Spring Hill Bicycle and Greenway Plan

Adopted:
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City of Spring Hill, Tennessee

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1.0 Introduction

A City's transportation network is more than roadways, turn-lanes, and traffic signals meant solely for automobile use. Similarly, a City's park system is more than ballfields and playgrounds. A mature and growing community must plan and budget for a wider array of transportation modes and parkland requirements to encompass the needs of a broader community. The *Bicycle and Greenway Plan* is presented to marry Spring Hill's vision and policies for transportation and parkland needs into specific recommendations and policies for bike lanes, greenways, and multi-use pedestrian trails.

The convergence of such national issues as volatile transportation costs, environmental concerns, and a growing interest in health and wellness reveal the need for additional bicycle and pedestrian-friendly facilities to be provided as part of a city's general services for its residents and stakeholders. The City of Spring Hill is undertaking an important step to address these broader issues at a local level by solidifying the policies contained in this planning document with an aim to improve the mobility, health, fitness, and quality of life of residents and stakeholders of the City. The City should build upon the current success and popularity of the Peter Jenkins Walking Trail, which has been recognized by the Tennessee Department of Health publication *Tennessee Trails / Tracks Resources Guide*, as a statewide model for public-private partnerships[1].

The *Bicycle and Greenway Plan*, while produced as a stand-alone document, is consistent with the *Master Parks and Recreation Plan*, adopted in 2012, as well as the City's *Major Thoroughfare Plan Update*, adopted in 2015. The *Bicycle and Greenway Plan* seeks to expand upon these planning documents by guiding the implementation of projects that increase bicycle and pedestrian options, while also providing a continuous and safe non-motorized system that ensures easy access to jobs, services, and commerce. The *Bicycle and Greenway Plan* represents a commitment to design, construct, and maintain a network of safe, convenient, and attractive bicycle and pedestrian facilities for both commuting and recreational use throughout Spring Hill.

The *Master Parks and Recreation Plan* existing conditions survey found approximately 5.06 miles of existing greenway and bicycle trails currently in Spring Hill with recommendations for 221,500 linear feet of additional greenways, trails, multi-use trails, bike lanes, and sidewalks. This document expands upon these recommendations and provides Spring Hill with the projects, programs, and policies necessary to create a first-class bicycling and pedestrian network, enhance and expand the existing greenway system, and provide a well-designed, integrated, safe, and efficient multimodal transportation system. This Plan proposes that the Spring Hill area pursue a robust bikeway and greenway network that includes a total of 483,200 linear feet of bicycle/pedestrian facilities for future development and use.

With growing awareness of the many benefits of bicycling and walking, as it relates to active living and alternative transportation, a network of bicycle and greenway routes will result in many other benefits for the City of Spring Hill such as:

- Enhancing the community image and local quality of life
- Promoting healthier lifestyles
- Reducing commuting costs
- Expanding tourism opportunities
- Increasing and stabilizing property values

[1] http://www.tn.gov/environment/recreation/docs/trails-tracks-resource-guide.pdf

- Enhancing the local economy
- Aiding business recruitment efforts
- Providing opportunity for people unable to drive or without cars
- Improving the natural environment
- Preserving natural areas

The *Bicycle and Greenway Plan* provides guidance for the engineering, education, enforcement, and evaluation of an integrated pedestrian friendly transportation system. In order to achieve these benefits and realize a healthier, vibrant, and more bicycle and pedestrian friendly Spring Hill, this plan presents the following Vision and Mission:

Vison:

Create an easy and safe environment to travel by foot and bicycle in and around the City of Spring Hill.

Mission:

To implement a plan and policies for the City of Spring Hill that will:

1. ***Identify and prioritize needed pedestrian and bicycle facilities;***
2. ***Ensure that bicycle and pedestrian facilities are included in all new public and private projects;***
3. ***Develop programs to promote walking and biking through education and ease of use.***

Picture 1- Residents enjoying a greenway system.

1.1 Planning Process

The planning process for this document builds upon the efforts undertaken by the City to produce both the *Master Parks and Recreation Plan* and the *Major Thoroughfare Plan Update*. The creation of a plan for bicycles and greenways involves many of the same elements of any other planning processes. The collection and analysis of demographic data and mapping of existing facilities provides required background data to understand the baseline information of the existing conditions within the City, as well as providing insight into the potential routes for bikes or greenways. Following is a brief description of the planning process utilized for this plan:

- **Existing Community Data and Facilities Inventory –** The purpose of this step was to analyze the City's current planning documents, demographic data and characteristics, and existing bicycle and greenway facilities. The following planning documents were reviewed: the *Comprehensive Plan*; the *Master Parks and Recreation Plan*; the *Major Thoroughfare Plan Update*; the *Subdivision Regulations of the City of Spring Hill*; and the *Municipal Zoning Ordinance of Spring Hill*.
- **Public Involvement –** A thorough public involvement process was utilized in the planning process to capture as much input from the citizens and stakeholders as possible. An initial public workshop was held in late March 2015, building upon the *Master Parks and Recreation Plan* planning process, to capture public input for proposed greenway, bike paths, and multi-use trails. The public workshop was held early in the planning process, with generalized routes set for greenways, bike paths, and multi-use trails to allow citizens to provide their thoughts and ideas on what was needed in terms of providing a comprehensive pedestrian and bicycle system throughout the City.

Picture 2- Flyer for the Public Workshop

A final public meeting was hosted by the Parks and Recreation Commission in late June 2015, after the planning process was complete and the plan was in static draft form. The public meeting was also a joint meeting of the Planning Commission and the Board of Mayor and Alderman. At this final public meeting, the plan, its policies, and its recommendations were presented to the public in full. After the final public meeting, the static draft was posted on the Spring Hill website and advertised through the City's social media outlets.

Picture 3- Final Meeting Flyer

- **Future Needs Identification –** The purpose of this step was to analyze the future needs of the greenway and bike network. To accomplish this, the planning team examined the land uses within Spring Hill that generate or attract bicycle and pedestrian activity and the *Master Parks and Recreation Plan* and the *Major Thoroughfare Plan Update* to fill in gaps in the City's overall transportation and parkland network.

- **Plan Development –** Based on input from the public meetings, the results of the comparative analyses of the existing facilities and demographic characteristics for both existing and future years, and the recommendations from the *Master Parks and Recreation Plan* and the *Major Thoroughfare Plan Update*, the recommendations for needed bike lanes, multi-use trails, and greenway facilities were identified. Following the needs identification, the planning team analyzed the most appropriate locations for the various needed facilities including pedestrian connections, greenways, and bike trails. This was based on an analysis of population distribution and the identification of attractors and generators within the City. Upon completion of the location analysis, the planning team identified potential bike and/or greenway trail connections that would link together the various parks, population centers, work places, shopping districts, and recreations facilities within Spring Hill. Finally, the project team provided listings of project priorities for the various recommended facilities and identified potential funding sources for implementation.

1.2 Facilities Analyzed

There are a variety of bicycle and pedestrian facility types from bike lanes and shared roadways to paved shoulders and bike boulevards, as well as multi-use trails and greenways. In addition to recreational use, these facilities are used to provide connections to attractors and generators throughout the City, such as parks and schools. In general a bike facility is a term denoting provisions to accommodate or encourage bicycle travel through the use of specific route designations, bike lane striping, and intersection treatments including parking and storage facilities. Likewise, there are also different types of off-street pedestrian trails, such as greenways and multi-use trails that are important corridors for utilitarian trips and designed to accommodate a variety of users and modes of transport. Specific design guidelines for these facilities can be found in the *Design Guidelines*, included as the Appendix to this Plan. For purposes of this Plan, the following facility types were analyzed and included in the future planning process:

- **Bike Lane**: A shared portion of the roadway that is dedicated as a means to safely separate bicyclists from motor vehicular traffic.
- **Greenway**: A linear area maintained as open space in order to conserve natural and cultural resources and to provide recreational opportunities. Greenways also typically are used as linkages to tie a City's Park System together. They usually provide separation that can benefit pedestrians and/or cyclists, who may be made uncomfortable directly interacting with automobile traffic, particularly if the auto traffic flows at a high rate of speed.
- **Attractors and Generators**: Locations or sites such as residential areas, parks, schools, public or quasi-public uses, retail and shopping centers, employment districts, and historic/cultural destinations that invite individuals to use bicycle and greenway facilities by offering favorable or convenient conditions for use
- **Multi-use Trail**: A trail that is physically separated from motor vehicle traffic by an open space or barrier and either within a right-of-way or a public easement that may be used by bicyclists, pedestrians, joggers, or other non-motorized travelers.
- **Trail Head**: The entry point to a greenway, multi-use trail, or bike lane, which may or may not include onsite parking.

1.3 Benefits of Bicycle and Greenway Facilities

Given the extensive commitment of time and resources needed to realize the benefits of the implementation of the *Bicycle and Greenway Plan*, it is important to assess the value to the City of a comprehensive bicycle and pedestrian transportation network. This section outlines proven benefits that other communities have found with the addition of an interconnected and safe bicycle and pedestrian network to reduce traffic congestion, increase mobility options and improve public health.

Reduce Traffic Congestion

One benefit of a bicycle, pedestrian, and greenways system is to minimize the use of automobiles, especially for short, frequent trips. Some Spring Hill streets carry more vehicular traffic than was originally intended. This has resulted in increasing street maintenance costs, the construction of new and wider streets, traffic congestion, commuter frustration, longer commute times, and increased use of nonrenewable energy resources. The 2009 National Household Travel Survey, conducted by the Federal Highway Administration, found the average vehicular trip length was 9.72 miles. With some trips even shorter, such distances could be achieved with a 10 to 15 minute bike ride or a 30 minute walk.[2]

Additionally, developing a bicycle, pedestrian, and greenways network uses less land and resources than similar systems for vehicular traffic. The maintenance cost per square foot is much less for these systems than for roadways. While implementing an interconnected bicycle, pedestrian, and greenway system in Spring Hill will not greatly reduce traffic congestion, even a small shift from automobile to bicycle and pedestrian transportation can reduce the overall cost to the City for transportation related projects and maintenance. Additionally, reducing the use of motor vehicles can aid in solving parking issues and consumption of land for parking spaces. Facilities for parking and storing bicycles require much less space and expense than an equal number of spaces for vehicles.

Increased Mobility

Bicycle, pedestrian, and greenway networks provide a needed alternative for those in the community who either choose not to drive or cannot. Individuals in this situation include those without drivers' licenses or cars such as the young, elderly, disabled, persons with poor driving records, or persons with low incomes. An automotive-dependent transportation network limits the choices and opportunities for these individuals. Many of these individuals depend on ad-hoc or informal carpooling, bicycles, or walking to get to work, stores, school, and other necessary destinations. A safe and efficient bicycle, pedestrian, and greenways network allows the City to better accommodate this segment of the population.

Improved Public Health

Bicycle and pedestrian facilities also increase opportunities for recreation and promote environmental protection resulting in more attractive, livable, and vibrant communities. Bicycle and

[2] http://nhts.ornl.gov/2009/pub/stt.pdf

pedestrian transportation and greenway systems can significantly benefit the quality of land, water, and air resources. Short, frequent trips made by automobiles increase air and water pollution. Many of these harmful pollutants can be filtered or trapped by the trees, shrubs, and grasses in greenways and trails before mixing with the air we breathe and water we drink. Natural corridors also provide valuable linkages and habitat for urban wildlife.

Providing adequate pedestrian and bicycle facilities promotes healthy lifestyles by providing safe and inexpensive opportunities for residents of all ages to improve their overall health by making it easier to be more active. There are numerous benefits to exercise, which is essential to maintaining good health. According to the American Heart Association, heart disease is the number one killer of Americans and has been directly linked to obesity.[3] Children and teenagers are less physically active than previous generations resulting in greater medical problems. People who are healthy and exercise regularly have fewer claims against their medical insurance and spend fewer days in the hospital.

In summary, investing in a bicycle, pedestrian, and greenway network will yield a substantial return on the community-wide investment. This return will be in the form of increased personal savings for users, increased property values, increased tourism revenue, and an increase in business recruitment, among other factors[4]. For example, a bicycle and pedestrian system that is designed for daily commuting can result in significant personal savings for the users. Owning and operating a bicycle for commuting is significantly less expensive than owning and operating a vehicle. The existence of bicycle and pedestrian facilities and greenspace amenities also factors into the decisions of potential home buyers searching for residential areas that include parks, bicycle and pedestrian amenities, and natural areas. The addition of an interconnected and safe bicycle and pedestrian network will provide the City of Spring Hill with a wide array of benefits and it should be viewed as an investment in the community's improved quality of life.

Picture 4- View of the Swamp Rabbit Trail Greenway System in Greenville, SC.

[3] http://circ.ahajournals.org/content/early/2013/11/11/01.cir.0000437739.71477.ee
[4] http://www.nps.gov/pwro/rtca/econ_all.pdf

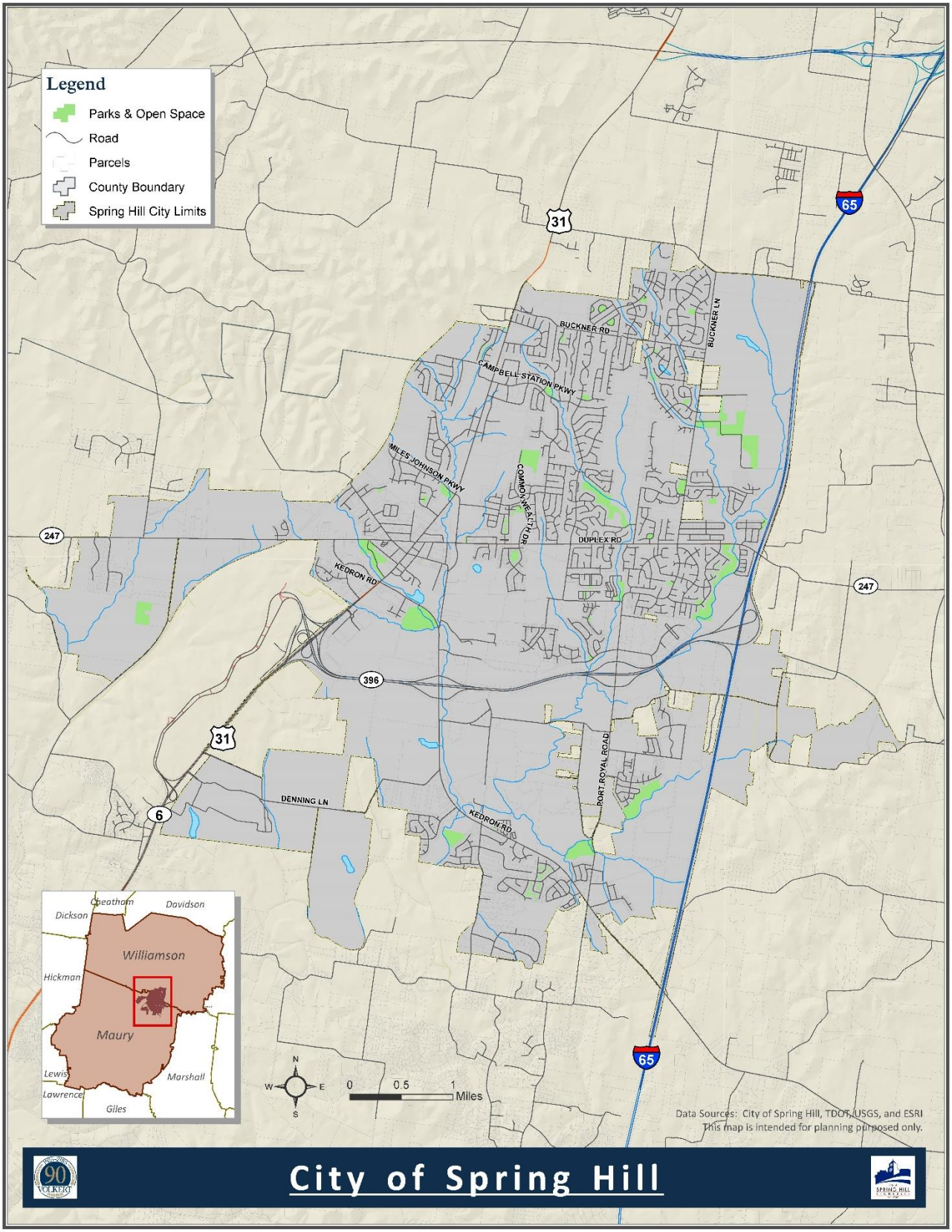
2.0 Existing Conditions

This chapter describes the current greenway and bicycle network within the City of Spring Hill with focus on important destinations for bicyclists and pedestrians, particularly connections to current residential areas, parks, retail/commercial centers, and schools. In addition to existing bike and greenway facilities, population and land-uses were also evaluated to assess opportunities to accommodate the bicycle and pedestrian needs of City residents. A thorough inventory of the current bicycle parks and greenway network is included to provide a baseline from which overall system improvements can be recommended.

Picture 5- Greenways help connect citizens to their natural surroundings. This picture shows Chapman's Retreat Trail, which is part of Spring Hill's existing greenway and trail system.

2.1 Study Area

The study area for this analysis is the entire City limits of Spring Hill, which is 17.7 square miles divided between Williamson County and Maury County. The study area is shown in **Map 1**.



Map 1- City of Spring Hill

2.2 Demographics

The 2014 Special Census counted 32,053 people living in Spring Hill – divided between 23,898 in Williamson County and 8,155 in Maury County. That is a 10 percent increase from the 2010 US Census population of 29,036. **Table 1** shows historical population information for the City. As the table indicates, the population of the City of Spring Hill has grown tremendously in the last 20 years.

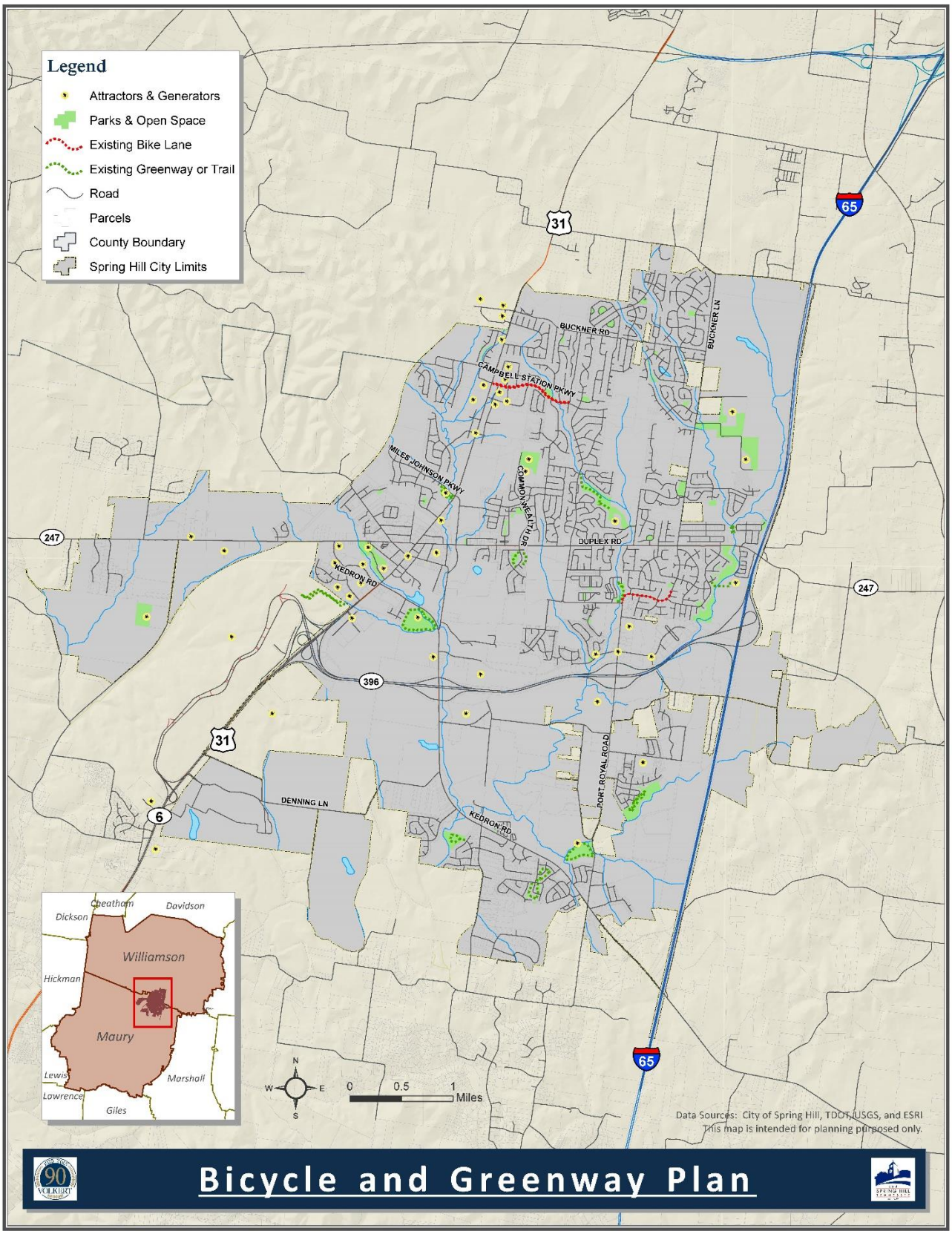
Table 1: Population

Year	Population	Absolute Change	% Change
1970	685	-	-
1980	989	304	44%
1990	1,464	475	48%
2000	7,715	6,251	427%
2010	29,036	21,321	276%
2014	32,053	3,017	10%

According to the 2010 US Census, 48.5 percent of the Spring Hill population was male, while 51.5 percent was female. The majority of the population of the City of Spring Hill is white (89.1 percent) while the largest minority population is Hispanic or Latino (5.6 percent), followed closely by Black or African American (5.4 percent). The median age is 33.1 years old. According to the 2014 Special Census, 26.4 percent of the Spring Hill population is under the age of 19. In addition, the average household size in Spring Hill, according to the US Census, is 2.80. This census data points to a young population that is comprised mostly of families with young children. While all levels of activity and ages are important to consider when planning for future bicycle and greenway or pedestrian facilities, it is particularly important to understand and accommodate the pedestrian and bicycle needs of such a young and active community.

