedestrian-activated devices that help warn oncoming traffic that a pedestrian is trying to cross at a marked midblock crossing. RRFBs are installed on the side of the roadway and on median islands, and they feature two rectangular amber light emitting diodes (LEDs) that supplement warning signs. They can be activated by pedestrians manually via a push button or passively by a pedestrian detection system. Once activated, the RRFBs use an irregular flash pattern that is similar to the flashers on emergency response vehicles. These flashers have been shown to be better at grabbing drivers’ attention than standard crosswalk signage.

**Transit Stop**

Pedestrian-accessible transit stops are essential in creating livable communities and having a balanced transportation system. They are also important in encouraging people to use public transit. Transit stops should be in highly visible
locations that are easily accessible; at intervals convenient for passengers; and designed to provide safe, convenient and comfortable facilities for passengers. Transit stops should be designed with signage, lighting, shelters with seating, trash receptacles and bicycle parking in mind, while not impeding pedestrian travel.

Appropriate placement of transit stops is crucial for user safety. For example, locating transit stops on the near side of intersections or crosswalks may block the pedestrian’s view of approaching traffic as well as the approaching driver’s view of the pedestrians. Far-side stops generally encourage riders to cross behind the bus and improve pedestrian safety. Placing stops at the far-side of the intersection can also improve motor vehicle operation in the immediate area near a transit stop.

Wayfinding

Wayfinding is comprehensive signage and/or markings to orient travelers and guide them to their destinations along preferred routes with little misunderstanding or stress. This is done by providing information such as distances or times to reach key destinations/areas. Wayfinding signage can help encourage walking by simplifying routes. Increasingly, mobile applications and other wireless technologies are being integrated into wayfinding systems.

Street Furniture

Well-designed pedestrian networks/walking environments are enhanced by urban design elements such as street furniture (benches, water fountains, waste/recycling receptacles, public restrooms, bus shelters, etc.) and landscaping. These amenities make the walking environment comfortable and inviting. Street furniture should be placed in a location which does not impede pedestrian traffic. These areas should also be maintained and kept clear of trash and overgrown plants and trees.

Consideration must also be taken into street lighting; quality street lighting will enhance the environment and provide increased safety and comfort. In downtown or commercial areas, pedestrian-scale lighting should be used as opposed to taller, auto-oriented lamps. Street lighting should be placed on both sides of the street to provide consistent lighting along the sidewalk/walkway. Pedestrian crossing areas should be supplemented with brighter lights.

Pedestrian Overpass/Underpass

Pedestrian overpasses and underpasses provide a grade-separated, uninterrupted path for pedestrians that is separate from the flow of traffic. These measures should be used as a last resort, due to the high cost associated with implementing them. The best use for these facilities is over/under busy highways, railroad tracks, and natural barriers; they work best when the topography allows for use of the structure without ramps. Pedestrian over/underpasses must be ADA compliant; measures to meet compliance may entail ramps and elevators.
TRANSIT ACCESS

Bus
A transit stop normally draws riders within a half mile (10-minute walk) distance. At a modest riding speed, a bicyclist can travel three or four times that distance in the same amount of time, thereby increasing the transit catchment area. Bicycle-friendly public transit can reduce traffic by encouraging bicyclists to use it. It can also improve safety, as bicyclists can use public transit to bypass or go through areas not well-suited for bicycling. FREDericksburg Regional Transit (FRED) has external bicycle racks mounted on the front of its entire fleet. Riders must receive permission from the driver prior to securing their bicycles to the racks on the busses.

Rail
Rail transit in the GW Region is provided by Amtrak and the Virginia Railway Express (VRE). VRE offers weekday commuter service from the four VRE stations in the Region to Northern Virginia and the District of Columbia. Morning trips originate at the Spotsylvania Station and terminate at Union Station in Washington, D.C., while evening trips operate in the opposite manner. Amtrak provides service on weekdays and weekends from the Fredericksburg Train Station to destinations nationwide along the Amtrak rail network.

VRE allows collapsible bicycles on all trains. These bicycles must be completely folded and safely stored to minimize inconvenience to other travelers. Full-size bicycles are permitted on the last three northbound and southbound trains. The bicycles must park in the designated area. No more than two full-size bicycles are allowed on the car at any time and must be tethered to the seat to maintain safety.

Amtrak permits bicycles on all trains. Some of the trains have bicycle racks in designated cars, and where the onboard racks are not available, bicycles can be checked as baggage. Collapsible bicycles are permitted on all trains as carry-on baggage. Some routes may require a reservation to be made to accommodate bicycles onboard while others are first come, first serve.