2.3 Attractors and Generators

Bicyclists and pedestrians tend to favor trails or paths with adjacent land uses that are captivating and enticing, such as shopping districts, cultural destinations, and/or areas with distinctive scenic views. The following inventory of attractors and generators, or destinations that have the potential to draw or appeal to bicycle and pedestrian traffic, tend to correlate with high levels of bicycle and pedestrian commuting, and are important when planning greenway and trail connections throughout Spring Hill. Bicycle and pedestrian attractors and generators include employment centers, shopping areas, residential areas, parks, and schools. With the help of City staff, combined with local knowledge, the project team came up with a list of such areas within the City and they are illustrated in **Map 2**.



Map 2- Attractors and Generators

Of particular note are the historical attractions within the City, including the Spring Hill Battlefield and Rippavilla Plantation. The battlefield, a recognized state and national historical place, is maintained to honor the Battle of Spring Hill, which occurred on November 29, 1864. The Battle of Spring Hill has been described as "one of the most controversial non-fighting events of the entire war[5]." The Spring Hill Battlefield Task Force is working to ensure the Spring Hill Battlefield is sufficiently protected for future generations in connection with the recent sesquicentennial of the Battle of Spring Hill. Rippavilla is an historic plantation site and museum located along Highway 31 in Spring Hill, which is listed on the National Register of Historic Places and has a variety of community events and festivals on site.

Picture 6- Rippavilla hosts many events and festivals every year.

2.4 Greenways and Bike Trails

There are 11 greenways and bike trails in the City of Spring Hill totaling just over 5 miles. **Table 3** below lists each of the greenways and bike trails in the City and they are shown on **Map 2**.

[5] http://www.civilwar.org/battlefields/spring-hill.html

Table 2: Existing Greenways/Trails

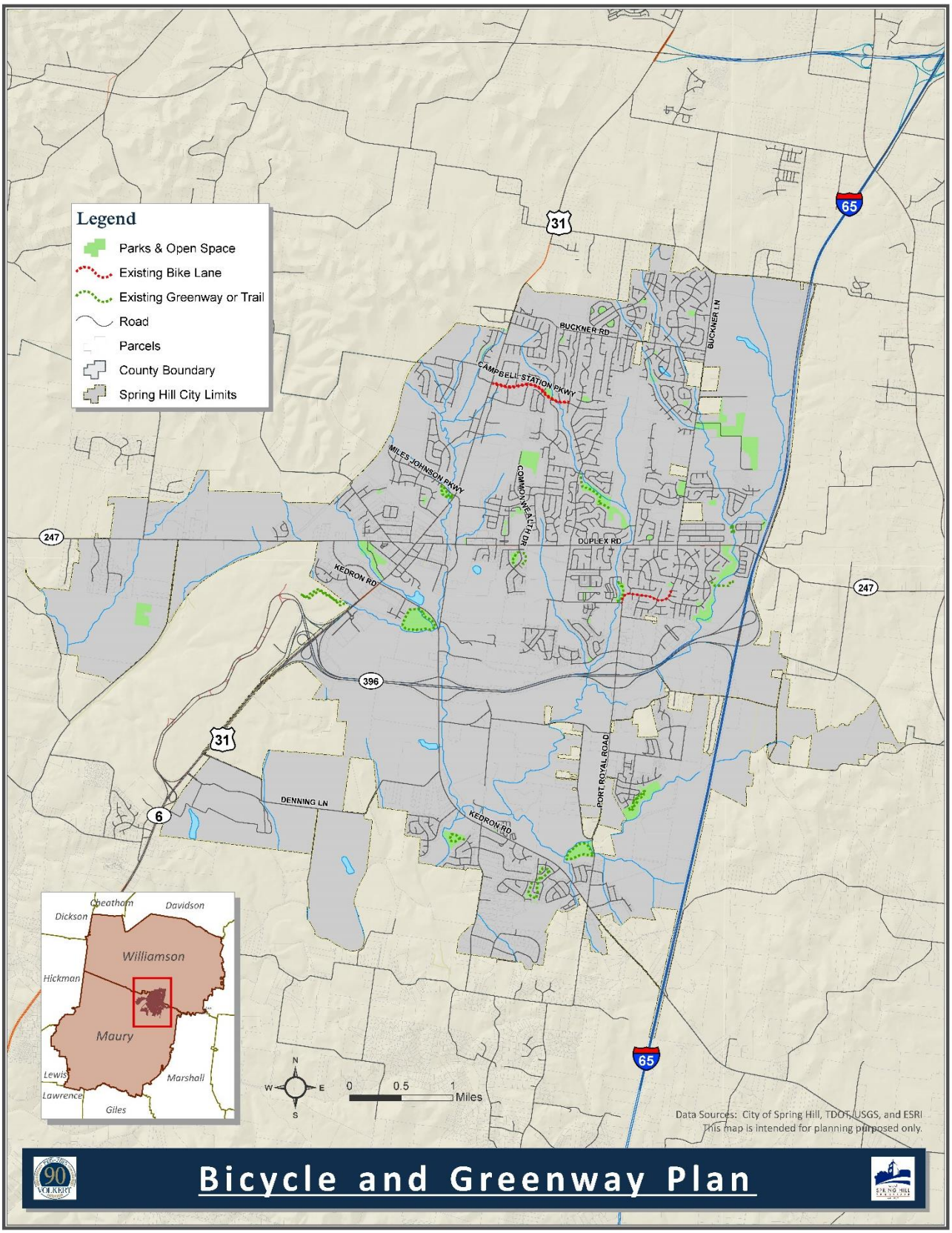
Trail No.	Trail Name	Location	Termini	Length (Miles)	Width	Material
1	Harvey Park Trail	Harvey Park	Miles Johnson Parkway parking lot	0.25	8'	asphalt
2	Jerry Erwin Park Trail	Jerry Erwin Park	Kedron Road Parking Lot	0.86	8'	asphalt
3	GM Walking Trail	GM Property	Behind UAW / GM parking area Saturn Pkwy	1.00	6'	asphalt
4	Rutherford Place Trail	Rutherford Place	Creekside Lane	0.25	6'	crushed stone
5	Golfview Estates Trail	Golfview Estates	Kristen Street, Golfview Way, Baker Way	0.75	6'	crushed stone
6	Meadowbrook Trail	Meadowbrook Subdivision	Sequoia Trail	0.50	6'	crushed stone
7	Walden Creek Trail	Walden Creek Apartments	No Public Access	0.25	10'	asphalt
8	Chapman's Retreat Trail	Chapman's Retreat Subdivision	Chapman's Retreat Elementary School, Callender Road	0.25	10'	asphalt
9	Chapman's Crossing Trail	Chapman's Crossing Subdivision	Locerbie Circle	0.20	5'	crushed stone
10	Peter Jenkins Trail	Wyngate Subdivision and Allendale Elementary	Commonwealth Drive	0.64	5'	asphalt
11	Hardins Landing Trail	Hardins Landing Subdivision	Commonwealth Drive	0.36	8'	crushed stone
12	Port Royal Park Walking Trail	Port Royal Park		0.57		asphalt
Total				**5.88**		

2.5 Bicycle Route and Greenway Deficiencies

Currently, the existing greenway trails in Spring Hill are used predominantly for recreation, with the exception of Peter Jenkins Trail that is used by elementary school students to walk to and from Allendale Elementary School. However, with strains on the street network within the City, there is a demand for a non-motorized transportation system that is efficient, interconnected, and safe. Lack of a continuous, safe bicycle and pedestrian network discourages residents and workers from bicycling or walking to their respective destinations. Low density land use and a transportation network designed solely for motor vehicles also creates a barrier to increased bicycle or pedestrian activity with the City. In fact, there are only two existing bike lanes in the City: along Campbell Station Parkway and along Buckner Lane/Port Royal Road. Campbell Station Parkway, and a short section of Buckner Lane in the Haynes Crossing subdivision, are striped for shoulders that could accommodate bikes but are not marked as bike lanes.

Picture 7-Trail heads are important components to a trail system. This picture shows a trail entrance at Jerry Erwin Park.

While there is not a general standard or recommendation for the length or miles of bicycle and pedestrian facilities for a community, Spring Hill currently has only 5.31 miles of bike/trail facilities, with no bike lanes specifically marked as such. This is an insufficient amount for a community the size of Spring Hill. This Plan aims to remedy this current deficiency by addressing the importance of improving walking and bicycling opportunities by connecting residential areas, employment centers, schools, retail centers, recreational centers, and other attractors to increases individual mobility. The existing bike lanes and greenways are identified on **Map 3**



Map 3- Existing bike lanes and greenways.

3.0 Plan Policies and Recommendations

This section discusses the recommendations for improving the City of Spring Hill's bicycle and greenway network by alleviating the previously described deficiencies and capitalizing upon the noted strengths. It is divided into three parts. Section 3.1 provides the Plan Policies meant to shape and guide City decisions related to bicycle and pedestrian facilities. Section 3.2 contains the Maps depicting the suggested routes for bicycle, greenway, and multi-use facilities throughout the City. Section 3.3 highlights several of the elements of the Plan's *Design Guidelines*, which are incorporated into the recommendations of this Plan for all bike, greenway, and multi-use trail projects.

3.1 Plan Policies

An Interconnected Network

Create and **maintain** an interconnected bicycle and pedestrian network to allow direct connections between attractors, generators, and residential subdivisions throughout the City. Special attention should be given to completing bicycle and pedestrian facilities adjacent to schools, historic sites, and public institutions. Where meaningful and appropriate, connections should also be made between private open spaces within residential subdivisions and the broader bicycle and pedestrian network.

Action Items:

1. Prioritization of facilitates within the Capital Improvement Program.
2. Inclusion of those facilities within the annual city budget.

Complete Streets Policy

Adopt a Complete Streets Policy. A Complete Street is defined by Smart Growth America as a street that is for everyone. It is a street that is designed and operated to enable safe access for all users, including pedestrians, bicyclists, motorists, and transit riders of all ages and abilities. [6] Complete Streets make it easy to cross the street, walk to shops, and bicycle to work.

A Complete Streets policy can take the form of an ordinance, a resolution, or a design manual. In essence, a Complete Streets policy will ensure that bicycle and pedestrian accommodation should be included as part of all roadway projects, unless there is a compelling reason not to include them, such as topography or safety concerns.

The inclusion of a Complete Streets policy will enable the City to ensure that, when private development occurs, the goals of this plan will continue throughout the City and not just through the use of public improvements.

Action Item: Formulate and adopt a Complete Streets policy that is right for Spring Hill.

[6] http://www.smartgrowthamerica.org/complete-streets

Land Use and Development

Require private development to fully incorporate the routes recommended by this Plan. This plan policy should be interpreted broadly, since exact future conditions are unknown and development may occur in such a fashion that was not considered by the planning process upon which this plan is based. In any event, the proposed projects and connectivity concepts presented in the Maps in Section 3.2 should be maintained and required as part of development proposals.

Promote land use and site design decisions that incorporate pedestrian and bicycle infrastructure as basic elements of the site development process.

Any lands proposed for annexation into the City after the adoption of this Plan should be **integrated** into the City's interconnected bicycle and pedestrian network and should abide by the recommendations and policies of this Plan.

Action Items:

1. Amend the City's *Subdivision Regulations* and *Zoning Ordinance* to include provisions to require greenway and bicycle facilities, as outlined by this plan, to be provided as part of the development review process.
2. Review the City's *Subdivision Regulations* and *Zoning Ordinance* to ensure regulatory language is clear, consistent, and coordinated for greenway and bicycle facilities.
3. Review the *Zoning Ordinance* annexation procedures to ensure that facilities proposed by this plan are included as part of any annexation request.

Safety

Strive to maintain a safe bicycle and pedestrian network. The Parks and Recreation Department may either create a holistic set of Bicycle and Pedestrian Safety Guidelines or separate Guidelines for individual trails or greenways, based on specific circumstances. For example, certain segments of a multi-use trail may be appropriate for motorize vehicles, such as golf carts, based on site conditions and other considerations. A strategy employed by many communities to maximize safety is to utilize the Crime Prevention Through Environmental Design (CPTED) methodology when planning and designing greenways and trails to ensure that the user's security is a chief consideration. In terms of design elements specific to the various facilities and supporting elements, please refer to the *Design Guidelines* appendix of this document.

Action Items:

1. Amend the City's *Subdivision Regulations* and *Zoning Ordinance* regulations as appropriate to require greenway and bicycle facilities to be constructed according to the *Design Guidelines* recommendations.
2. Establish Bicycle and Pedestrian Safety Guidelines.

Comfort and Enjoyment

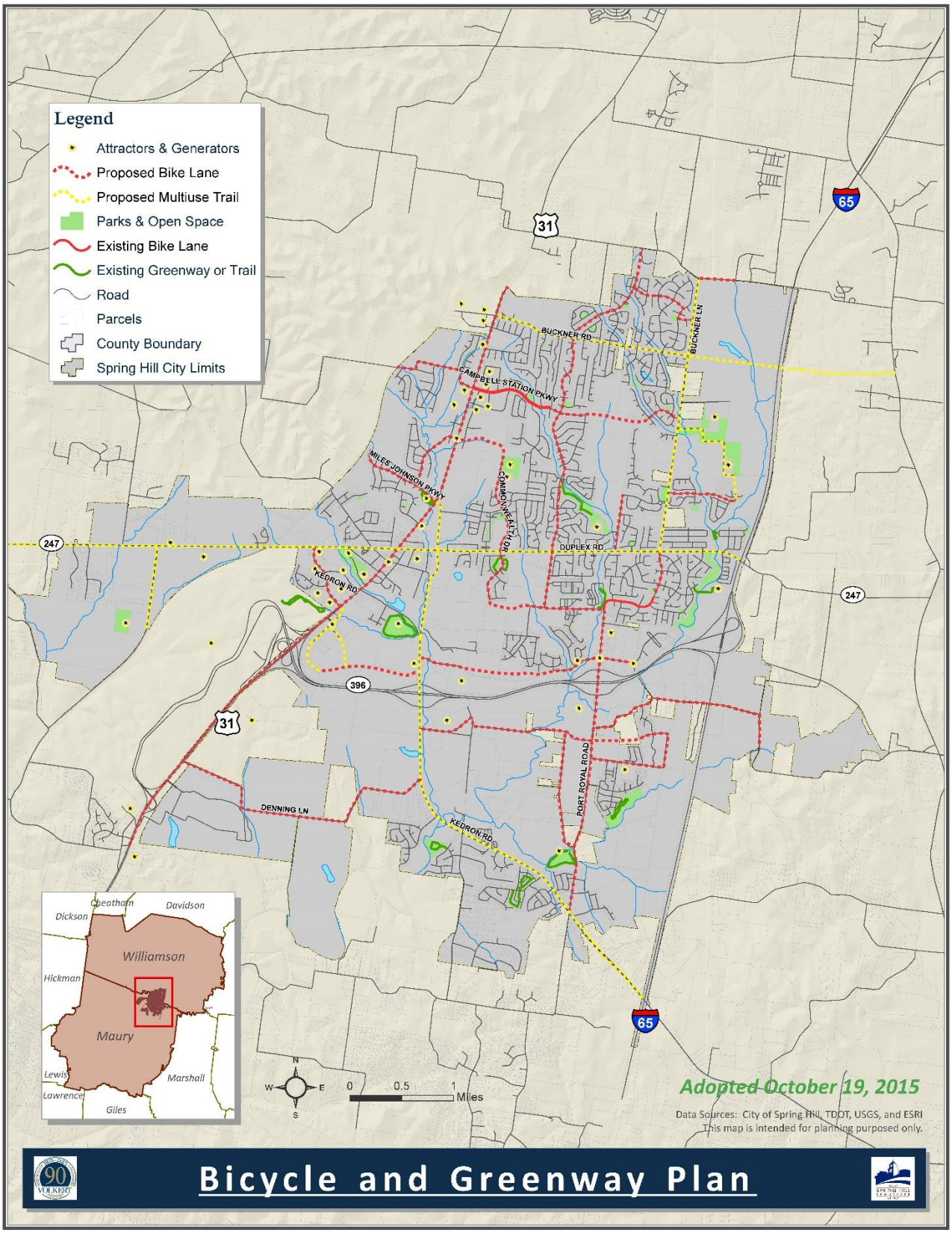
Encourage the inclusion of artistic, historic, and natural elements throughout the bicycle and pedestrian network, along with trail furniture, pedestrian scale lighting, and landscaping, to ensure that the network is both comfortable and enjoyable. The recommendations related to these elements of the network are presented in the *Design Guidelines* appendix.

Action Items:

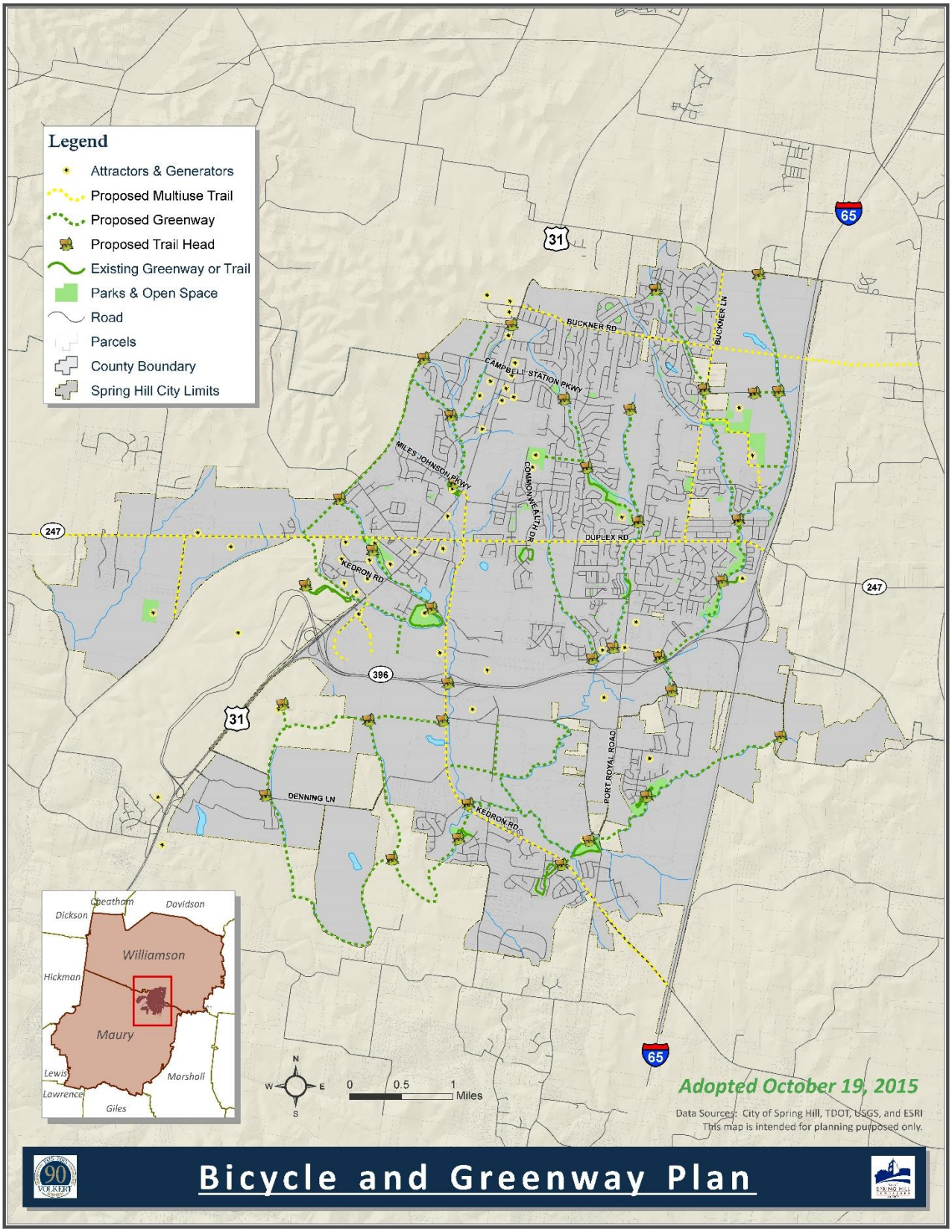
1. Follow *Design Guideline* recommendations for appropriate trail furniture and lighting.
2. Include appropriate native landscaping and public art displays as elements of each facility as it is planned and budgeted.

3.2 Mapping of the Proposed Facilities

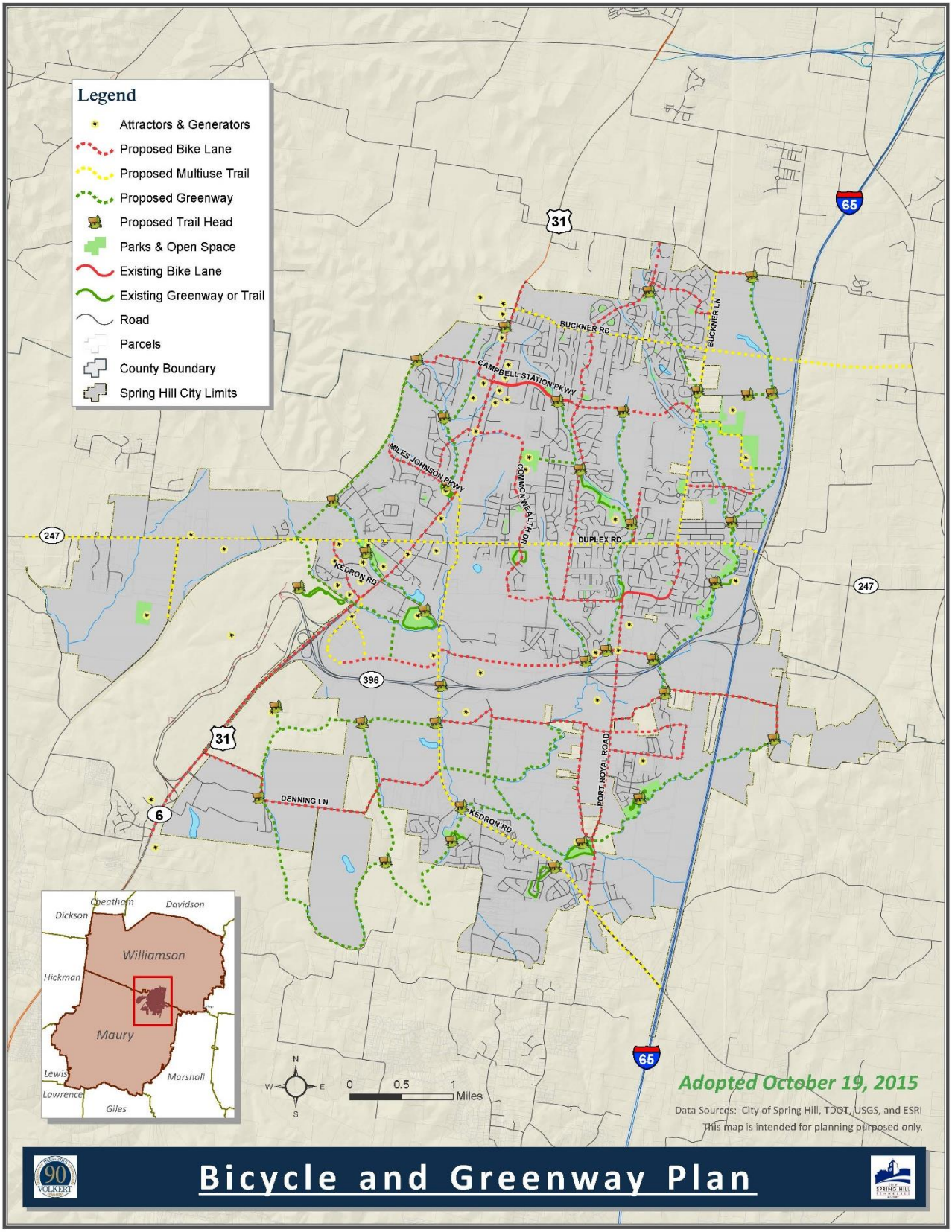
The results of the overall effort of this planning process are best captured in the series of maps that follows. The following provides the recommend routes for proposed bike lanes, greenways, and multi-use trails within the City of Spring Hill. **Map 4** depicts the bike lanes. **Map 5** depicts the greenways and trails. Finally**, Map 6** includes multi-use trails and includes all the recommended bike lanes and greenways shown on Maps 4 and 5. Please note: these routes are to be considered preliminary design/budgeting level plans, exact routes may vary, based on detailed private development proposals, new City capital budget priorities, and/or specific site conditions. The underlying policy for these routes is to provide the connections, as shown, between attractors, generators, and residential areas in a cost-effective and efficient manner.



Map 4- Proposed Bike Lanes



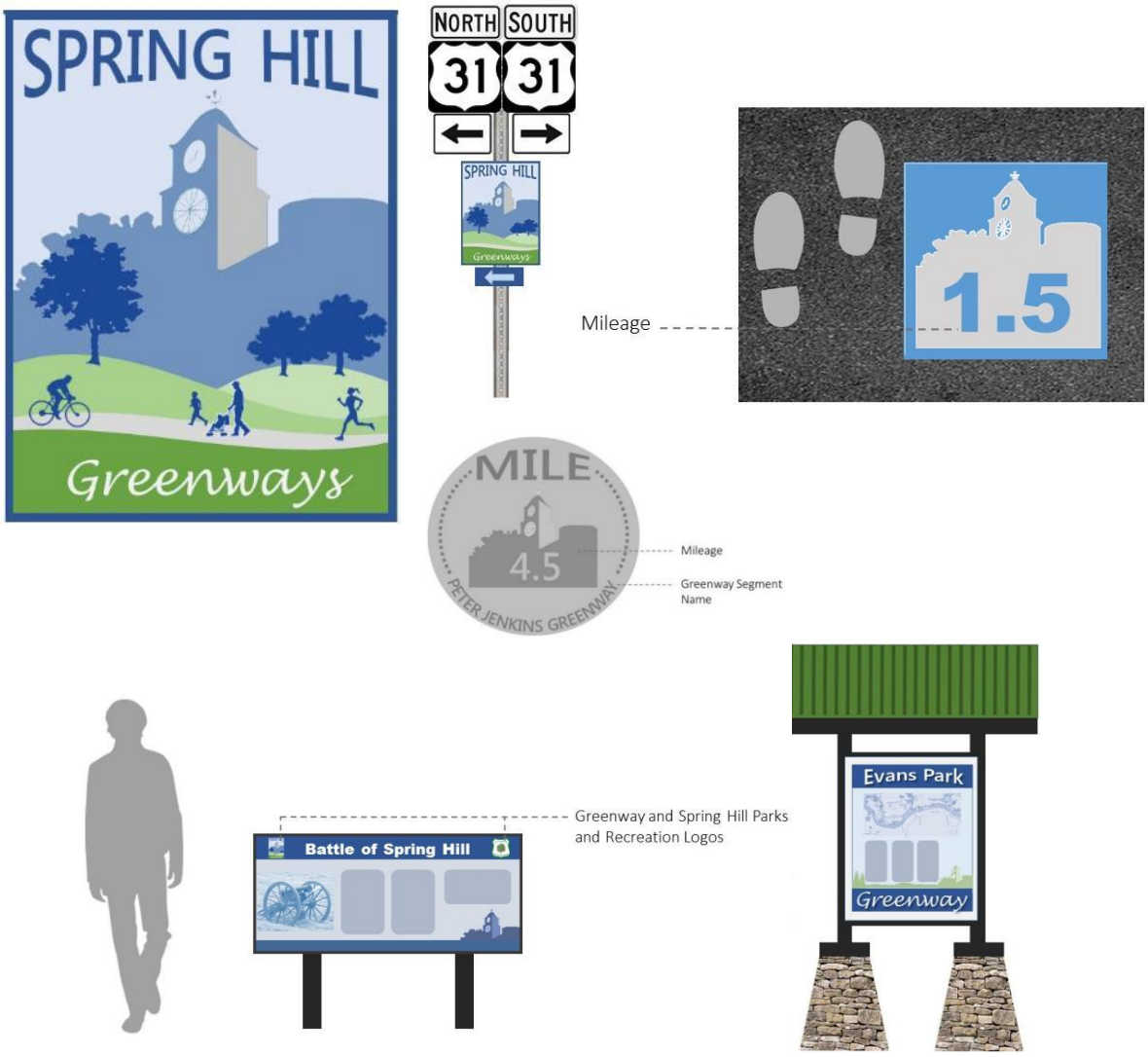
Map 5- Proposed Greenways & Trail Heads



Map 6- Combined Improvements Map, which depicts Greenways, Trailheads, Bike Lanes, and Multi-use Trails.

Section 3.3 Bicycle and Greenway Design Guidelines

The *Bicycle and Greenway Design Guidelines*, included as the appendix to this Plan, are provided to form the foundation for the planning, construction, and furnishing for all facilities recommended by this Plan (bike lanes, greenways, multi-use trails, and trail heads) and shown on the Maps in Section 3.2. The *Design Guidelines* provide a wide array of design and development standards for bicycle and greenway routes, including: cross-sections for trails; trail design speed; relationship of pathways to roadways; bridge standards; railing and fence standards; guidance on typical amenities such as bicycle parking, benches, picnic tables, pet waste stations, and other trail furniture; and a template for signage and wayfinding for the bicycle and greenway network. The *Design Guidelines* are hereby incorporated into all recommendations of this Plan and should be adopted and used as the design template for all bike lanes, greenways, and multi-use trail facilities within the City of Spring Hill.



4.0 Implementation

As indicated in Chapter 3, there are multiple needs within the City of Spring Hill in terms of providing a bicycle and pedestrian network. Given the number of needed facilities, it is necessary to develop a detailed implementation plan that will serve as a guide to City leadership as they prioritize capital projects. There are two primary components in an implementation plan: project schedule/time frame and potential funding strategies. Each is addressed below.

4.1 Project Priority

This section includes a list of proposed project priority project that will be necessary to implement the recommended routes shown in Chapter 3. The project priorities are presented to provide the City with a list of projects to include in future Capital Improvement Budgeting. The project priorities provide information necessary to plan for and implement the recommended projects.

Project Priority

In order to bring all of these proposed projects to fruition, a strategy must be established to fund them. Unfortunately, many communities today, including Spring Hill, do not have the funding to build all of the trail or greenway facilities that are needed and/or desired. However, by developing a long range implementation plan to construct these projects over a period of many years, it becomes much more feasible. More immediate needs were identified and have been placed in the short term category while needs that are based more on anticipated population growth and desired amenities were placed in the mid term and long term category.

The timeframe for improvements are short term, mid term, and long term. Short term projects are intended to be implemented by 2020, mid term projects are intended to be implemented by 2030, and long term projects are intended to be implemented by 2040.

Project Priorities are separated by facility type (Bike Lanes, Greenways, and Multi-use Trails) and are provided in **Table 3 for Recommended Bike Lane Projects**, **Table 4 for Recommended Greenway Projects**, and **Table 5 for Recommended Multi-use Trail Projects**.

Table 3: Project Priorities for Recommended Bike Lane Projects

BIKE LANE PROJECT	TERMINUS	TOTAL LENGTH IN FEET	PRIORITY
New Port Royal Road Bike Lanes Phase 1	From Thompson's Station Road to Buckner Road	**6,305**	**Short Term**
Wades Crossing Bike Lanes	From Buckner Lane to Spring Station Road	**3,472**	**Short Term**
Commonwealth Drive Bike Lanes Phase 1	From U.S. 31 to Longview Elementary School	**4,223**	**Short Term**
Commonwealth Drive Bike Lanes Phase 2	From Longview Elementary School to Duplex Road	**3,846**	**Short Term**
New Port Royal Road Bike Lanes Phase 2	From Stewart Campbell Point to Burgess Lane	**3,532**	**Short Term**

BIKE LANE PROJECT	TERMINUS	TOTAL LENGTH IN FEET	PRIORITY
Stewart Campbell Bike Lanes	From Loudenslager Drive to Buckner Lane	**6,968**	**Short Term**
Luther Bradley Parkway Bike Lanes	From The Crossings to Kedron Road	**9,493**	**Short Term**
Derryberry Bike Lanes	From Port Royal Road to Tom Lunn Road	**5,436**	**Short Term**
Cameron Farms Bike Lanes	From New Port Royal Road to Buckner Lane	**4,201**	**Mid Term**
Buckner Lane Bike Lanes Phase 4	From Duplex Road to Lona Court	**2,263**	**Mid Term**
US 31 Bike Lanes Phase 1	From Buckner Road to Campbell Station Parkway	**3,846**	**Mid Term**
US 31 Bike Lanes Phase 2	From Campbell Station Parkway to Belshire Way	**2,693**	**Mid Term**
US 31 Bike Lanes Phase 3	From Belshire Way to Miles Johnson Parkway	**3,365**	**Mid Term**
US 31 Bike Lanes Phase 4	From Miles Johnson Parkway to Duplex Road	**3,144**	**Mid Term**
US 31 Bike Lanes Phase 5	From Duplex Road to Kedron Road	**2,785**	**Mid Term**
US 31 Bike Lanes Phase 6	From Kedron Road to The Crossings	**2,157**	**Mid Term**
Campbell Station Bike Lanes	Along Campbell Station Parkway from U.S. 31 to Wilkes Lane and along Wilkes Lane from Campbell Station Parkway to the railroad tracks west of The Arbors at Autumn Ridge	**5,014**	**Mid Term**
New Port Royal Road Bike Lanes Phase 4	From Buckner Road to Stewart Campbell Point	**4,089**	**Mid Term**
New Port Royal Road Bike Lanes Phase 3	From Burgess Lane to Duplex Road	**3,764**	**Mid Term**
Belshire Bike Lanes	From U.S. 31 to Miles Johnson Parkway	**3,642**	**Mid Term**
Autumn Ridge Bike Lanes	From U.S. 31 to just west of Autumn Ridge Way	**4,562**	**Mid Term**
Town Center Bike Lanes	From Beechcroft Road to U.S. 31	**3,462**	**Mid Term**
Port Royal Road Bike Lanes Phase 1	From Duplex Road to Reserve Boulevard	**8,346**	**Mid Term**
Reserve Bike Lanes	From Kedron Road to Port Royal Road	**9,451**	**Mid Term**
Old Port Royal Bike Lanes	From Port Royal Road to Parkway Business Center	**1,838**	**Mid Term**

BIKE LANE PROJECT	TERMINUS	TOTAL LENGTH IN FEET	PRIORITY
Thompson's Station Road Bike Lanes	From Buckner Lane to Sherrie Street	**1,878**	**Long Term**
US 31 Bike Lanes Phase 7	From The Crossings to southern City Limits	**10,500**	**Long Term**
Commonwealth Drive Bike Lanes Phase 3	From Duplex Road to Port Royal Road	**5,796**	**Long Term**
Port Royal Road Bike Lanes Phase 2	From Reserve Boulevard to Derryberry Lane	**5,108**	**Long Term**
Port Royal Road Bike Lanes Phase 3	From Derryberry Lane to Kedron Road	**7,967**	**Long Term**
Denning Lane Bike Lanes	From U.S. 31 to Kedron Road	**14,765**	**Long Term**
Royal Park Boulevard Bike Lanes	From Kedron Road to Timberline Drive	**2,875**	**Long Term**
Jim Warren Road Bike Lanes	From Port Royal Road to south of Crafton Road	**10,852**	**Long Term**
Lunn Bike Lanes	From Port Royal Road to Worthington Lane	**10,667**	**Long Term**

Table 4: Project Priorities for Recommended Greenway Projects

GREENWAY PROJECT	TERMINUS	TOTAL LENGTH IN FEET	PRIORITY
Harvey Park Greenway Phase 1	From Campbell Station Parkway to Harvey Park.	**7,100**	**Short Term**
Peter Jenkins Greenway Phase 1	From Longview Recreation Center to New Port Royal Road	**2,580**	**Short Term**
Peter Jenkins Greenway Phase 2	From current Peter Jenkins trail eastern terminus to Duplex Road	**2,900**	**Short Term**
Peter Jenkins Greenway Phase 3	From Duplex Road to Port Royal Greenway	**1,890**	**Short Term**
Peter Jenkins Greenway Phase 4	From southern terminus of Port Royal Greenway to Reserves Boulevard	**2,755**	**Short Term**
Battlefield Greenway Phase 1	From Jerry Erwin Park to GM Trail including US 31 underpass	**2,700**	**Short Term**
Port Royal Greenway Phase 1	From Port Royal Park to Kedron Road	**1,550**	**Short Term**
Port Royal Greenway Phase 2	From Longhunter Chase park to Port Royal Park	**5,840**	**Short Term**
Rippavilla Greenway Phase 1	From Kedron Road to northern loop of Rippavilla Greenway	**4,000**	**Short Term**

GREENWAY PROJECT	TERMINUS	TOTAL LENGTH IN FEET	PRIORITY
Battlefield Greenway Phase 2	From Battlefield Greenway Phase 1 to Luther Bradley Parkway.	**1,900**	**Mid Term**
Battlefield Greenway Phase 3	From GM Greenway to Beechcroft Road	**2,100**	**Mid Term**
Harvey Park Greenway Phase 3	From terminus of Harvey Park Greenway Phase 1 to Battlefield Greenway Phase 6	**2,800**	**Mid Term**
Peter Jenkins Greenway Phase 5	From eastern midpoint of Peter Jenkins Greenway Phase 2 to Campbell Station Parkway Extension	**6,100**	**Mid Term**
Peter Jenkins Greenway Phase 6	From midpoint of Peter Jenkins Greenway Phase 1 to Campbell Station Parkway	**3,380**	**Mid Term**
Summit Greenway Phase 1	From south side of Chapman's Crossing Trail to Duplex Road	**575**	**Mid Term**
Summit Greenway Phase 2	From north side of Chapman's Crossing Trail to Twin Lakes Drive including connections to Chapman's Crossing Park, Wades Crossing and Spring Station Middle School	**11,480**	**Mid Term**
Summit Greenway Phase 3	From Duplex Road to Chapmans Retreat Trail	**8,700**	**Mid Term**
Summit Greenway Phase 4	From Buckner Road to Summit Greenway Phase 2	**6,500**	**Mid Term**
Peter Jenkins Greenway Phase 7	From Reserves Boulevard to Duplex Road	**6,650**	**Mid Term**
Kings Creek Greenway Phase 1	From Kedron Road to Lunn Road and Royal Park Boulevard	**12,150**	**Mid Term**
Battlefield Greenway Phase 4	From Beechcroft Road to Battlefield Greenway Phase 6 terminus	**2,625**	**Mid Term**
Battlefield Greenway Phase 6	From Battlefield Greenway Phase 4 terminus to Jerry Erwin Park	**7,500**	**Mid Term**
Battlefield Greenway Phase 5	From Battlefield Greenway Phase 4 and 6 terminus to Wilkes Lane	**8,500**	**Long Term**
Kings Creek Greenway Phase 2	From Kings Creek Greenway Phase 1 to Rutherford Creek	**2,025**	**Long Term**

GREENWAY PROJECT	TERMINUS	TOTAL LENGTH IN FEET	PRIORITY
Kings Creek Greenway Phase 3	From Kedron Road to Port Royal Greenway Phase 1	**7,400**	**Long Term**
Rippavilla Greenway Phase 2	From Rippavilla Greenway Phase 1 western terminus to Rippavilla property	**5,700**	**Long Term**
Rippavilla Greenway Phase 3	From Rippavilla Greenway Phase 1 western terminus to Denning Lane	**3,200**	**Long Term**
Rippavilla Greenway Phase 4	From Kedron Road through Rutherford Place Trail to Denning Lane	**12,295**	**Long Term**
Rippavilla Greenway Phase 5	From Rippavilla Greenway Phase 4 midpoint to Rippavilla Greenway Phase 2 terminus	**19,260**	**Long Term**
Port Royal Greenway Phase 3	From Port Royal Greenway Phase 2 terminus to Jim Warren Road including I-65 underpass	**6,900**	**Long Term**
Harvey Park Greenway Phase 4	From Wilkes Lane to City Limits	**2,050**	**Long Term**
Summit Greenway Phase 5	From Buckner Lane to Buckner Road	**3,350**	**Long Term**
Summit Greenway Phase 6	From Buckner Road to New Port Royal Road	**3,400**	**Long Term**
Summit Greenway Phase 7	From Twin Lakes Drive to Thompsons Station Road	**6,350**	**Long Term**
Summit Greenway Phase 8	From Old Port Royal Road to Jim Warren Road including Saturn Parkway underpass	**1,900**	**Long Term**

Table 5: Project Priorities for Recommended Multi-use Trail Projects

MULTI-USE PATH PROJECT	TERMINUS	TOTAL LENGTH IN FEET	PRIORITY
Cleburne Multi-Use Path	From Beechcroft Road to Spring Hill Middle School	**4,267**	**Short Term**
Beechcroft Multi-Use Path Phase 2	From Town Center Parkway to Cleburne Road	**7,954**	**Short Term**
Duplex Multi-Use Path	From U.S. 31 (Main Street) to I-65	**17,500**	**Short Term**
Miles Johnson Multi-Use Path Phase 1	From U.S. 31 (Main Street) to Duplex Road	**2,620**	**Short Term**

MULTI-USE PATH PROJECT	TERMINUS	TOTAL LENGTH IN FEET	PRIORITY
Miles Johnson Multi-Use Path Phase 2	From Duplex Road to Kedron Road	**4,573**	**Short Term**
Kedron Multi-Use Path Phase 1	From Miles Johnson Parkway to Saturn Parkway	**2,912**	**Short Term**
The Crossings Multi-Use Path Phase 2	From the Crossings Boulevard roundabout through the Crossings Shopping Center	**2,393**	**Short Term**
Spring Station Multi-Use Path	From Buckner Lane to Wades Crossing	**6,453**	**Short Term**
Beechcroft Multi-Use Path Phase 1	From U.S. 31 (Main Street) to Town Center Parkway	**4,161**	**Mid Term**
Kedron Multi-Use Path Phase 2	From Saturn Parkway to Mahlon Moore Road	**8,048**	**Mid Term**
Kedron Multi-Use Path Phase 3	From Mahlon Moore Road to Port Royal Road	**6,887**	**Mid Term**
The Crossings Multi-Use Path Phase 1	From U.S. 31 (Main Street) to movie theater	**4,385**	**Mid Term**
Buckner Lane Multi-Use Path Phase 1	From Thompson's Station Road to Buckner Road	**3,986**	**Mid Term**
Buckner Lane Multi-Use Path Phase 2	From Buckner Road to Spring Station Road	**3,680**	**Mid Term**
Buckner Lane Multi-Use Path Phase 3	From Spring Station Road to Duplex Road	**6,339**	**Mid Term**
Buckner Road Multi-Use Path Phase 1	From U.S. 31 (Main Street) to New Port Royal Road	**4,202**	**Mid Term**
Buckner Road Multi-Use Path Phase 2	From New Port Royal Road to Buckner Lane	**5,889**	**Mid Term**
Buckner Road Multi-Use Path Phase 3	From Buckner Lane to I-65	**4,674**	**Mid Term**
Beechcroft Multi-Use Path Phase 3	From east of Petty Lane to Cleburne Road	**8,021**	**Long Term**
Kedron Road Multi-Use Path Phase 4	From Port Royal Road to I-65	**5,846**	**Long Term**

4.2 Funding Strategies

As seen in **Tables 3 - 5**, a substantial investment in infrastructure is needed to provide an adequate bicycle and greenway system for the citizens of Spring Hill. In order to accomplish this, multiple funding sources are required and it will take a substantial investment of time and effort to acquire the funding. Following is a description of several funding sources that the City and its partner agencies should pursue for funding opportunities.

Non-Profit Groups

The City should continue to build on recent successes by seeking other opportunities to partner with these organizations or others with similar goals in mind.

Corporate Sponsorships

Team with businesses that would be interested in providing land, labor, materials, etc., or that would be willing to pay for naming rights and/or signage for advertising purposes. This strategy has recently been proven successful with the Peter Jenkins Walking Trail extension project. The City partnered with Outdoor Encounter, a non-profit organization who received donations from several private companies to provide in-kind services and/or made cash donations for the construction of the trail. In return, the companies were recognized in multiple news media stories and were recognized at the opening of the trail.

Fund Raising/Community Involvement

Start an Adopt-a-Park/Adopt-a-Trail program to help construct and maintain trails and greenways. Adoptions could be made by corporations and/or community members and could consist of funds raised and/or time donated to construction and maintenance. There are many successful Adopt-a-Park/Adopt-a-Trail programs in communities throughout the country.

Another option would be to start a neighborhood pick-up program for neighborhood associations and/or civic groups to provide clean up and maintenance of trails, greenways, equipment, etc. Lastly, several fund raising strategies could be used, such as community yard sales, bake sales, name a brick/piece of equipment campaign, revenue from sports tournaments, etc.

Property Tax/Sales Tax Increase

It is possible to dedicate a portion of property taxes and/or sales taxes paid by City of Spring Hill residents to fund bike route, trail, and/or greenway facilities. This has been successfully implemented by communities around the country. If this funding mechanism is implemented, it is recommended that City residents vote on a parks allocation of taxes rather than the Board of Mayor and Aldermen (BOMA) using general fund monies. This would provide residents with more direct ownership of the decision. One benefit of implementing this strategy is that citizens are assured that a certain portion of their tax dollars are going specifically toward something that benefits the community directly in the form of tangible bicycle and pedestrian infrastructure projects.

Partnerships with Maury/Williamson Counties or Neighboring Municipalities

Partner with Maury and/or Williamson County and/or neighboring municipalities to help fund and connect projects. By pooling resources, it may be possible to bring more projects to fruition. In addition, it might be possible to partner with the Maury and Williamson County school systems so that they might provide land adjacent to or on school grounds for parks and recreation development.

Grant Funds

The state and federal governments have many grant programs that could be utilized to obtain funds for trails. Some of these grants include enhancement grants, Active Living grants, Land and Water Conservation funds, Surface Transportation Program (STP) funds, Safe Routes to Schools, etc.

Bond Issue

The City of Spring Hill could issue bonds to fund projects. The most common types of municipal bonds are general obligation bonds, which are tax exempt bonds with low interest rates that

governments use as a funding source for capital projects. These bonds would be re-paid with funds dedicated to such payments, usually through a property tax levy.

Usage Fees

Lower on the list of preferences would be usage fees that would be charged to access park facilities. The preference would be for as many facilities to be free and open to public as possible, but some level of usage fees may be necessary to cover funding gaps and operations and maintenance associated with the facilities.

Adequate Facilities Tax / Impact Fees

The City of Spring Hill could levy an adequate facilities tax or institute Impact Fees for new development, which is permitted by the state for high-growth communities. All or a portion of the adequate facilities tax or impact fees could be utilized for facilities recommended by this plan.

State Street Aid Fund

This fund is comprised of a portion of the proceeds from the state gas tax and is available to incorporated communities throughout the state for use on municipal streets. (Streets, as defined by TCA § 54-4-201, which would include greenways and trails that are "public ways dedicated to public use and maintained for general public travel lying within a municipality's corporate boundaries.)

5.0 Conclusion

Spring Hill, after experiencing rapid growth and development over the past 30 years, is poised to become a leader in quality of life of its residents among regional peer cities. One component of becoming a City with an improving quality of life is a connected and complete network of bicycle lanes, multi-use paths, and greenway trails that function as a vital link between the City's parkland and transportation network.

The City has some of the highest numbers of families with young children in the region and, as such, there is a much needed commitment by the City to provide linkages between the City's park system and its transportation network. By developing this plan, the City has taken the first step in establishing a commitment to providing an excellent community to live, work and play. This Plan provides a detailed "trail map" for the City, its citizens, and stakeholders to follow in terms of creating a connected, complete, and comfortable bicycle and pedestrian network. The City of Spring Hill stands to benefit greatly from the implementation of this network with potential benefits to its citizens through the promotion of exercise and personal health, community pride, economic development/growth, and environmental enhancement. By implementing this Plan, the City of Spring Hill will further its efforts to create an attractive, viable, and vibrant community for current and future generations of citizens and stakeholders.

City of SPRING HILL TENNESSEE est. 1809

APPENDIX: THE CITY OF SPRING HILL BICYCLE AND GREENWAY DESIGN GUIDELINES

1.0 Bicycle and Greenway Facility Design Standards

Proper planning and design of greenway paths is crucial to providing safe facilities, reducing the impact upon the natural environment, maximizing long-term benefits, and reducing potential future maintenance issues. These design guidelines are intended to function as a reference for local government, engineers, planners, and others who make decisions that affect bicycle and pedestrian travel in Spring Hill. These should be used in conjunction with the City of Spring Hill's already-established sign regulations, in addition to the established guidelines of the American Association of State Highway and Transportation Officials (AASHTO), the current edition of the *Manual on Uniform Traffic Control Devices* (MUTCD), and the *Americans with Disabilities Act* (ADA). Other emerging guidelines such as the NACTO *Urban Bikeway Design Guide*, in addition to those listed above, should be consulted and may be found to provide more innovative guidance that might be appropriate given unique site-specific trail conditions.

This document cites several resources, including Vermont Agency of Transportation's (VTRANS) Vermont *Pedestrian and Bicycle Facility Planning and Design Manual* and Maryland State Highway Administration's (SHA) Bicycle and Pedestrian Design Guidelines. Other resources used include the State of Washington's Department of Transportation's (WSDOT) *Design Manual* and the Tennessee Department of Transportation' (TDOT) *Complete Streets Design Guidelines*. All sources conform to AASHTO, MUTCD, and ADA requirements and guidelines.

1.1 Initial Considerations

In general, greenway paths should be designed with the following considerations:

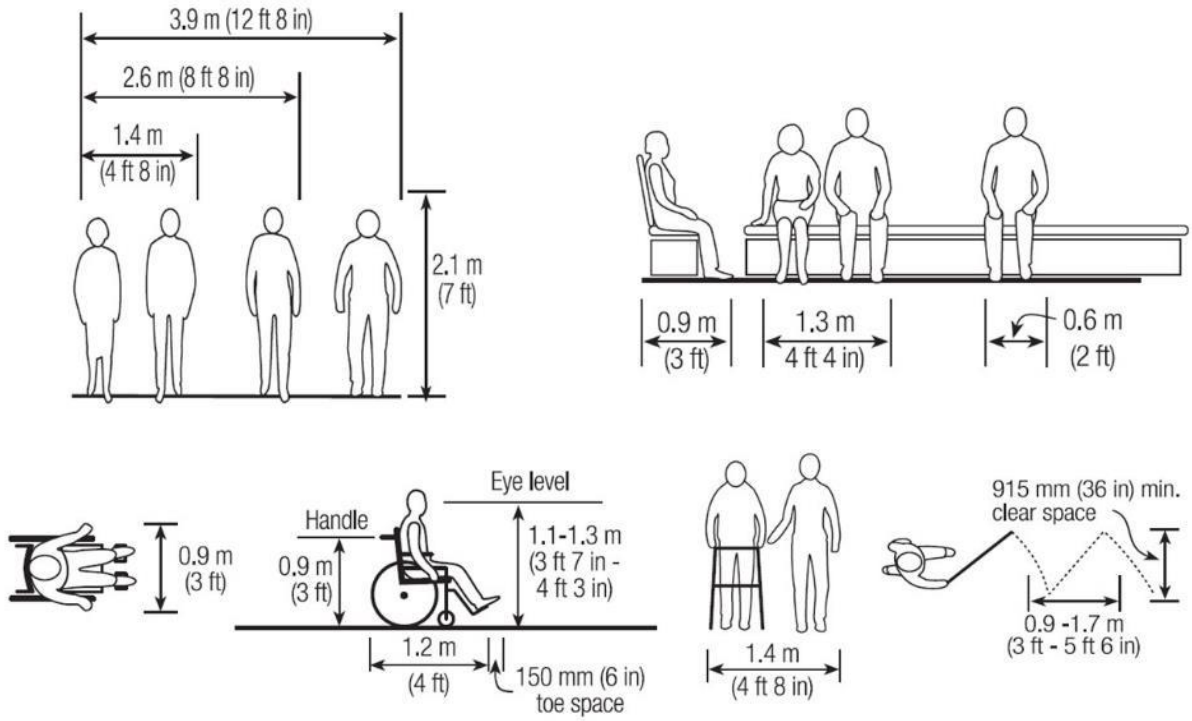
- Ease of accessibility for all users – regardless of user type, age, ability, or trip purpose.
- Real and perceived safety. Facilities should be free of hazards and obstructions, designed to minimize conflicts with vehicular traffic, and properly lit where appropriate.
- Anticipated volume of users. Facility widths should be wide enough to comfortably accommodate initial and predicted volumes of users.
- Continuous community connections. The City's 2012 Spring Hill *Parks, Recreation, and Greenways Plan* envisions "an extensive trail network in Spring Hill that covers the entire City and provides connectivity to other trails, schools, parks, etc."
- Compatibility at the community level and within the facility's immediate context. Design should complement adjacent land uses, as well as enhance neighborhood design objectives.
- Aesthetics – design of facility and surrounding realm should be conducive to the human scale. These design elements include: quality-of-life, public art, natural environment, scenery, solitude, tranquility, etc.
- Environment – linear parks (greenways) provide important nature restoration areas, especially for trails alongside streams and creeks. Greenways also act as a wildlife corridor in an often development-fragmented landscape providing both habitat and unrestricted movements between undeveloped areas.

1.2 Users of Greenways – Design Dimensions

When designing greenway facilities, it is important to keep in mind users' dimensions, abilities, and trip type. User types of the Spring Hill Greenway system may include walkers, pedestrians with baby strollers, joggers, in-line skaters and skateboarders, bicyclists (recreational and commuting), wheelchair users and other types of mobility devices.

Pedestrians

Pedestrians vary greatly in age, cognitive ability, reaction time, height, physical ability, and visual acuity. These variables should be taken into consideration when designing such facilities in order to provide the safest facility possible for its users. According to the MUTCD, normal walking rates range from 2.5 to 6.0 fps or 1.7 to 4.1 mph with an average of 4.0 fps or 2.7 mph. A runner's typical speed is considered to be 6.2 mph. According to FHWA's *Characteristics of Emerging Road and Trail Users and Their Safety*, a manual wheelchair's typical speed is 3.6 mph, while a motorized power wheelchair is 6.8 mph. Five feet (1.5 m) is a recommended minimum for a wheelchair to make a 180 degree turn. Human dimensions for walking and sitting is shown below, along with the spatial dimensions of pedestrians using a wheelchair, walker, or cane.

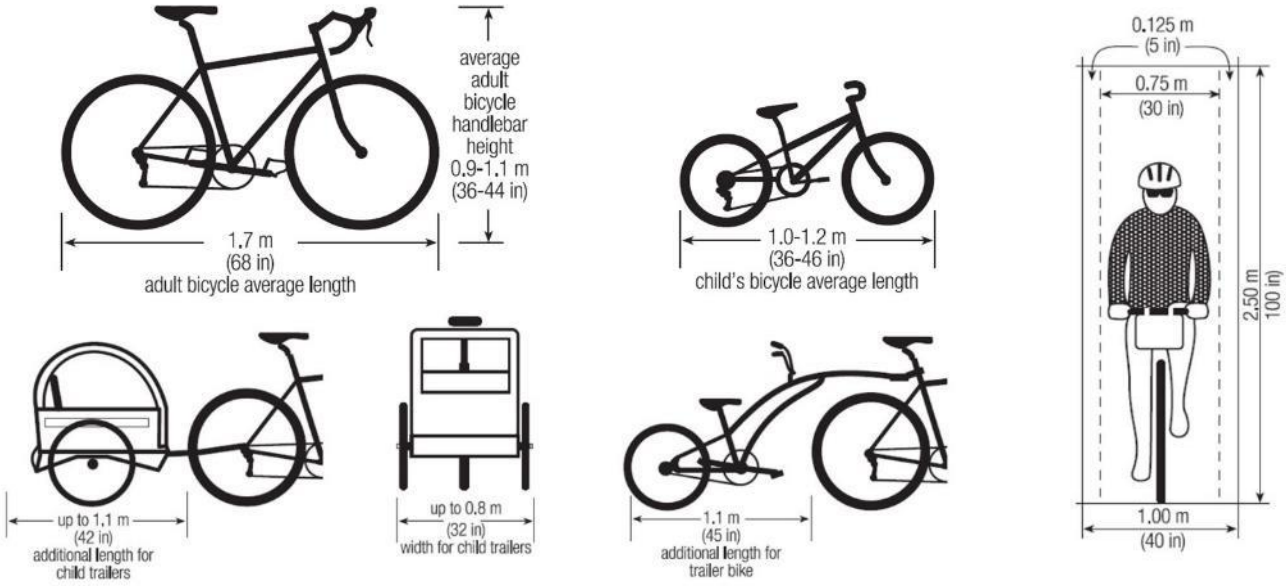


Source: VTRANS, Vermont Pedestrian and Bicycle Facility Planning and Design Manual

Figure: Pedestrian Dimensions

Bicyclists

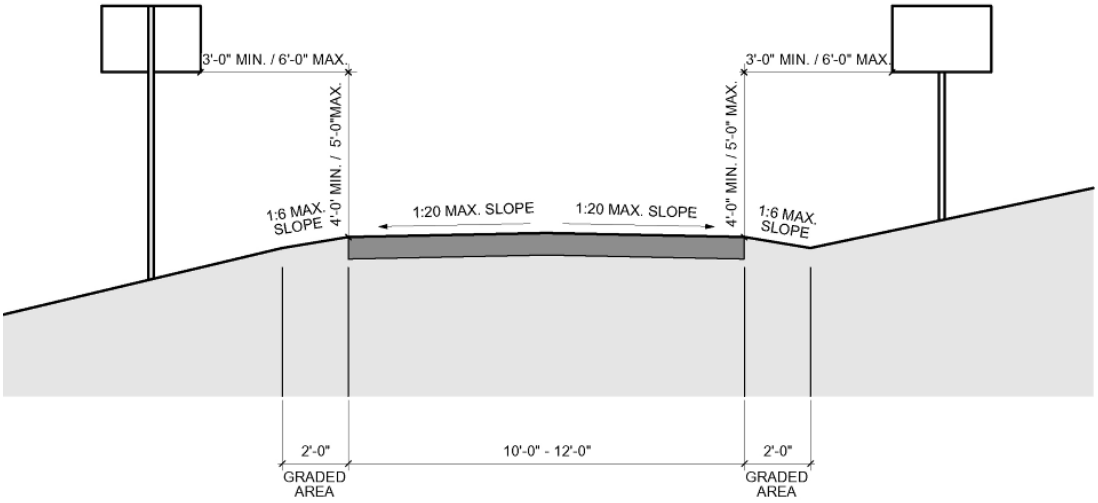
Similar to motor vehicles, bicycles come in a variety of sizes and configurations, therefore requiring special design considerations when planning a greenway facility. Smaller tire sizes, usually found on road bikes, can be especially sensitive to imperfections and debris on the riding surface. Smooth transitions between a pathway and bridge, bicycle tire-friendly stormwater grates, sightlines, stopping distances, pathway materials, and maintenance of the trail (debris) are all important design considerations for this user group. Typical reaction and braking times vary widely by user but should typically allow 2.5-3.0 seconds with an additional 1.5 seconds for applying the brakes. Maximum deceleration for a bicycle is 11 mph/second, while the average speed of an adult (average) rider is 8-15 mph with a proficient adult rider averaging 12-24 mph. Below are dimensions for various bicycle types and a bicyclist's general operating space.



Source: VTRANS, Vermont Pedestrian and Bicycle Facility Planning and Design Manual

Figure: Bicyclist Dimensions

1.3 Trail Facility Basics



Source: AASHTO, Guide for the Development of Bicycle Facilities

Figure: Recommended Width, Lateral Clearance and Slope Standards for Multi-Use Paths

Pathway Width

In general, the recommended width for a two-way, shared-use path is 10 feet. This design width allows two pedestrians and a bicyclist going in opposite directions to pass one another comfortably. The minimum, 8 feet, is permissible for paths in rare instances such as a connector path between destinations and the greenway facility or where low user volumes (occasional pedestrian use, low bicycle traffic) are expected. When a one-way path is the only available option, a width of 6 feet is recommended; however, these facility types are discouraged as they are often used as two-way facilities. In areas where high user volumes are expected or areas with steep grades, a width of 12-14 feet is recommended.

Shoulders

The preferred shoulder width on both sides of a pathway is 2 feet (0.6 m). This realm of the pathway provides pull-off, resting, or recovery space and should be graded to a maximum slope of 1:6. Trees and bushes should be pruned to prevent overhang in the shoulder area. Other obstructions, such as a fence, should also not encroach the shoulder area.

Lateral Clearance

The minimum horizontal clearance from the edge of the pathway to an obstruction is 2 feet (0.6 m), while the preferred is 3 feet (0.9 m) where space allows. Obstructions may include, but are not limited to, trees, poles, guardrails, fencing, or walls. It should be noted that the MUTCD prescribes a minimum distance of 3 feet (0.9 m) to a maximum of 6 feet (1.8 m) for the placement of signs measured from the nearest edge of a sign to the edge of the pavement.

Vertical Clearance

The recommended vertical clearance, from the pavement surface to overhead obstructions, is 10 feet; however, 8 feet is an acceptable minimum. This clearance allows for the accommodation of emergency and maintenance vehicles. A vertical clearance of 12 feet is recommended for pathways that may serve horseback riders.

Running Slope and Cross Slopes

For proper drainage, a facility's recommended cross slope is 2 percent (1:48). A slope any greater poses balance challenges for wheelchair users and other pedestrians with mobility issues. The recommended cross slope is important to maintain as ponding water may yield algae growth during warmer months or icy conditions in colder months, posing a safety risk to greenway users.

Variations in the facility's running slope (grade) can be expected but should be kept to a minimum, especially on long inclines. Ideally, running slopes should not exceed 5 percent with the most gradual possible slope used at all times. Slopes any steeper are undesirable for bicyclists, both in climbing and descending. As steep slopes are sometimes unavoidable for short segments of the greenway, ASHTO suggests the following grade restrictions and grade lengths guidelines:

5-6%	For up to 800 feet (240 m)
7%	For up to 400 feet (120 m)
8%	For up to 300 feet (90 m)
9%	For up to 200 feet (60 m)*
10%	For up to 100 feet (30 m)*
11% +	For up to 50 feet (15 m)*

* - *Slopes greater than 8.33% are not considered accessible by ADA guidelines*

The following design considerations should be also be given for pathway segments with excessive path grades:

- Adding additional pathway width (2-4 feet) for high level use pathways in order to accommodate slower users or bicyclists wishing to dismount and walk
- Increasing the pathway's lateral clearance and recovery area dimensions
- Signage alerting users of the maximum percent of grade or for cyclists to dismount
- Providing a series of switchbacks
- Longer landing area for descending bicyclists to reduce their speeds doubling as a rest area for users to recover along their climb or descent
- Installation of centerline to better delineate traffic
- Installation of hand railings and landings every 30 feet as slopes between 5 and 8 percent are considered a ramp by the ADA

Design Speed

AASHTO recommends a design speed of 20 mph (30 km/h) for greenway facilities. This speed meets an acceptable riding threshold for more experienced bicycle riders. A design speed of 30 mph (50 km/h) or more is recommended when strong prevailing tailwinds exist or a downgrade exceeds 4 percent.

Curve Radii

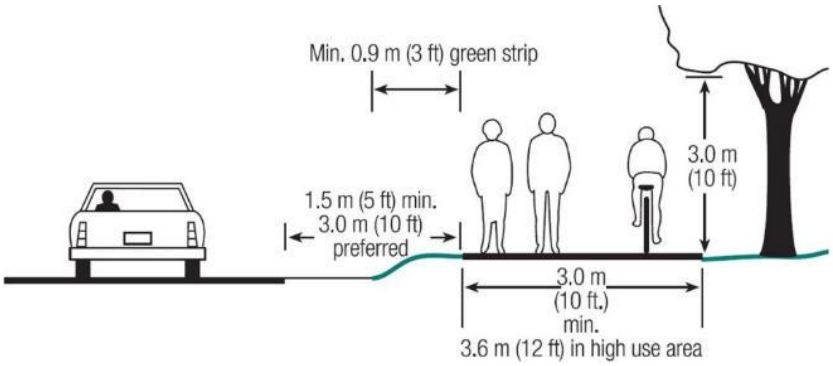
The table below displays the various design speeds and corresponding suggested minimum radii of curvature for a pathway. These recommendations are based upon a "desirable maximum lean angle of 15˚ (AASHTO)". When topography or right-of-way limits the recommended curve radii, signage should be considered to alert users. Additionally, a centerline or additional pavement width may improve safety along sharp curves.

Design Speed (V)	Minimum Radius (R)
12 mph (20 km/h)	36 ft (12 m)
20 mph (30 km/h)	100 ft (27 m)
25 mph (40 km/h)	156 ft (47 m)
30 mph (50 km/h)	225 ft (74 m)

1.4 Relationship with Roadways

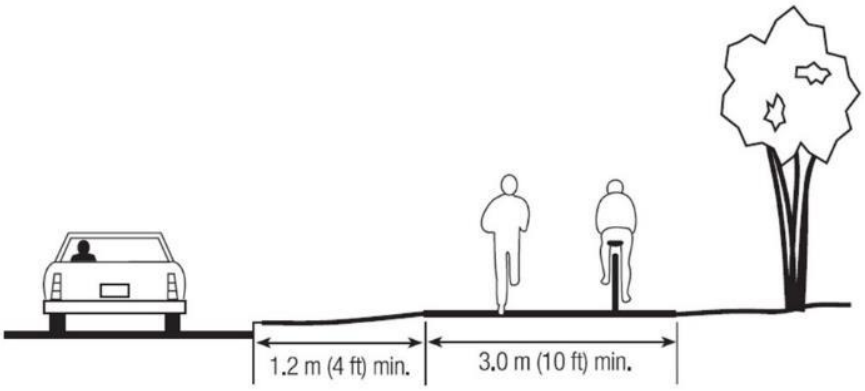
Ideally, pathways should not be located next to roadways for both safety and aesthetic reasons. If a pathway must be placed adjacent to a roadway, such placement should be kept to a minimum with the greatest amount of separation provided between facilities. Only roadways with a limited number of intersections and driveways should be considered for pathway placement in order to minimize potential conflicts. Conditions warranting an adjacent path may include restrictions for placement elsewhere, high traffic volumes and speeds on the adjacent roadway, and/or high greenway user levels at that location.

As depicted in the figures below, a separation of 10 feet between pavement edges is generally preferred. When the separation is less than 5 feet, a barrier (with a height of at least 42 inches, according to AASHTO) is recommended as long as the barrier does not negatively affect sight distances or adjacent motorists. Below are suggested dimensions for an uncurbed and curbed section of a roadway.



Source: VTRANS, Vermont Pedestrian and Bicycle Facility Planning and Design Manual

UNCURBED SECTION OF ROADWAY



Source: VTRANS, Vermont Pedestrian and Bicycle Facility Planning and Design Manual

CURBED SECTION OF ROADWAY

Figure: Pathway Dimensions for Uncurbed and Curbed Section of Roadway

1.4.1 At-Grade Crossings

Greenway/roadway intersections present a higher level of danger for path users, therefore requiring proper planning and design to minimize potential hazards. The overall guiding design principle is for the intersection to be designed so that it looks and functions like a typical roadway intersection. The familiarity of such conditions helps motorists and path users know what to expect and how to behave at the intersection. The following conditions should be considered in the design of these pathway/roadway interactions:

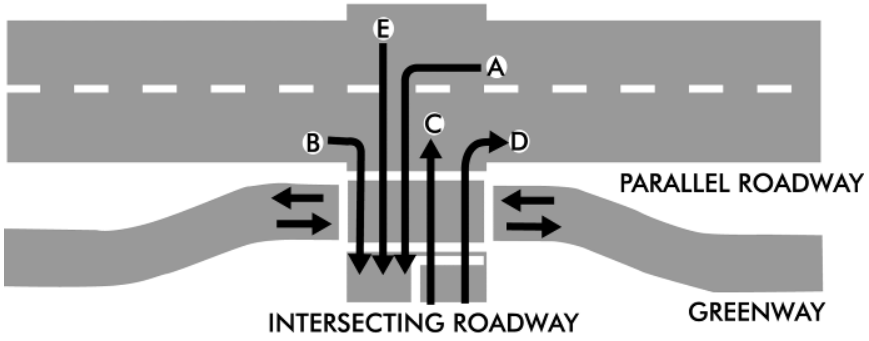
- Accommodate the full spectrum of users and their unique needs (ex: senior citizen's slower pace or a small child's inability to understand traffic procedures)
- Consistent design across the community's greenway system
- Particular consideration of sight-related elements including the potential for sun blinding, pedestrian-scale lighting under low visibility conditions, and sightline distances
- Adequate staging and refuge for crossing users, especially for bicycles and wheelchairs
- Roadway's traffic volume and posted speed limit
- Running grades should be kept to a minimum for maximum accessibility at roadway intersections
- Consider high visibility strategies for At-Grade Crossings (imbedded LEDs, flashing warning signs, etc).

AASHTO categorizes at-grade pathway/roadway intersections into three categories – adjacent path, midblock, and complex. Each category is discussed below. It should be noted that intersection design requires engineering judgment in determining the need for traffic control devices, as well as the proper signage according to MUTCD standards of size, placement, and type.

Adjacent Path Crossings

These types of crossings occur where a path crosses a roadway at an intersection, whether a four-legged intersection (as shown below) or a T-intersection. This presents a unique set of challenges including additional potential conflicts. These include potential conflicts with left-turning vehicles

from point A and right-turning vehicles from point B of the parallel roadway and on the crossed roadway at points C, D, and E.

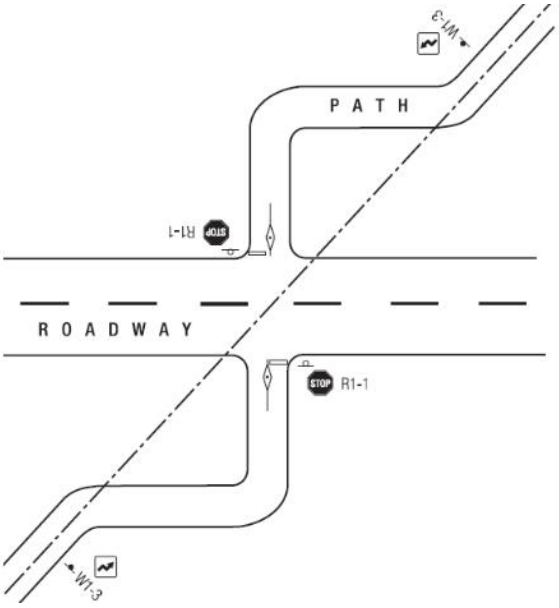


Source: Adapted from AASHTO

Figure: Adjacent Path Crossing

Midblock Pathway Crossing

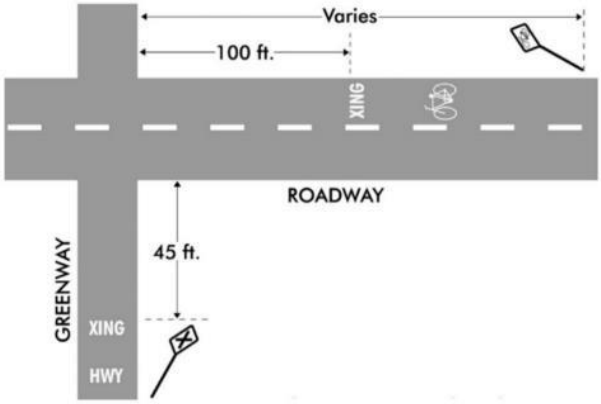
An intersection is considered midblock when a pathway crosses the roadway far enough away from any other intersection to be considered its own independent intersection. The pathway should ideally be aligned perpendicular to the roadway at the crossing location as to maximize visibility to potential hazards. AASHTO suggests a 45˚ crossing angle may be acceptable when trying to minimize right-of-way requirements. The figure below displays the realignment of a pathway to achieve the 90˚ preferred angle where it meets the roadway.



Source: AASHTO

Figure: Ninety Degree Crossing

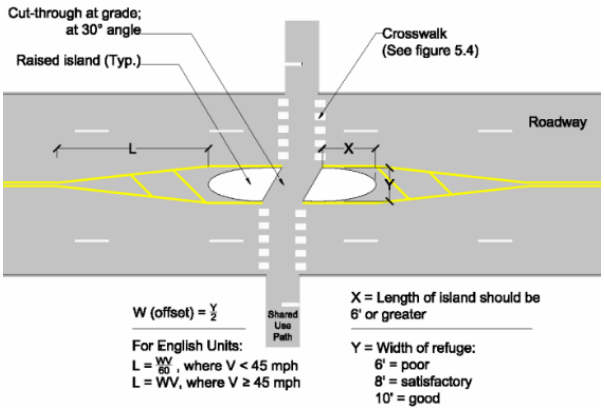
Roadways that experience high traffic volumes should be avoided for midblock crossings when at all possible. TDOT's *Complete Streets Guidelines* do however, acknowledge that the midblock intersection is sometimes the safest choice as it provides both motorists and path users plenty of warning and reaction time for such crossing movements. As long as intersections have proper pavement markings, adequate signage, maximized sight distances, and appropriate design, midblock intersections may be safely navigated by both motorists and pathway users.



Source: AASHTO

Figure: Midblock Crossing

Based upon the unique dynamics of the intersection (particularly the roadway's traffic volume and design speed) appropriate traffic control devices should be installed. Two-lane, low-volume roadways may only require simple MUTCD-compliant crosswalk markings, while multi-lane, higher volume roadways may require a raised crosswalk or median island in addition to the installation of traffic control devices. As shown in the figure below, a median island should be angled (at a suggested 30˚) towards oncoming traffic for improved visibility. It is recommended that the median's width never be less than 6 feet. The median island breaks down a complex crossing into two stages. Similarly, raised medians provide added protection for pathway users. TDOT suggests a raised median be installed on multi-lane roadways that carry 12,000 cars or more per day.

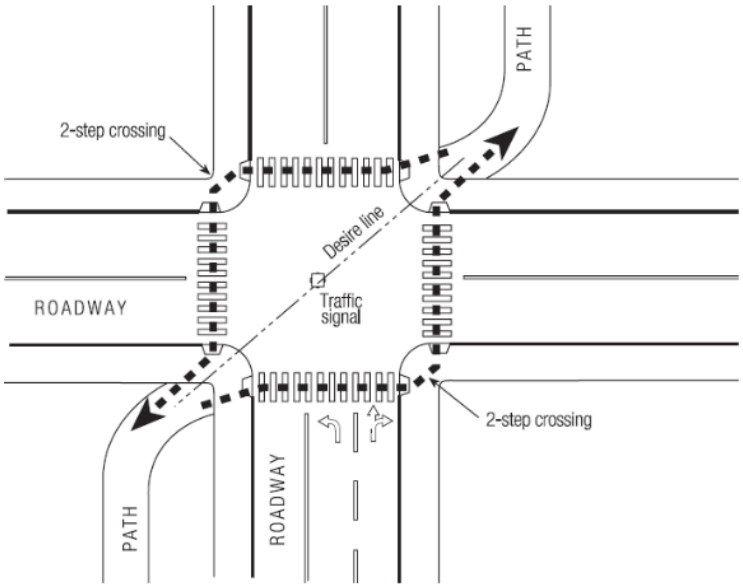


Source: Maryland SHA Bicycle and Pedestrian Design Guidelines

Figure: Angled Median Island

Complex

Complex intersections crossings include a variety of configurations depending on the intersection's unique geometric design and number of lanes entering the intersection. Offset or skewed approaches and/or multiple streets entering from different angles can create confusion for all roadway users. Some situations may warrant a two-step crossing for path users in order to simplify the crossing. "This is typically done where, because of alignment constraints, the path-roadway intersection is skewed markedly from the 90-degree optimum and path realignment is not possible (VTRANS)". Signs should be used to encourage the two-step crossing instead of the most direct route, identified by the desire line in the figure.



Source: VTRANS, Vermont Pedestrian and Bicycle Facility Planning and Design Manual

Figure: Two-Step Crossing

1.4.2. Grade-Separated Crossings

Over- and underpasses are structures used to traverse barriers, such as a roadway or railroad, in order to maintain a desired continuous pathway. While overpasses provide more visibility and security than underpasses, these structures typically require longer approaches (sometimes up to 1,000 feet of ramp) to achieve the 17 feet clearance over roadways, 23 feet over railroads, and a pathway grade of 5˚. For this reason, overpasses tend to be used less by pathway users.

Underpass

Underpasses tend to be preferred, especially when a right-of-way under an existing elevated roadway exists. Safety and maintenance concerns should be especially considered for these locations and may warrant additional warning signs, such as flooding hazards and slippery conditions when pathways lie alongside a stream. Removing debris and silt deposits from this segment of the trail may be required following flood events. When a nearby existing bridge is not present, an underpass structure may be constructed. A vertical clearance of 10 feet is recommended to accommodate maintenance or emergency vehicles. Proper lighting, designed to withstand vandalism, is recommended when visibility is poor.

Source: VTRANS, Vermont Pedestrian and Bicycle Facility Planning and Design Manual

Figure: Underpass

1.5 Other Facility Design Features

Bridge

In some cases, such as stream crossings, bridges may be the only practical treatment. These structures should be designed to serve both pedestrians and non-motorized users. Ideally, the clear width of pedestrian bridges will match the approaching greenway including the recommended minimum two-foot wide cleared area on either side of the trail. Including the cleared area width allows for free space between the users and requisite safety railings and barriers.

Railings and Fences

Railings and fences are used for both aesthetics and safety purposes along a greenway pathway. They provide protection from steep slopes, water features, active transportation facilities (i.e., active rail line or roadway), and in some cases, security. AASHTO describes the following conditions as the most common for installing railings or fencing:

- Structures (i.e., bridges)
- Pathways adjacent to steep slopes and/or waterways
- Pathways adjacent to active rail lines or roadways

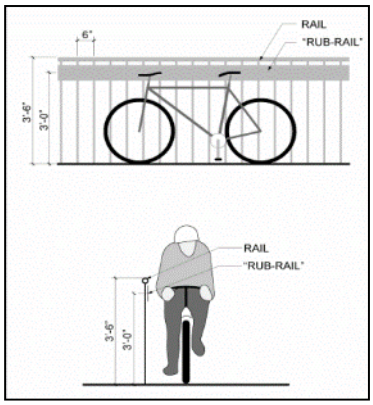


Figure: Railings and Fencing

AASHTO recommends a minimum fence or railing height of at least 42 inches for pedestrians. Railing or fencing along bridges should be a height of 54 inches to provide bicyclists protection from falling over the fence. The installation of "rub rails" at a height of 36 inches from the ground is recommended to prevent bicycle handlebars from brushing against the railing or fence.

Aesthetic purposes of fencing and railing include defining clear property boundaries, screening from conflicting land uses, and achieving a desirable atmosphere. There is no specified height requirement for aesthetic fencing or railing if not within the pedestrian or bicycle right-of-way. The most common fencing materials used along a shared use path are wood, wrought iron, vinyl, or masonry.

If fencing is utilized to separate a multi-use path, bike lane, or greenway from a private residence, commercial or industrial facility, or roadway, the fence should be constructed of wood or vinyl.

Motor Vehicle Barriers

Where pathways begin and end or instances where the pathway traverses a roadway, a bollard (barrier posts) should be installed. These structures prevent motor vehicles from entering the pathway. Removable or collapsible bollards allow for emergency and maintenance vehicle traffic when desired. Bollards can, however, present a safety concern for unsuspecting bicyclists and therefore should be properly marked both on the structure and pavement. An example of striping may be found below. Ideally, bollards should be spaced 5 feet apart with a minimum of 5 feet behind the intersection or pathway termination point. This allows users to clear the bollards prior to entering an intersection where attention should be paid to roadway traffic. In locations requiring more than one bollard, an odd number should be used to create an even number of passing pathways.

An additional method to restrict motor vehicle traffic is the splitter island. The splitter island allows a vehicle to easily navigate and clear the structure while still functioning as a traffic calming method. This alternative increases safety for cyclists and is often more aesthetically pleasing.

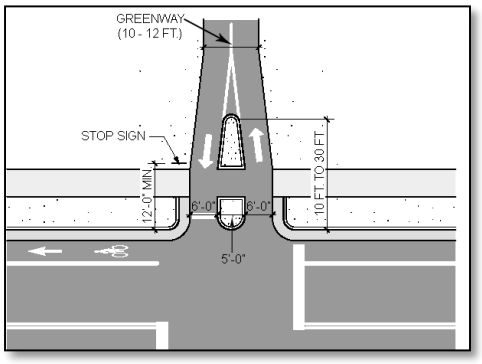
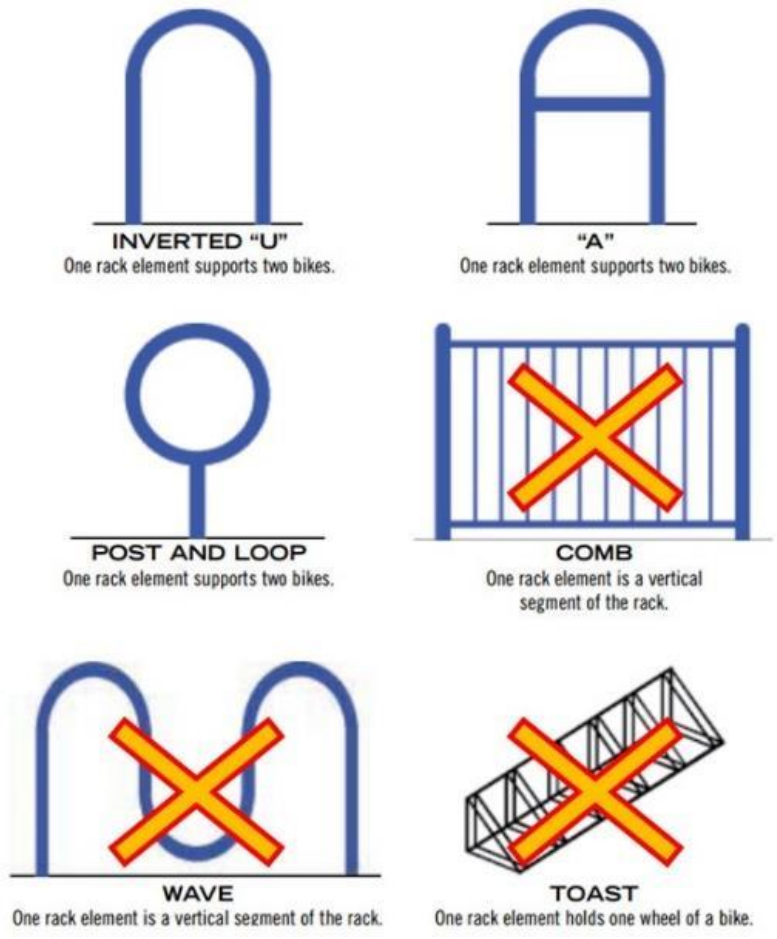


Figure: Motor Vehicle Barriers

1.6 Common Trail Amenities

Bicycle Parking

Bicycle racks, ideally located in visible and well-lit places, provide temporary secure parking. Typical rack placement include trailheads (no further than 50 feet from the entrance) and points-of-interest along the trail. These locations may include playgrounds, pavilions or picnic tables, scenic overlooks, restroom facilities, and other attractions.



The rack element, the part of the structure that supports one bicycle, should support the bicycle upright by its frame in two places. It should allow for usage of the U-type bike locks with the ability to link both bicycle frame and wheel. Spatial requirements of bicycles should be especially considered when providing a series of leaning rail racks or a ribbon-style rack. Single leaning rail racks should be placed at a minimum 2.5 feet apart to allow for a bicycle to clear an already-parked bicycle, while a 5 foot clearance should be given perpendicular to the bike. Wave, toast, and comb-style bike racks should generally be avoided as they can bend tire rims and can be cumbersome to use when multiple bikes are present.

Source: Greenville County, South Carolina, Comprehensive Greenway Plan

Figure: Bicycle Parking

Pet Waste Station

Pet waste stations are increasingly being used by parks in light of water quality concerns, contamination risks, and general aesthetics. Greenway facilities running along stream banks or in especially environmentally-sensitive areas may benefit from a disposal station. Potential sites for pet waste stations include trailheads, playgrounds, or segments of the trail predicted to have high user volumes or those located adjacent to residential zones. At a minimum, stations should be set back 3 feet from the trail.

Benches

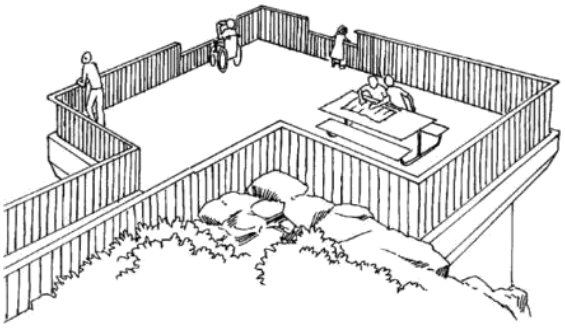
Benches should be considered for locations such as a scenic view, streamside, trail access points, restroom facilities, or a public art display. Seating may also be structurally incorporated into other greenway elements such as a viewing deck or planter edges. When possible, seating should be placed underneath tree canopies to provide natural shading. Benches should be anchored securely to the ground with a minimum of three foot between bench and trail.

Picnic Tables

Picnic tables provides greenway users with a place to rest or congregate. They may be placed at a variety of locations including near playgrounds or other park facilities, in scenic spots, or scattered along the trail. Picnic table design should be wheelchair-accessible and placed in locations that minimize weather conditions when possible, i.e., out of direct wind or sunlight.

Observation Deck

Observation decks can be built overlooking scenic views. Careful placement and design should be considered when locating within a flood zone. These structures should not interfere with nearby residents' privacy and should not be located in areas not readily accessible by maintenance vehicles.



Restrooms

Restroom facilities are generally found at trailhead locations. Style and roofing-type should match existing park facilities in Spring Hill.

Public Art

Public art enhances a greenway's overall environment and can either help unify the grander system through the establishment of an identity or help to differentiate individual pathway systems. Some

art pieces can be interactive in nature and provide either resting or recreational space for users. Placement of public art is especially appropriate at trail access points, locations near other site amenities, public gathering areas, locations of historical or cultural significance, or open wall faces (including bridge/underpass structures). Several Tennessee communities, including Manchester and Cleveland, incorporated community art projects to beautify the roadway underpasses their greenways run under. The photos below are from the Cleveland/Bradley County Greenway in eastern Tennessee, which incorporates numerous public art pieces.

Lighting

Lighting is suggested for segments of the greenway where operating hours extend beyond the usual dusk-to-dawn timeframe. Fixtures are especially appropriate at trail access points, bridges or underpasses, ramps, public gathering locations (such as a gazebo or bench), and trails located within a roadway's right-of-way. Consideration to nearby residents and wildlife should be given when using lighting. Pedestrian scale fixtures, like those shown below, are designed to limit light pollution, while providing more efficient energy use. All fixtures should comply with the lighting standards in the Zoning Ordinance of the City of Spring Hill.

Trash Receptacles

Trash cans should be placed consistently along the greenway facility. They should especially be placed near picnic tables, playgrounds, restrooms, trailheads, trail connection points, and other high volume areas. Placement of cigarette receptacles may be beneficial at public congregation points such as gazebos, observation decks, or playgrounds to accommodate the range of potential users.

Drinking Fountain

Drinking fountains are most often found with restroom facilities; however, other prime locations for free-standing fountains include trailheads, pathway connection points, or, when possible, along the trail intermittingly. Wheelchair-accessible fountains should also be provided at some locations. Consideration should be given to pets, as some greenway users may use the assistance of a service dog or walk their pets on the greenway or in the park areas (if allowed). Some drinking fountain units have built-in ground level stations to accommodate such use if desired.

1.7 Facility Connections to Greenways

Providing adequate linkages between the community and the greenway system is an important aspect of pathway planning. Not all community destinations and high volume areas can be accommodated with a trail facility. Instead, pedestrians and bicyclists must utilize existing infrastructure. Providing citizens with adequate, safe, and timely connection opportunities to the

greenway system encourages use for potential users. The following bicycle facility design guidelines seeks to provide consistent and predictable facilities for greenway connections.

1.7.1 Off-Street Connection Facilities

Connector paths provide connections between various destinations along a greenway corridor. These connections provide short, direct routes between land uses without, as shown in the figure. These facilities are especially effective in providing links to destinations off limited-access highways that prohibit bicycle travel. Connector paths should be considered for greenway paths that lie adjacent to important community destinations (such as a school, library, or community center) or are expected to serve a non-motorized transportation function. Acceptable widths for off-street connectors range from five to ten feet.

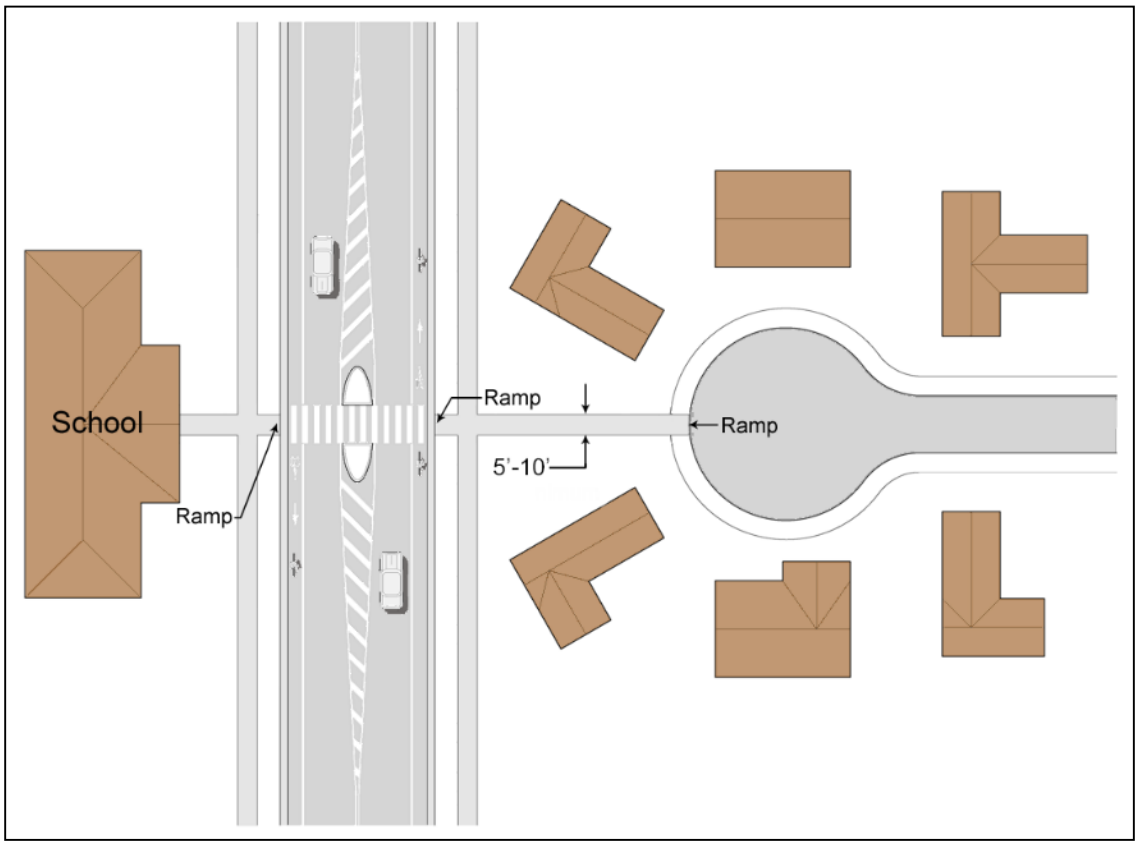


Figure: Connector Facilities

1.7.2. On-Street Connection Facilities

Shared Roadways

Shared roadways are facilities identified by appropriate signage and pavement markings as preferred bike routes. Designating such routes alerts motorists to the likelihood of a bicyclist's presence, while relaying to bicyclists that this particular route is advantageous to connect to other nearby roadways. A shared roadway may or may not include roadway facility improvements

described in the latter portion of the section. Signs designating shared roadways are not required but are typical.

Signed Bicycle Routes

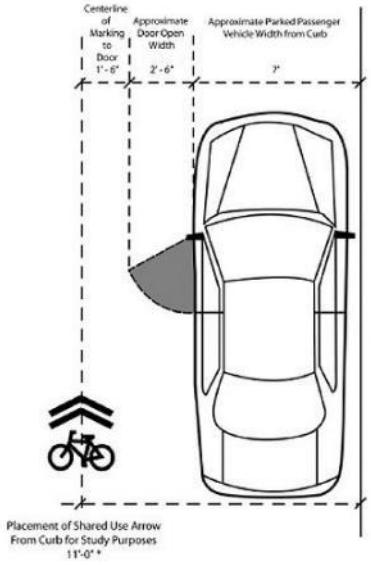
When designating a roadway as a signed bike route, the following should be considered:

- Route provides a higher degree of connection (accessibility to community population centers) than alternative roadways
- Route connects to on-street bicycle facilities or greenway pathway
- Scenic and more direct routes are more desirable to riders
- Potential for design and traffic hazards
- Ideally, routes experience lower traffic volumes (especially trucks) and lower posted speed limits
- Quality of existing pavement
- Adequate sight distances
- Minimal topography
- Presence of rumble strips
- Presence and turnover of on-street parking
- Lane widths of roadway

The following bicycle route signs are recommended to be placed at all major decision points, especially when routes change direction: D11-1, M1-8, M1-9. Route confirmation signs are often advantageous, but may not always be necessary depending on each route's unique circumstances.

Marked Shared Roadways

Marked shared roadways are identified bike routes further designated by shared lane pavement markings, also referred to as "sharrows". Sharrows are bicycle symbols placed in the roadway lane indicating the likelihood of the presence of cyclists, but are not to be used to solely designate bike routes. These pavement markings, instead, encourage bicycle travel and proper positioning of bicycles within the lane. Use of sharrows is especially appropriate where on-street parking is permitted and frequently used, there is a gap or terminus of a designated bike lane, or in locations where cyclists are encouraged to take the full lane. The minimum placement of sharrows is 11' from the roadway curb, ideally between vehicle tire tracks to minimize wear. Off-setting the sharrow from the center of the lane (towards the roadway centerline) will help to further draw cyclists away from on-street parking preventing "car-dooring".



Source: Greenville County, South Carolina, Comprehensive Greenway Plan

Figure: Sharrow Pavement Marking

Shoulder Bikeways

Paved shoulders are a type of on-road bicycle facility that provides additional pavement width for bicyclists. Shoulders are a good way to incorporate bicycle facilities in a cost-effective manner along rural roads or roadways without curb and gutter. Paved shoulders also improve general roadway operations by providing additional space for motorist emergencies and emergency vehicles, help to maintain the edge of the roadway thus extending the road's service

life, improve sight distance, provide space to make evasive maneuvers, and provide space for off-tracking of trucks rear wheels around curves (VTRANS).

A shoulder width of at least four feet is recommended to fully and safely accommodate the operating width of a bicycle. Five to six feet is suggested on roadways with high traffic volumes (especially large vehicles), speeds above 50 mph, steep graded sections, or when a shoulder rumble strip or some other type of obstruction (such as a guardrail) is present on the side of the road. If a desired minimum width of four feet cannot be achieved, shoulders that are two to three feet wide are still able to improve travel conditions; these, however, should not be identified as a bicycle facility.

Wide Outside Lanes

An additional type of on-road bicycle facility are wide outside lanes, or wide curb lanes. These facilities are accomplished by striping a roadway so that the outside lane provides extra space for better accommodation of both vehicle and bicycle travel. This extra lane width allows for motorists to safety pass a cyclist without changing lanes.

In general, fourteen feet of usable lane width is recommended for wide outside lane facilities. A width of fifteen or sixteen feet is preferred along roadway segments with a steep grade or where obstructions such as a drainage grate, on-street parking, or raised reflectors reduce the travel lane's usable width. If wide outside lane widths greater than fifteen feet continue for an extended period of time, striped bike lanes should be considered.

These facilities are a preferred alternative for arterial and collector streets that do not have adequate room for bike lanes and do not have paved shoulders. While some cyclists feel less comfortable on these facilities versus bike lanes, wide outside lanes are a significant improvement over standard eleven or twelve foot travel lanes. According to MUTCD, sharrows should be used to identify wide outside lanes. Again, these markings alert motorists of the likely presence of bicyclists, while providing bicyclists guidance on where they should position themselves.

Bicycle Lanes

The MUTCD defines bicycle lanes, "bike lanes", as a "portion of a roadway that has been designated by signs and pavement markings for preferential or exclusive use by bicyclists". These types of facilities should be one-way located on both sides of the roadway so that travels of direction are the same for both motorists and cyclists. Bike lanes are best suited for higher volume, urban roadways (including collectors), although may be located where high demand for cycling exists or where roadway configurations do not provide safe and efficient accommodations for bicycle travel. By delineating users' right-of-way, movements become more predictable and structured increasing safety for all roadway users. Placement of bike lanes on roadways with the following conditions should be avoided (NCDOT *Bicycle Facilities Guide*):

- Numerous complicated intersections and/or interchanges
- Strip development areas or areas with a high number of commercial driveways
- Complicating/unusual traffic patterns

Width

The recommended width for bike lane facilities is four to six feet depending upon a roadway's unique configuration and classification. Bike lanes on roadways with or without curb and gutter should have a minimum width of four feet. If a curb and gutter exists, the width includes the gutter pan. While considered acceptable, extra care should be considered in its usage as storm grates, gathered silt and debris, and the pavement/concrete seam may cut down on the bike lane's effective width, forcing the cyclist into the travel lane. When bike lanes are located adjacent to on-street parking, curb facing, or guardrails, a minimum width of five feet is recommended. Six feet is the recommended minimum when the following conditions are present:

Figure: Gutter Pan Within Bike Lane

- High traffic volumes
- Steep grades
- High percentage of heavy vehicle traffic
- Bike lane is adjacent to a moderate- to high-use

Widths greater than six feet are discouraged as they may be mistaken for parking or conventional travel lanes.

Pavement Markings

Bike lanes are delineated from travel lanes by a minimum six inch (150 mm) white stripe placed longitudinally between the travel lane and bike lane. All pavement marking materials should be durable, slip-resistant, and retroreflective. A four inch (102 mm) solid white strip may also be placed between the bike lane and parking lane to encourage motorists to park closer to the curb and to better differentiate the bike facility from a conventional travel lane. At bus stops, facilities should be striped with dashed lines to indicate where buses are expected to merge into the bike lane in order to reach the curb. Standard pavement markings, as shown in the figure below, should be placed within bike lanes, but out of the path of motor vehicle crossings, to indicate the dedicated cyclist space.

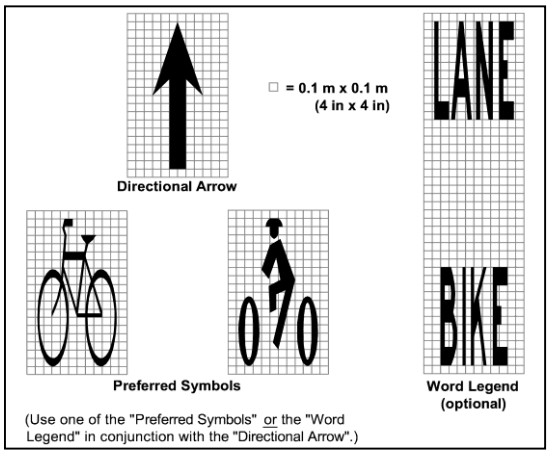


Figure: Bike Lane Pavement Markings

Location-Specific Design Considerations for Bike Lanes

Intersections

Design is especially critical, and often challenging, for bike lanes around intersections. A high proportion of incidents between bicycles and automobiles occur at intersections, therefore requiring facilities to be designed in a coherent and consistent manner. Both motorists and cyclists must be provided with a well-defined path to follow and a clear indication who has the right-of-way. As usual, bicycles should be treated as vehicles at intersections and the path designated for bicycles should remain as close to the conventional travel lanes as possible. Bike lanes may be striped all the way to the crosswalk, but should not extend through pedestrian crossings or through intersections. Dotted lines may be extended through complex intersections or multi-lane roundabouts if extra guidance is warranted.

As cyclists approach an intersection, they will need to position themselves in the movement location they intend to make. When bike lanes are present at an intersection, they are typically only intended for through movements. For turning movements, this may require cyclists to merge into outside travel lanes or areas without bike lanes.

Free-flowing intersections, like those with slip lanes, allow motorists to make turns without being controlled by a traffic signal, thus enabling higher speed turns. This design decreases safety for cyclists who must cross paths with motorists at some point. Therefore, slip lanes should be avoided when a bicycle facility is provided.

Intersections without Right-Turn Lanes

Signalized or stop-controlled intersections without excessive right turn lanes should be replaced with a dashed line for a minimum of fifty feet prior to the intersection. The dashed line will alert motorists and cyclists that they may be merging with one another at the intersection. Solid striping should start again immediately on the far side of the intersection.

Minor intersections that are not stop-controlled should be striped with a solid line all the way to the crosswalk. However, intersections that experience a high number of right-turning vehicles or where there is a near-side bus stop, striping should be dashed for at least fifty feet or for the length of the bus stop.

Intersections with Right-Turn Lanes

Bike lanes at these intersections should be placed to the left of the exclusive right-turn lane, as shown in the figure below. Conflicts between cyclists traveling through the intersection and right-turning vehicles can be lessened by signage and striping. Encouraging bicyclists and motorists to cross paths in advance of the intersection, in a merging fashion, are preferred to those that require crossing paths in the immediate vicinity of the intersection (VTRANS). To encourage early merging, the bike lane should be striped with dashed lines at least fifty feet in advance of the intersection. The solid line striping should resume when the full-width of the right-turn lane is achieved and should extend to the crosswalk or stop line.

Locations without adequate space for both a separate bike lane and a right-turn lane may be marked as a shared-use lane, with bicyclists directed to the left side of the lane. While this approach is not included in the AASHTO or MUTCD manuals, cities including Memphis, TN and Eugene, OR have

implemented this approach. Another option for locations with limited space is to end the bike lane and widen the through lane to at least fourteen feet for shared use.

In cases where a parking lane or through travel lane is dropped to incorporate a turn lane at an intersection, the bicycle lane should be located between the through and right-turn lanes, if possible. If a through lane has been dropped to become a right-turn-only lane, MUTCD states that bicycle pavement markings should stop at least one hundred feet before the beginning of the right-turn lane, and through bicycle markings should resume to the left of the right turn lane. Intersections with a high volume of right-turning bicycles may warrant a right turn only bike lane in addition to a through bike lane.

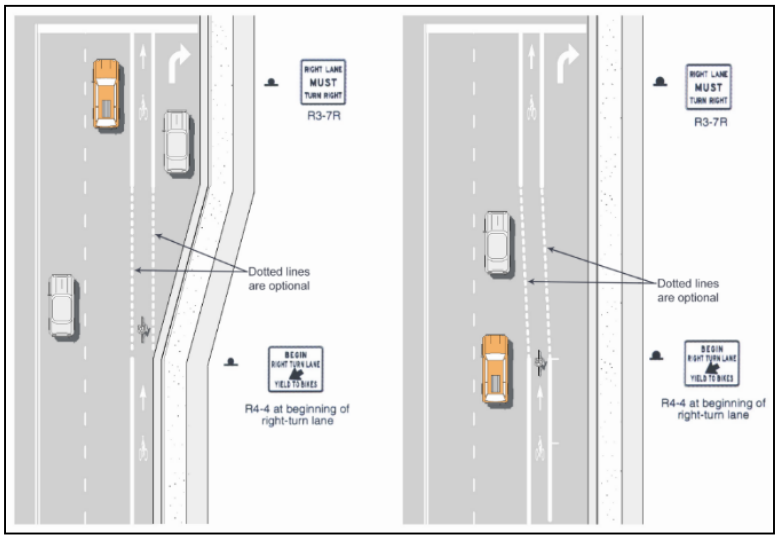


Figure: Intersection with Right-Turn Lanes

Intersections with Dual Right-Turn Lanes

Approaches with dual right-turn lanes consist of either two exclusive right turn lanes or an exclusive right-turn lane and a shared through/right-turn lane. These types of intersection configurations complicate the placement of a bike lane. Safety concerns are raised for cyclists traveling straight through the intersection as they must merge across two right turn lanes to a through lane, or proceeding through the intersection in a lane where drivers may be turning right.

The MUTCD states that the bicycle lane should be discontinued at these types of intersection approaches. A possible alternative for this type of location is to provide a dashed line from the edge of the pavement to guide the cyclist to the shared through/right turn lane. An additional alternative is to provide a sidewalk cut in order to allow the cyclist to enter the intersections as a pedestrian. Proper signage, shown in the figure, should be provided warning cyclists of the conditions ahead. Dual right turn lanes should be avoided for bicycle facilities. For roadways where significant bicycle traffic is anticipated, the implementation of dual right turn lanes should be warranted by an engineering study.

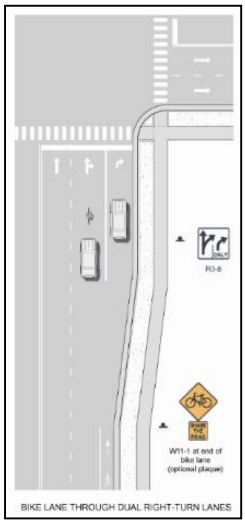


Figure: Dual Right-Turn Lanes

T-Intersections

As illustrated in the figure, bike lanes should be provided for both left and right-turning movements, especially where traffic volumes are high and there is available space. If space is limited, the bike lane should be dropped in advance of the intersection so that cyclists may position themselves in the proper conventional lane. If the bike lane is dropped, the left turn lane is recommended to be at least fourteen feet wide.

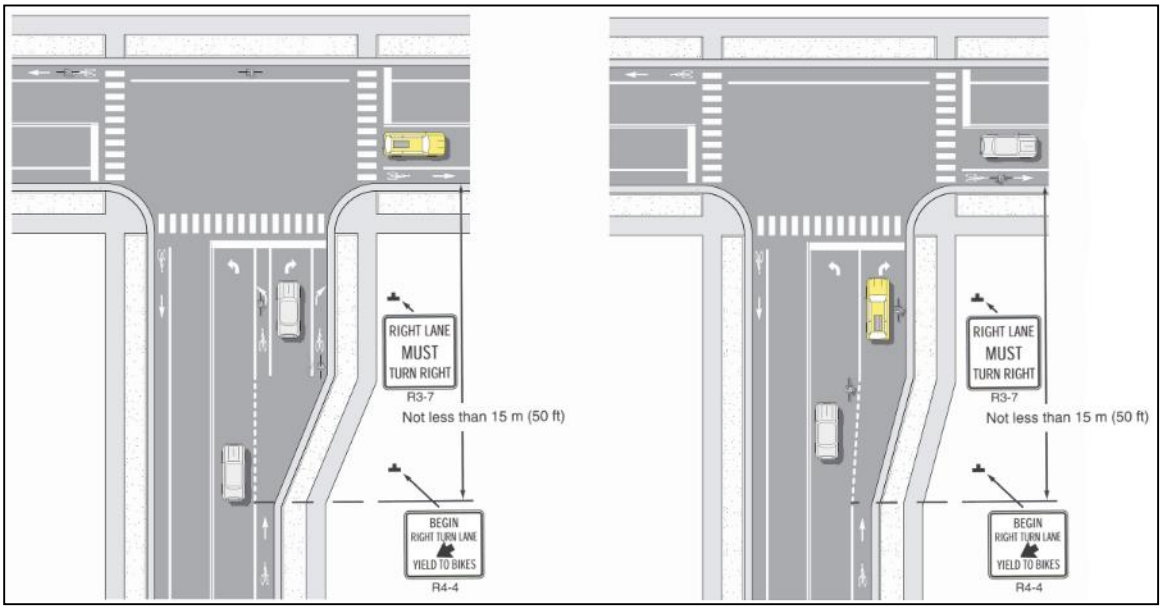


Figure: T-Intersections

Complex Intersections

Complex intersection configurations, including offset, skewed approaches or multiple streets entering from various angles, can create confusion for all roadway users. Acute angled approaches reduce bicycle visibility from certain angles and can often increase the distance across the intersection. Ideally, skewed intersections should be realigned to meet at right angles. Multiple street intersections may ideally be redesigned so only two roads cross at one point, and the additional approaches intersect the road at another location. A roundabout for this type of intersection may also be appropriate. If realignment or reconfiguration is not possible, maximum sight distance should be achieved for the intersection. Additionally, bike lanes may be dashed through the intersection to guide cyclists and to keep motorists from encroaching into the path of travel.

Railroad Crossings

At-grade railroad crossings can be particularly difficult to navigate for cyclists, especially when forced to cross at an angle. Gaps between the tracks and roadway pavement, known as the "flangeway", can catch the front wheel of the bicycle throwing the bicyclist off. Bikeways are therefore recommended to cross railroad tracks as close to a right angle as possible. If the projected path of the bikeway will meet the railroad at less than a 45˚ angle, it is generally recommended that the bikeway be realigned to provide a more perpendicular approach.

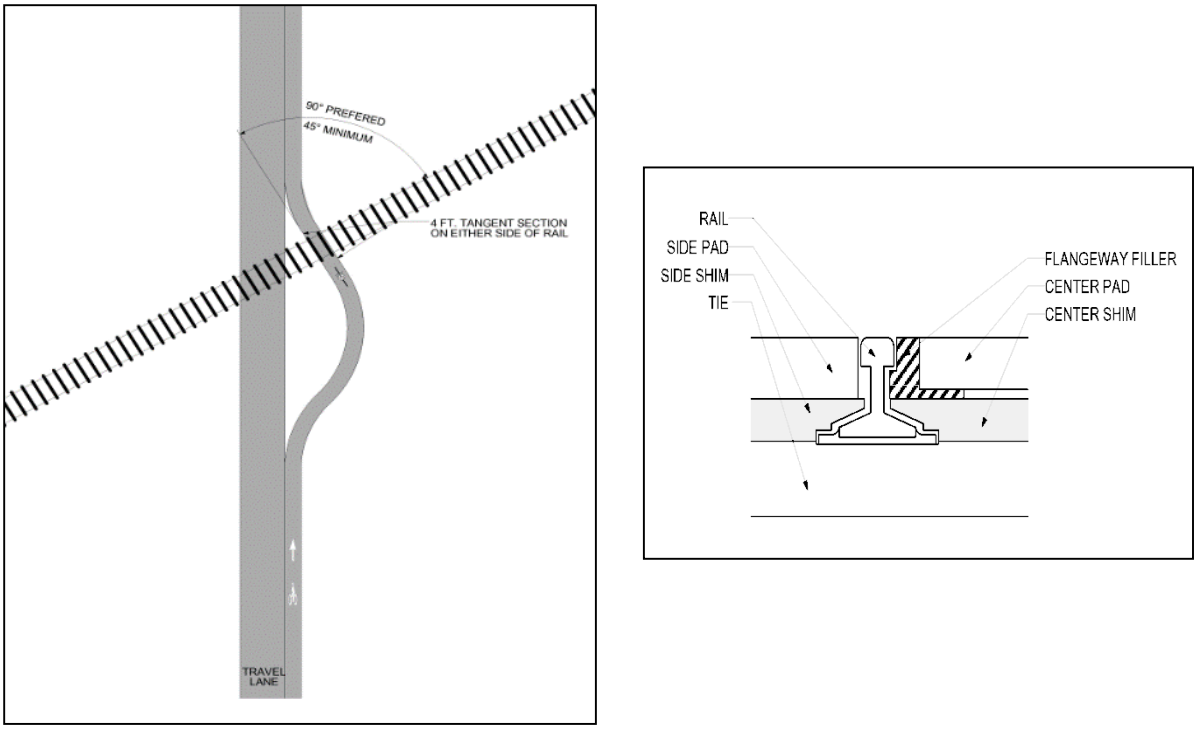


Figure: Angled Railroad Crossing

For low-speed rail lines (such as an industrial rail yard or rail car loading zone), commercially available flangeway fillers can be installed (VTRANS). These provide a smooth crossing for bicyclists and other wheeled devices such as strollers and wheelchairs. The best solution for railroad crossing surfaces is to replace timber and untreated crossings with either concrete crossing panels, rubber crossing panels (not appropriate for roadways that experience high volumes of heavy vehicles), or a combination of the two. The pictures below depict various railroad crossing materials.

Advanced warning signs and pavement markings should be installed in advance of a railroad crossing, as stated in the MUTCD and as shown in the figure below. Pavement markings should also be used to indicate the safest crossing angle to cyclists.

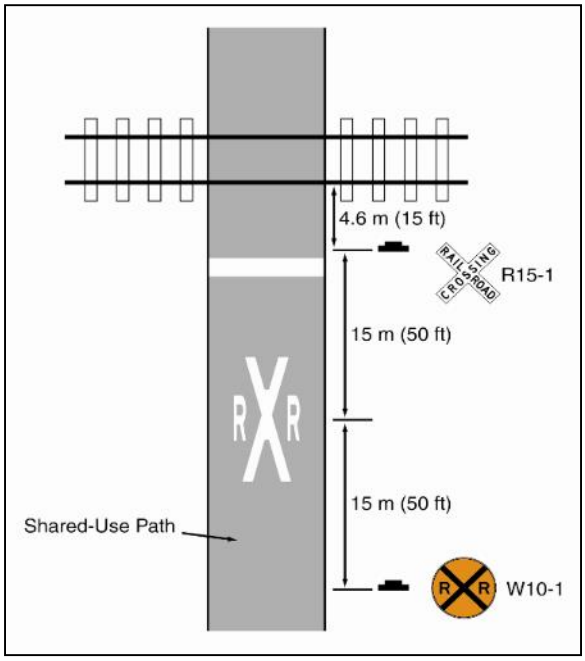


Figure: Railroad Crossing Signage

Interchanges

Areas around freeway or interstate interchanges can be particularly challenging for cyclists due to the high-speed, free-flowing nature of motor vehicle traffic. Problems occurring at entrance and exit ramps include:

- Motorists exiting to the right sometimes do not use turn signals, making it difficult for cyclists to predict vehicle movements
- Motorists may not anticipate bicycle traffic as they are often exiting a bicycle-restricted roadway
- Merging motorists may be distracted and not as attentive to the presence of cyclists
- Motorists are generally accelerating to merge into traffic, increasing the speed differential with bicyclists
- Visibility issues caused by the acute angle at which vehicles are approaching

The bicycle lane designs shown below illustrate recommended solutions for interchanges with uncontrolled vehicular movements. These configurations help to increase safety and comfort by improving sight distance, minimizing the distance cyclists must cross, and by moving the conflict point to a location where motorists are not concentrating on merging with traffic. This is accomplished by pulling the bike lanes away from the through lane of the roadway and curving them around to intersect the road at near-right angles. Communities such as Portland, Oregon have experimented with the use of colorized bike lanes at entrance and exit ramps to further increasing visibility.

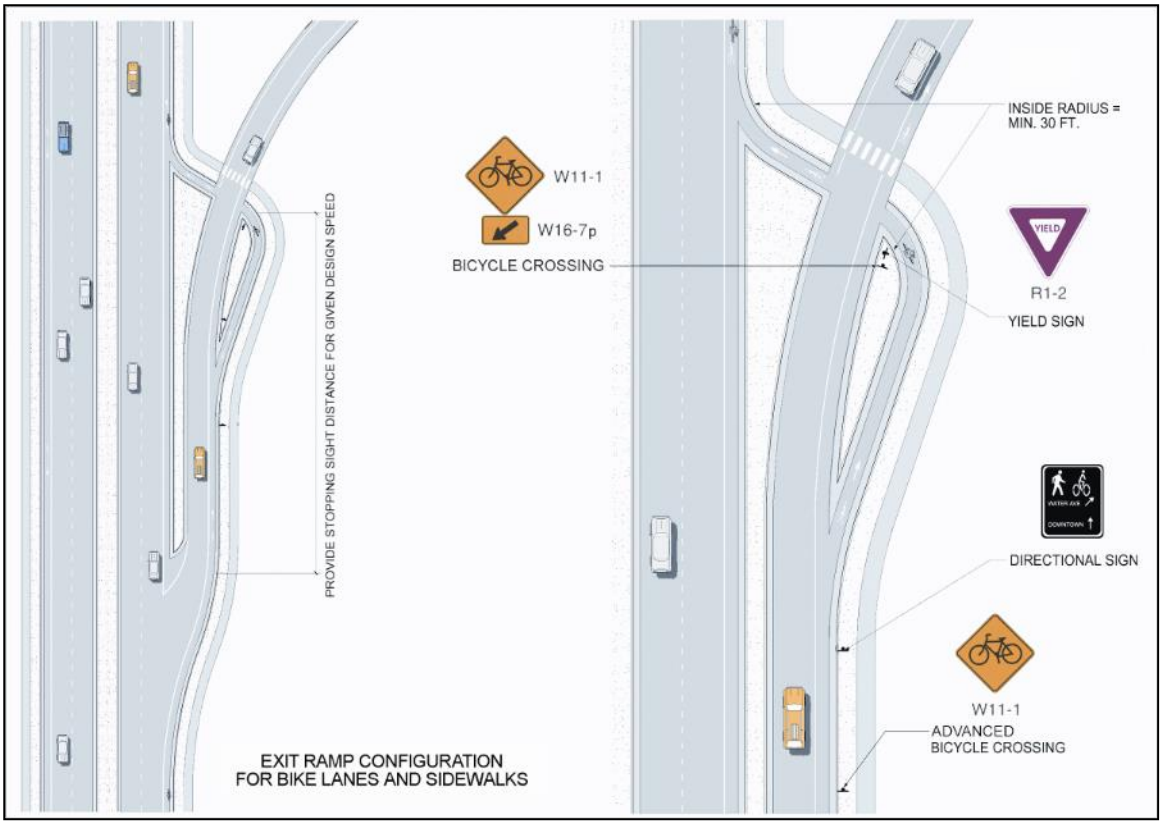


Figure: Interchanges

Bike Lanes Adjacent to On-Street Parking

When bicycle lanes lie adjacent to on-street parking, a minimum width of five feet should be considered to provide additional maneuver room for bicyclists to avoid car mirrors, opening car doors, or vehicles entering and exiting parking spots. A width of six feet is desirable for locations experiencing high parking turnover. AASHTO states that the minimum combined width for both bicycle facility and parking lane should be twelve feet. Placement of the bicycle lane should be between the parking lane and travel lane, never between the parking lane and curb. Diagonal parking

poses additional visibility concerns for cyclists and is generally not recommended on streets with bike lanes. Consider installation of "Look for Bike" signs to alert drivers of presence of bicyclists when backing out of diagonal parking or when opening the driver's side door in a parallel parking lane.

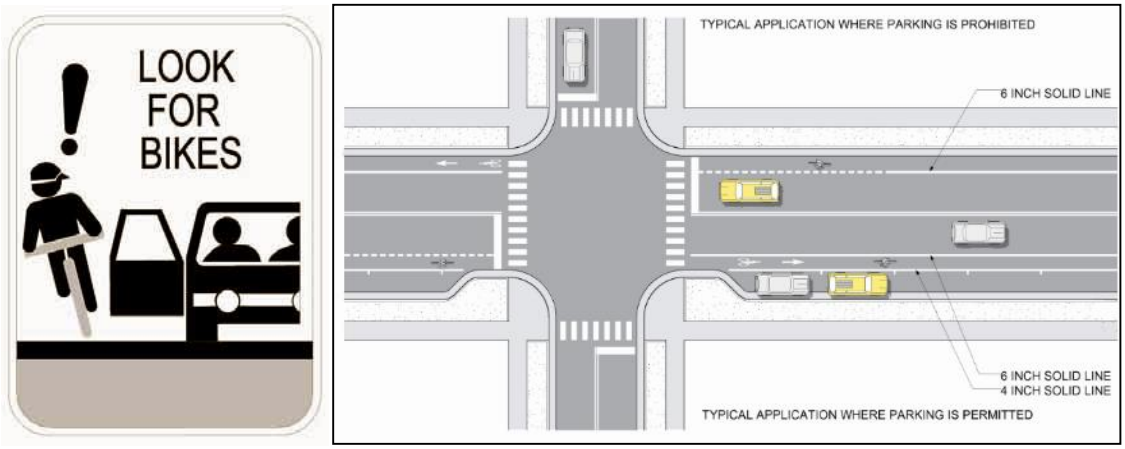


Figure: Adjacent to On-Street Parking

Other Design Considerations for On-Road Bicycle Facilities

Rumble Strips

While an effective safety measure for motorists, rumble strips can wreak havoc on bicycle traffic. Riding on rumble strips is, at best, uncomfortable. They can also cause damage to bicycles, such as a flat tire or bent rim, and potentially cause cyclists to lose control or fall. Therefore, bicyclists avoid riding on them forcing them either into the travel lane or to the shoulder (if any). If rumble strips are desired, keeping widths and depths to a minimum is suggested. Providing gaps in the strip allows cyclists to safely merge, cross, or turn without coming into contact with the rumble strip. Regardless of minimization techniques, they should never be used on a roadway with a bike lane facility. On roadways with wide outside lanes, rumble strips should be located on the right side of the lane line.

Drainage Grates

Drainage grates pose a serious threat to cyclists depending upon their design and location. Raised or sunken grates (or utility covers) can divert a bicycle's wheel, sometimes resulting in a crash or damage. Even worse, grates or grate frames with long slots parallel to the path of travel can trap a bicycle's tire potentially leading to serious injuries. They should, therefore, be designed and placed in locations that are bicycle-friendly. If a grate must be placed within in a bicycle's right-of-way, especially along a bike facility it should have a tire-friendly design similar to those shown below. If immediate replacement of existing grates cannot be achieved, a temporary solution is to weld steel cross straps or bars perpendicular to the path of travel, spaced a maximum of six inches apart.

Another hazard regarding storm grates is created by resurfacing streets without raising the grates. This gap between pavement and grate creates unsafe riding conditions for cyclists. Therefore, it is recommended that the grate be no more than one-quarter of an inch offset from the new pavement. If not possible, the pavement should be tapered into the grate to avoid leaving a severe edge. This

design is recommended for all streets, not just those designated for bicycle use. Below are a few examples of the acceptable and unacceptable grate designs for bicycle use.

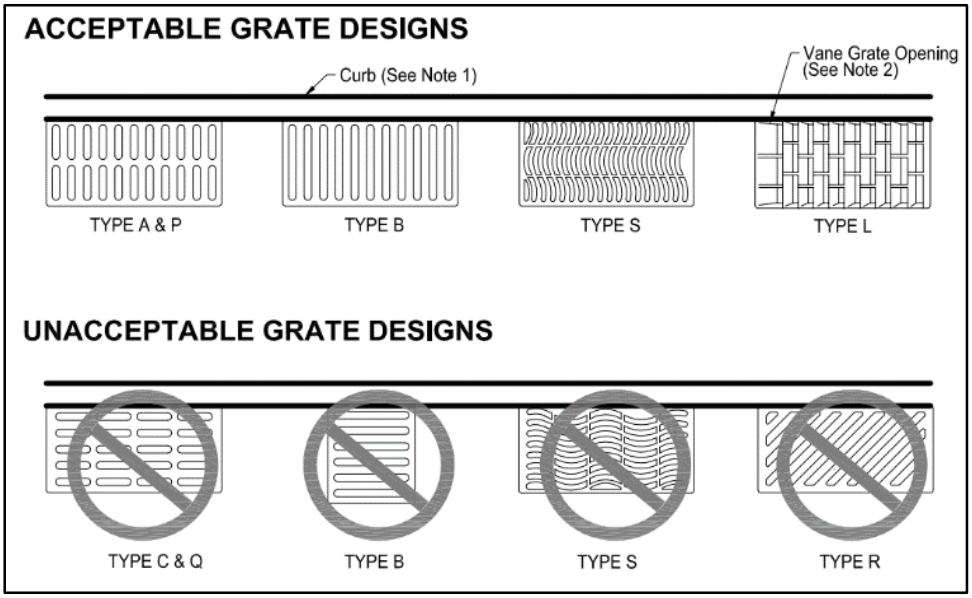


Figure: Bicycle-Friendly Storm Grate Designs

Pavement Condition

Cyclists travel on two high-pressure wheels and are even more vulnerable to poor roadway conditions than motor vehicles. Therefore, bicycle facilities should be maintained to the same high standard as roadways for motor vehicle traffic.

Bicycle facilities require routine maintenance just as roadways do. Because of their design, bicycles can be even more susceptible to accidents or damage caused by poor roadway conditions than motor vehicles. Debris on the roadway can deflect bicycle wheels, causing cyclists to lose control, and potholes can bend the rim of a bicycle wheel.

Maintenance/Sweeping

Cyclists should be provided with smooth riding surfaces. Therefore, surface imperfections should be maintained. Irregularities, such as potholes, ridges, cracks, and other surface defects, should be identified as part of regular maintenance and repaired promptly, especially when they are located within the bicycle path of travel. Also, an effort should be made to respond quickly to complaints of a specific hazard made by facility users.

Routine inspection and maintenance programs should be organized to guarantee that litter and debris are removed from bicycle facilities on a regular basis. Streets that are equipped with bicycle facilities may require even more attention than roadways without bike facilities. Areas of the roadway between through and turning traffic often collect debris and are often in the path of bicycle travel. In order to keep them functioning properly and to keep water out of the bicycle path of travel, drainage areas should be kept clear of debris.

Repaving

Repaving projects often present an opportunity to add or improve bicycle facilities on a roadway. Repaving may result in additional room for shoulders or bike lanes, adjustment of conventional travel lanes or the repair of surface irregularities.

Pavement overlays should extend across the entire pavement width (e.g., travel lanes, turn lanes, shoulder area, etc.) to prevent surface problems, like a ridge or edge, within the bicycle travel path.

As part of the repaving project, certain roadway features, such as manhole covers and storm grates, should be raised to offset the pavement surface by no more than one-quarter inch.

1.8 Greenway and Connection Facilities Signage

A comprehensive system of signage ensures that information is adequately presented to both roadway and greenway users in a coordinated and consistent manner. Signage serves many purposes including wayfinding, trail identification, safety, and brand identity for the Spring Hill Greenway. To be effective, while unobtrusive to the visual landscape, sign designs should be simple and small, only detailing pertinent information.

1.8.1 Regulatory/Warning Signs

Bicycle and greenway facilities often require signs directed at motorists and cyclists/pathway users, sometimes both. Additional signage may be warranted alerting motorists of non-motorized traffic, especially at complex intersections or locations with high bicycle traffic and insufficient bicycle facilities. Signs directed at cyclists and pathway users are typically smaller versions of standard roadway signs since users travel at lower speeds and are often traveling closer to the signs.

All signs, like standard roadway signs, should be easy to understand by all roadway and/or pathway users. The use of symbols is preferred over text on signs in general.

The 2009 MUTCD provides guidance on signage, placement and pavement markings for bicycle facilities. Signs included in the 2009 MUTCD are shown in the figure on the following page. The latest edition of the MUTCD should be consulted when installing signs and pavement markings (http://mutcd.fhwa.dot.gov/).

Multi-Use Paths/Greenways

Regulatory and warning signs should identify existing or potentially hazardous conditions on or near the trail. Like those on roadways, these signs identify steep grades, intersections, stop or yield signs, changes in pavement conditions or material, and speed limits for bicyclists. These signs are often used near intersections, bridges, crossings, and tunnels. Regulatory and warning signs should also be placed in advance of intersections between pathways and roadways. For example, a "Bicycle Warning" sign (W11-1) should be placed on the roadway to warn approaching motorists of potential pedestrians and bicyclists. Signs directed at users on the shared-use path approach to an intersection, should only be visible to those on the pathway, not to motorists.

Shared Roadways

It is recommended that bicycle route signs (D11-1, M1-8, M1-9 and supplemental plaques) be placed at all major intersections where routes change direction and on streets with a minimum spacing of 1,000 feet. As previously mentioned, bike route signs should include information, such as destinations, directions or identifying bikeways.

Bicycle Lanes

"Bicycle Lane" signs (R3-17) should be used only for designated bike lanes, i.e., those marked by the "Bicycle Lane Symbol" marking. In conjunction with the "Bike Lane" sign (R3-17) at the beginning and end of the marked lane, supplemental bike lane plaques "Ahead" (R3-17a) and "Ends" (R3-17b) should be used. A "Bicycle Warning" sign (W11-1) and the "Share the Road" plaque (W16-1) should both be used just after the "Bike Lane Ends" signage. When bike route signs (D11-1, M1-8, M1-9, and supplemental plaques) are used, they should include directional and bike route identification information. On roadways with bike lanes, this type of informational signage is only needed at major intersections or where the route changes streets with a minimum spacing of 1,000 feet.

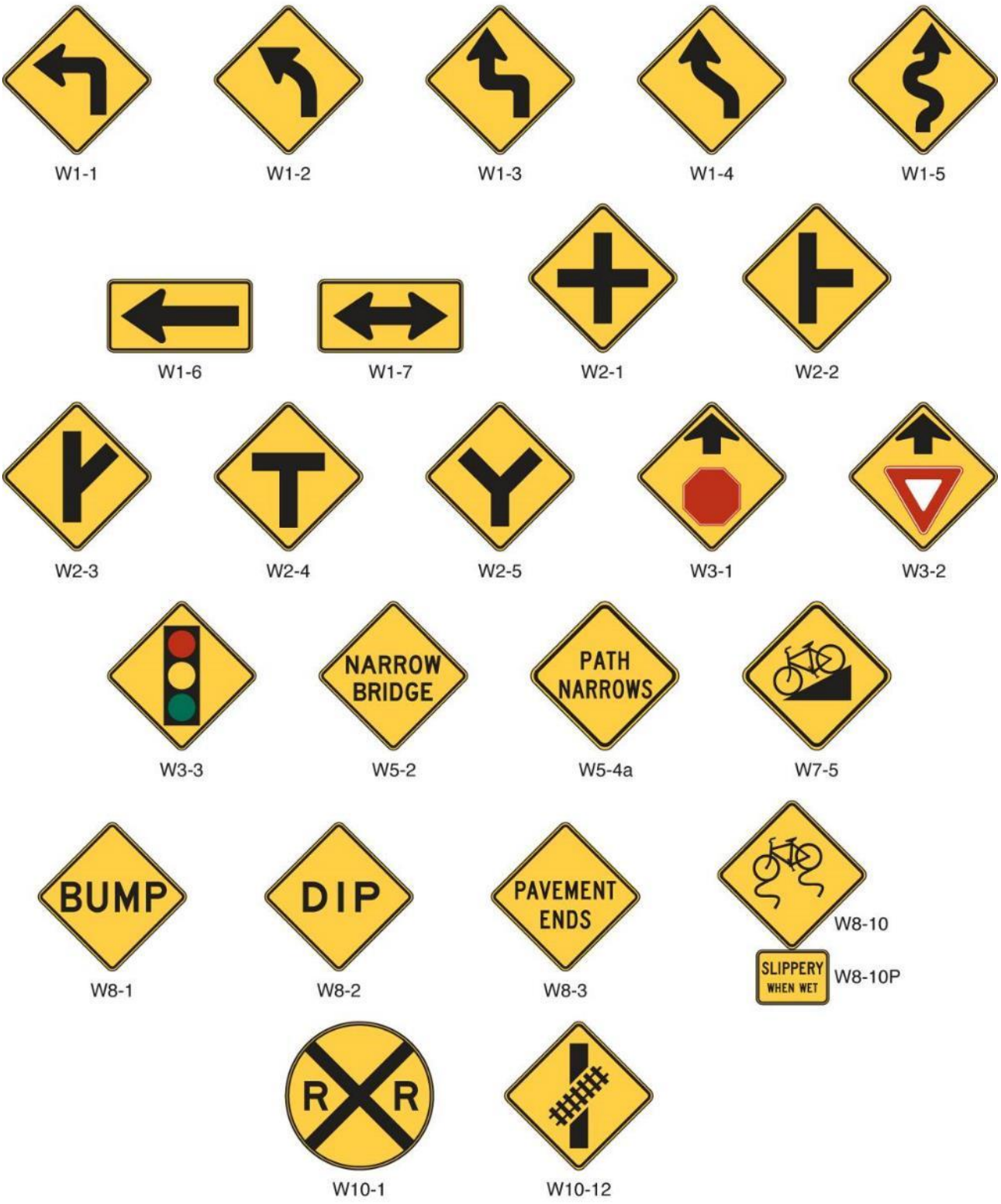
Locations where bike lanes are discontinuous, bike route signs should be provided to guide cyclists from one bike lane to the other. It is also recommended that bike route signs provide additional destination information, such as "Bike Route: XX Street Bikeway" or "Bike Route: Zoo".

"No Parking Bike Lane" signs (R7-9, R7-9a) may be necessary in areas where parking within bike lanes is a recurring problem. However, in most cases, adequate pavement markings in bike lanes reduce the need for these signs.

On roadways where motorists must transition across bike lanes into right turn lanes, "Begin Right Turn Lane Yield to Bikes" signs (R4-4) should be installed at the beginning of the taper, or, if none, at the point where merging begins.

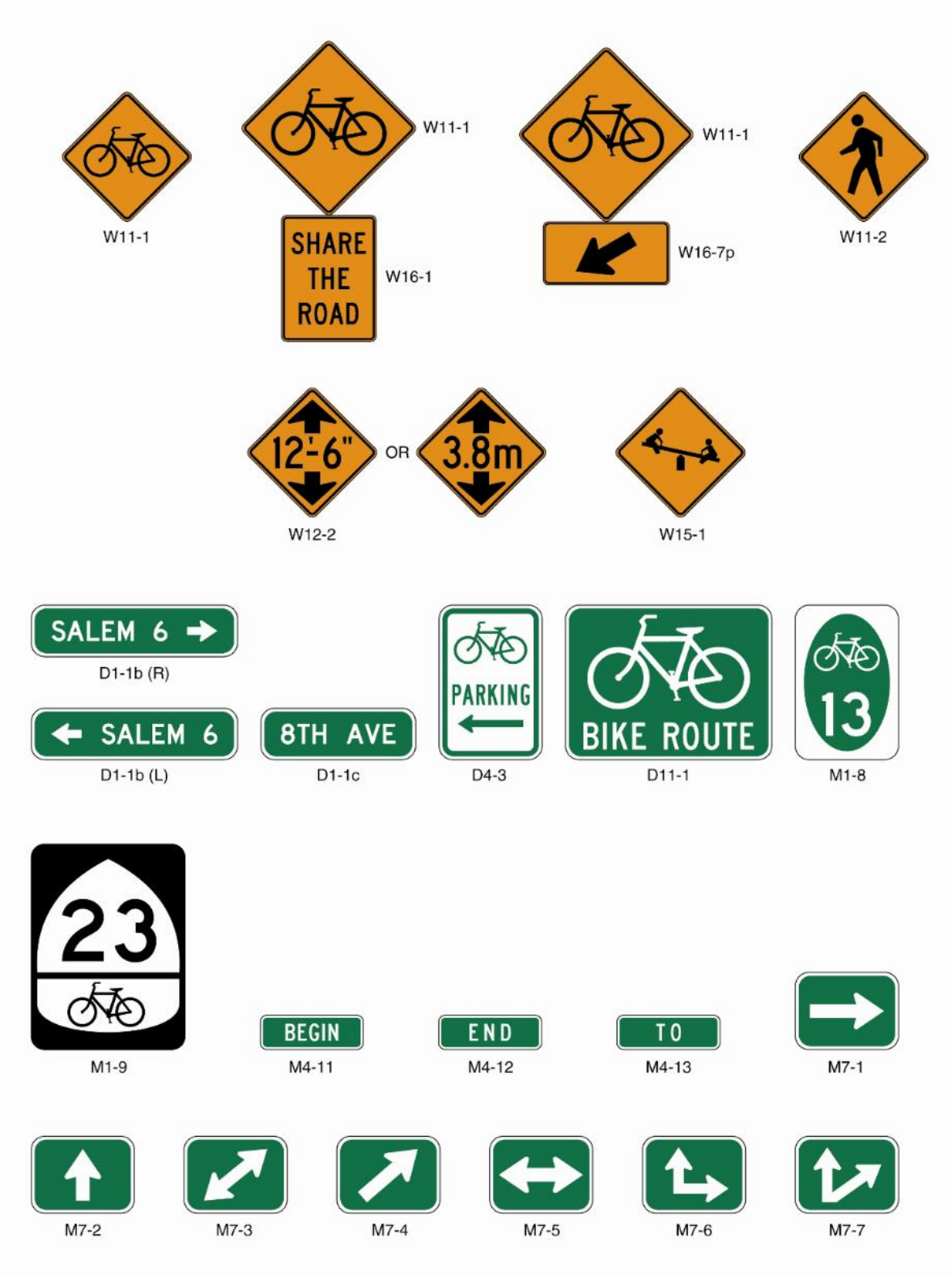
Source: MUTCD

Figure: Regulatory, Warning, and Directional Signage for Bicycle Facilities



Source: MUTCD

Figure (continued): Regulatory, Warning, and Directional Signage for Bicycle Facilities



Source: MUTCD

Figure (continued): Regulatory, Warning, and Directional Signage for Bicycle Facilities

1.8.2. Greenway Wayfinding Signage

Signage has the ability to have a collective impact on the overall visual and perceived quality of the greenway system. Knowing a sign's purpose will help to answer other important design questions – where to locate the sign, how big the sign should be, and what information should be included on the sign. Only signs with a clearly defined purpose to meet an identified need should be installed. The network should be signed seamlessly with other alternative transportation routes (bike routes), neighboring jurisdiction trails, and local neighborhood trails.

Signage for greenway networks is divided into several categories:

- Regulatory and warning signs (covered in the previous section) – Informs users of greenway rules and warns of potential hazards and upcoming roadways, steep grades, sharp curves, etc. All should conform to the MUTCD
- Network/entry signs – Greenway logos and trailhead entrance signs help to direct users to the facility and provide a sense of arrival at the greenway facility
- Directional/wayfinding signs – Maps, arrows, mile markers, and other signage relating to users' location, where they are going, and how to get there
- Educational/interpretive signs – Provides users with information about the greenway, flora and fauna, history and culture, and other points of interest along the pathway

Implementation of coordinated signage will allow the Spring Hill Greenway network to move from a conceptual vision to a clearly identified network of trails, travel routes, and destinations. While wayfinding signage helps to establish a greenway identity, it in itself is a component of a broader effort to brand Spring Hill community and park facilities. All wayfinding signage should conform to the Signage Requirements of the Zoning Ordinance of the City of Spring Hill (listed in the table below). These regulations are specific to all non-residential districts.

Spring Hill Signage Requirements	
Minimum Setback from Property Line:	Five (5) feet
Minimum Setback for Base of Sign:	Five (5) feet from right-of-way
Maximum Height:	Six (6) feet
Maximum Sign Area per Sign:	Thirty-two (32) square feet *Larger signs permitted for multi-tenant centers and office parks
Sign Base Area Limit:	50% of the sign face area
Permissible Materials:	Masonry or natural materials, except for any attached letters or logos

Figure: Spring Hill's Signage Requirements

The following signs are the suggested design prototypes for greenway wayfinding signage in Spring Hill. It should be noted these are merely concepts and do not reflect engineering design standards.

Network Signs

The Spring Hill Greenway logo should be used to reinforce the system's identity. It may be used as a standalone sign, on other signs, or incorporated into other pathway features such as benches or trash cans. Depending upon the context, a modified logo without the figures may be used.

Figure: Prototype Logo and Trailblazer Sign

Trailhead Entry Signs

Main entrance, or trailhead, signs mark terminus points for each greenway path. Sign size depends upon each location's unique conditions. The display should be large enough to be legible from a moving vehicle and generally only includes the greenway name. If a pathway is using an existing park facility's parking lot, the greenway logo should be added to existing entrance signs. If the greenway trailhead has its own parking lot and corresponding amenities, sometimes referred to as a primary trailhead, a larger-version monument sign should be used. For connector path/greenway intersections or secondary trailheads, a much smaller monument sign is more appropriate.

Monument:

Figure: Prototype Monument Sign

Complimentary Park Entrance Sign (Concept):

Trailhead Kiosk:

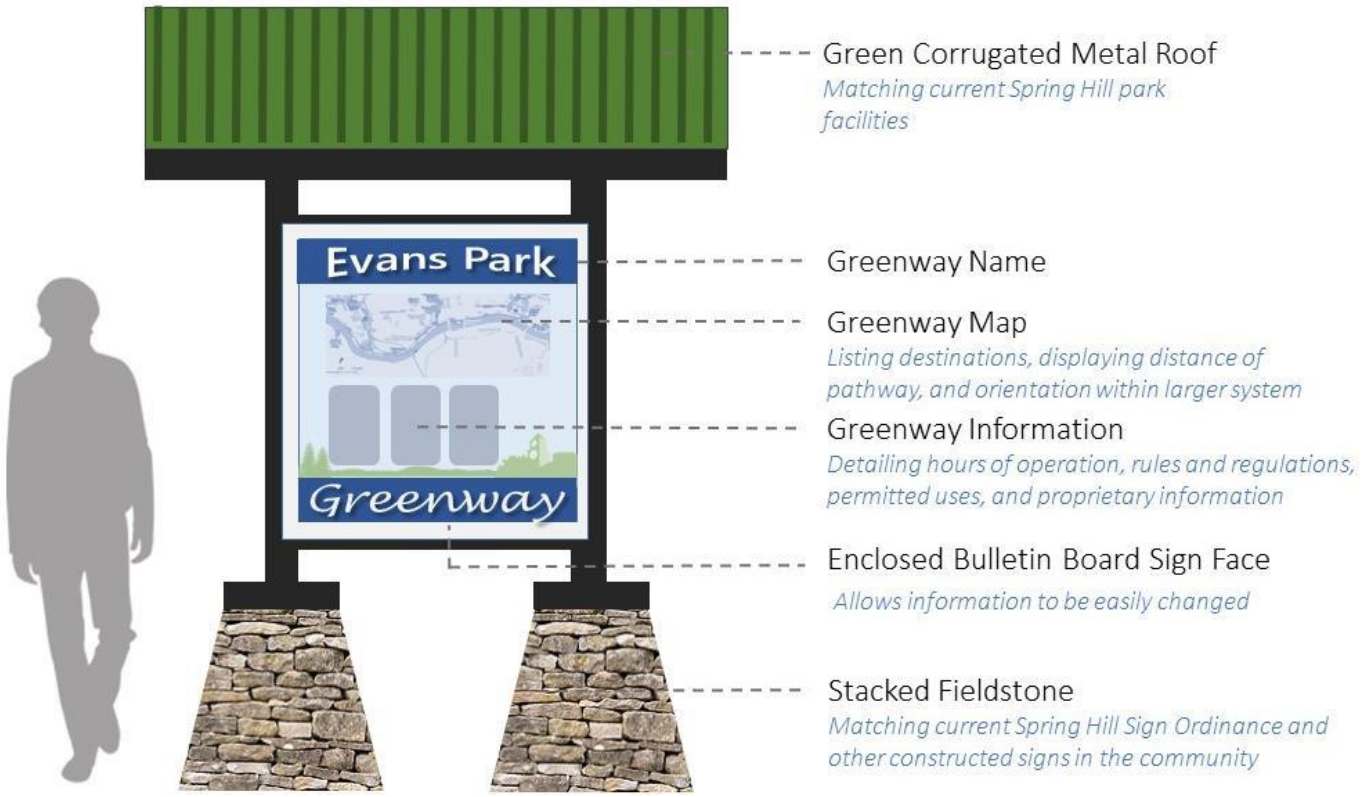


Figure: Prototype Trailhead Kiosk

Directional

Directional signs direct pathway users and motorists to locations of trail heads, nearby community destinations (typically no more than a mile from the pathway with an adequate means of connection), and other greenway pathways. Directional panel signs should be located at important pathway intersections, especially at pathway connection points or where the pathway diverges into two. The directional sign type also includes mileage displays which provide users with exercise benchmarks and/or locational orientation along the pathway. This is an especially important safety feature for emergency personnel. Placement of mile markers depends upon the length of the greenway segment. For shorter pathways, mile markers are typically placed every quarter or half mile approximately 3 feet from the edge of the path.

Panel Direction Sign:

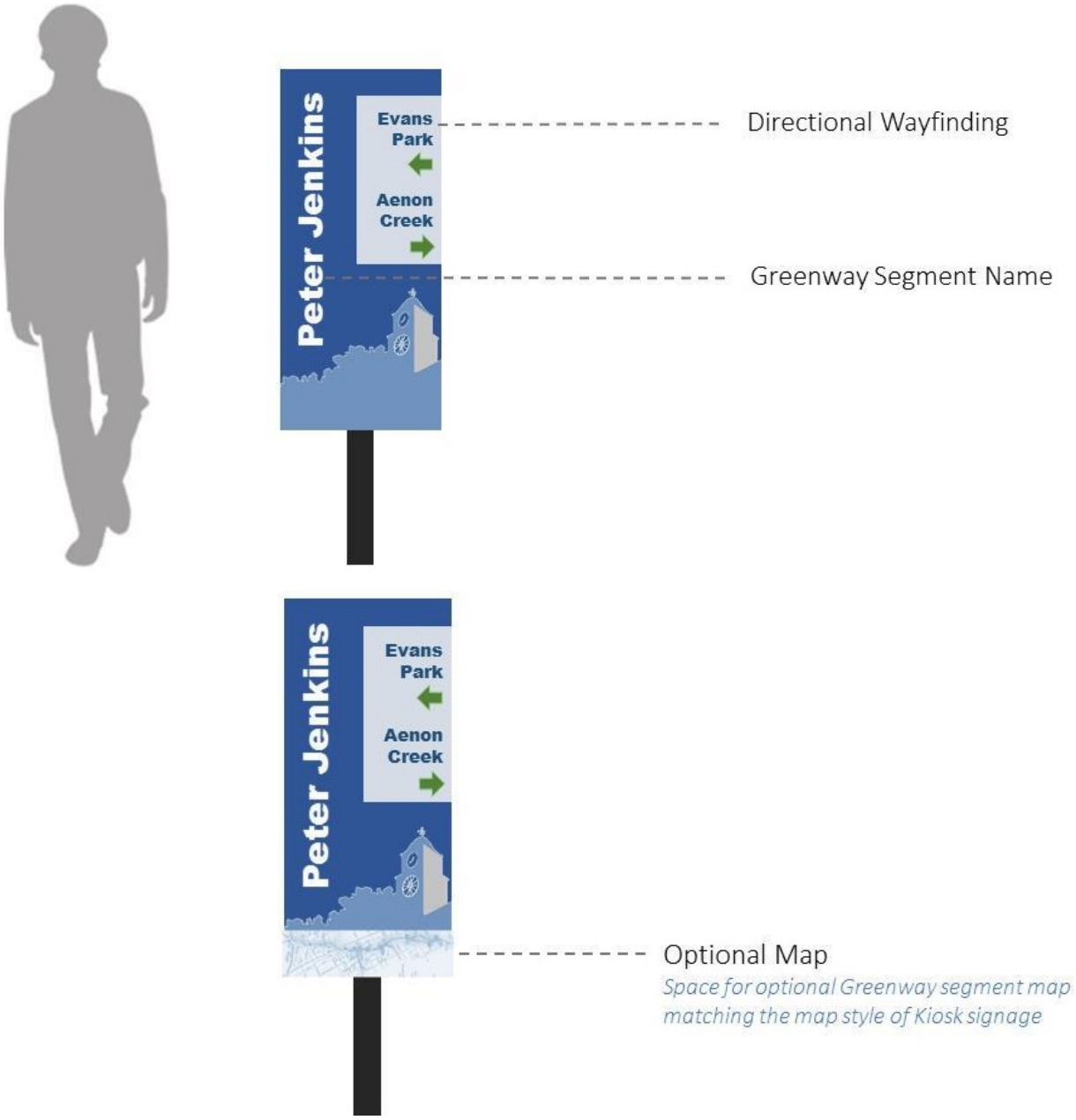


Figure: Prototype Panel Direction Sign

Embedded Emblem Mile Marker:

Figure: Prototype Embedded Emblem Mile Marker

Stenciled Pavement Mile Markers:

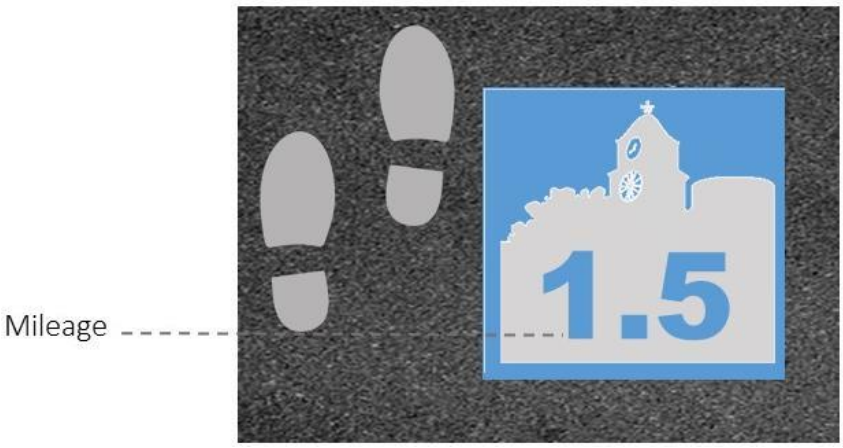


Figure: Prototype Stenciled Pavement Mile Marker

Educational/Interpretive

Education, or interpretive, signage provides greenway users with information about the greenway, native flora and fauna, history and culture, and other significant pathway elements. There is wide variety in the amount and type of information educational/interpretive panels provide with a variety of styles in which it is presented. These signs should be placed no closer than three feet from the edge of the pathway keeping in mind users with mobility challenges. An example educational/interpretive panel for Spring Hill Greenways is shown below.

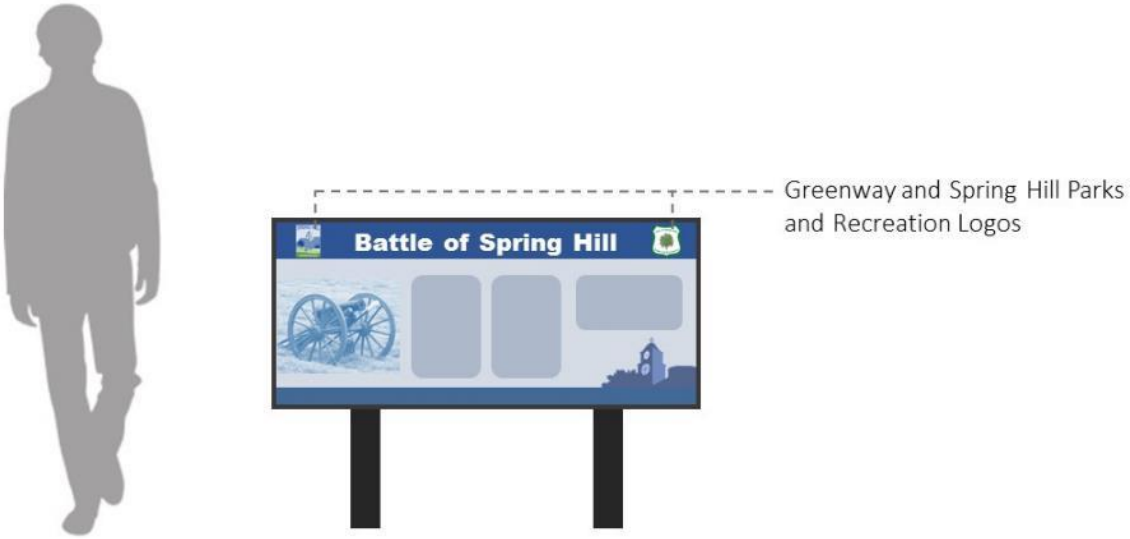


Figure: Example Interpretive Panel


SPRING HILL
Peter Jenkins
Greenway


Evans Park
Greenway


Peter Jenkins
Evans Park
Aenon Creek


Battle of Spring Hill


MILE
4.5
PETER JENKINS GREENWAY


SPRING HILL
Greenways


NORTH
SOUTH
31
31
SPRING HILL
Greenways


SPRING HILL
SPRING HILL
WASTE